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**TOPIC: COMPARATIVE STUDY OF WATER AND ROAD TRAFFIC CRASHES IN
SELECTED CITIES IN NIGERIA, GHANA AND KENYA**

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LIST OF ABBREVIATIONS:

ABO: Association of Bus Operators
BBA: Boda Boda Association
BMU: Beach Management Units
CBD: Central Business District
EAC: East African Community
FGD: Focus Group Discussion
FRSC: Federal Road Safety Corps
FRSC: Federal Road Safety Commission
GDP: Gross Domestic Product
GDP: Gross Domestic product
GNP: Gross National
GPRTU: Ghana Private Road Transport Union
GPS: Global Positioning System
HPIs: High Priority Investments
IMIS: Integrated Management Information System
KeNHA: Kenya National Highways Authority
KeRRA: Kenya Rural Roads Authority
KMA: Kenya Maritime Authority
KNBS: Kenya National Bureau of Statistics
KPA: Kenya Ports Authority
KPS: Kenya Police Service
KRC: Kenya Red Cross
KRCS: Kenya Red Cross Society
KURA: Kenya Urban Roads Authority
LAGFERRY: Lagos Ferry Service
LAMATA: Lagos Metropolitan Area Transport Authority
LASG: Lagos State Government
LASU: Lagos State University
LASTMA: Lagos State Traffic Management
LASWA: Lagos State Waterways Authority
LATF: Local Authorities Transfer Fund
LVBC: Lake Victoria Basin Commission
LVBIWRMP: Lake Victoria Integrated Water Resources Management Programme
LVTa: Lake Victoria Tourism Association
MOA: Matatu Owners Association
MTTD: Motor Traffic and Transport Department of the Ghana Police Service
NIMASA: Nigeria Maritime and Safety Administration
NRSA: National Road Safety Authority
NTSA: National Transport and Safety Authority
PSV: Public Service Vehicle
RTC: Road Traffic Crashes
SACCOs: Savings and Credit Cooperative Organisation
SDGs: Sustainable Development Goals
SUMATRA: Surface and Marine Transport Regulatory Authority
TASAC: Tanzania Shipping Agencies Corporation
VHF: Very High Frequency
WHO: World Health Organization
WTC: Water Transport Crashes

THE EXECUTIVE SUMMARY

This study examines travel accidents on the roads and waterways of three selected cities in West and East Africa. It aims to obtain the number, pattern, causes, injuries, and fatalities of road and water accidents in the areas of study. The first city is Lagos, in Nigeria, which has extensive road networks with a huge population estimated to be more than twenty million and a coastline of 180Kms; 25% of the total surface area of 3,577 km² is water comprising of Lagoons and Creeks with a thriving water transportation system. The Ada region in the lower Volta belt is part of Greater Accra, and water transport is very active and thriving, hence its choice. Accra will provide the data for road crashes. In East Africa, we propose the Nyanza region of Lake Victoria west of Nairobi, where water mobility is significantly available, to give us insights into water accidents. Nairobi will provide adequate data on road crashes.

The Research Objectives are to determine the number of accidents and casualties on the roads and waterways of the selected coastal cities, describe the causes and patterns, compare the data among the cities and between the two modes, and evaluate and compare the safety regulation framework and safety education in the three countries.

This is a mixed-method exploratory and comparative analysis of three city case studies. We collected the primary data through focus group discussions and interviews with relevant stakeholders. Field observations Our secondary data on the accidents and incidents were obtained from the appropriate authorities. In Nigeria, from Nigeria Bureau of Statistics, Federal Road Safety Commission, Nigeria Inland Waterways Authority, and Nigeria Maritime Safety and Administration at the federal level. At the state level, data was collected from the Ministry of Transportation, Lagos State Waterways Authority, and Lagos State Traffic Management Authority and others. In Ghana the main providers of the secondary data are the two regulatory agencies : Motor Traffic and Transport Department for the road and the Ghana Maritime Authority for the water. In Kenya they are the National Transport and Safety Authority which manages the road transport system in the city and the Maritime Authority for the waterways.

Each region is presented as a case study and then a comparative analysis.

Thus, the report is divided into five chapters: the introduction, chapters two, three, and four, which present the three case studies of the selected cities in Nigeria, Kenya, and Ghana. Chapter five provides the comparative analysis, conclusion, and recommendations.

Our major findings are that Lagos's situation revealed a very high rate of crashes on the road and the land. The main factors are the increasing population and urbanization. It has the highest population and vehicular density in the country. The resultant effect is the heavy pressure on the fragile transport infrastructure. Lagos accounts for more than 40% of the 11.8 million vehicles in Nigeria. This is in spite of the fact that it is only 0.36% of the landmass, out of which about twenty-five percent is water.

Nairobi and Lake Victoria regions of Kenya indicated challenges like those in Lagos. Its status as the country's capital poses its own set of difficulties. Ada region came up with equally depressing findings of poor infrastructure, bad roads, waterways not marked dotted by tree stumps, and sunk wrecks that regularly capsizes the boats. On the roads, the potholes and minimal signage create blind spots, leading to frequent accidents. There is more similarity between the institutional framework of Ghana and Kenya, which is one agency for

road and one for water. This is a reflection of the governance structure of the countries. The Lagos State government duplicates federal agencies except NIMASA, which regulates international waters.

In all three case studies, the main culprit is the human factor. These manifest through reckless driving, drug and alcohol abuse, inadequate training, over speeding, taking telephone calls on the wheel, and other violations of traffic rules. The desire to make as much money as possible to meet the target of the vehicle and boat owners is also a factor. In most cases, the operators are not the owners and, therefore, must meet definite financial targets, or else they will be thrown out of the job. Consequently, they overload their vehicles beyond their standard capacity on land or water and overspeed to make more runs, especially during rush hours.

Most vehicles in the three regions under investigation are used, popularly called Tokunbo in Nigeria and Ghana. They are usually at the very tail end of their service years. Thus, mechanical failures, breakdowns, and blow-outs are regular features causing accidents. In other major causal factor for the water is the seasonal high tides that cease the control of the boats from the boat operators who have no access to or care for weather forecasts.

Some of our recommendations include public education and enlightenment, strict enforcement of regulations, continuous training of operators and regulators staff, regular policy reforms, investment in infrastructure, vehicle safety standards and compliance, weather reporting system and enlightenment, post-crash services, independent accident investigation body, improved data collection and analysis to understand better the causes and trends of traffic crashes, collaboration among government agencies, transport unions, and private sector stakeholders,

In conclusion, the study revealed that the three regions face similar road and water traffic accident challenges. However, the degree of enforcement, the quality of infrastructure, and public awareness differ across time and space. To reduce the level of crashes and their costs, it is critical to strengthen regulatory templates, invest more in infrastructure, and embark on continuous public enlightenment and education on safety. Only by determined and joint efforts can we witness safer road and water transport situations in the regions of our study. Each region is advised to pay the required attention to the safety and well-being of its citizens; lives and property lost in delayed action could thus be saved.

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Comparative Study of Water and Road Traffic Crashes in Selected Cities in Nigeria, Ghana, and Kenya

CHAPTER ONE: INTRODUCTION

1.1 Background and Rational

This study examines travel accidents on the roads and waterways of three selected cities in West and East Africa. While studies of road traffic crashes are extensive, studies on waterway accidents are rarer. The unique urban forms of cities with water bodies present peculiar safety and environmental challenges. Safety policies are usually well formulated and regularly communicated to enlighten citizens. However, this is less so for water transportation, especially for the local artisanal boat and ferry operators patronised mainly by the urban poor. Hence, accidents are common, with many of them unreported. This study is a crucial step towards addressing this urgent issue.

The study aims to obtain the number, pattern, causes, injuries, and fatalities of road and water accidents in the cities of study. Our objectives include a comparative analysis of the data among the cities and between the modes. It will also entail evaluating the safety regulations, enforcement, and enlightenment.

The perennial congestion in these cities creates a regular situation of crashes costing a lot of lives and property. The poorly maintained heavy trucks, trailers, boats, and ferries add to this, adding to the chaotic situation. It is further noted that the economic cost of these accidents and injuries has been estimated at 1% of GNP in low-income countries to which Africa belongs (FRSC, 2018, Tiwari et al. (2020)

As an exploratory survey research, primary data will be collected through interviews with relevant stakeholders and field observations to document some cases of real-life incidences and casualties over three months. The secondary will be from the appropriate authorities. This study is expected to contribute to the understanding of mobility safety issues in cities with road and water transport systems and to policy guidelines on how to minimize accidents.

Motivation

The mobility agonies experienced personally by the lead researcher in his city of residence, Lagos, a former federal capital of Nigeria; his regular visit to Ghana, Nigeria's neighbour with the most excellent affinity, and the occasional visit to Kenya inspired the advocacy for multimodal transport system where a city is naturally endowed with water bodies. The assumption is that it should be cheaper and safer if some variables are clearly outlined for the operators and the passengers. It is also expected to reduce pressure on the roads and thus expectedly make the urban roads less chaotic and safer. However, these assumptions are presently not confirmed. The presence of water bodies does not necessarily mitigate road accidents, and the waterways are experiencing mishaps at a very high rate.

In areas of study, we have many options for cities with water bodies in SSA. Still, we settled for the three-outline proposed here for the convenience of data collection, approachable regulating authorities, reasonable availability of archival data, and safety and security of the

research teams. Lagos has extensive road networks with a huge population estimated to be more than twenty million (LASG, 2021) and a coastline of 180Kms 25 % of the total surface area of 3,577 km² is water comprising of Lagoons and Creeks with a thriving water transportation system. Hence, we are assured of data adequacy that will enable us to arrive at reasonable conclusions on the road.

The Ada region in the lower Volta belt is part of Greater Accra, and water transport is very active and thriving, hence its choice. Accra will provide the data for road crashes. In East Africa, we propose the Nyanza region of Lake Victoria west of Nairobi, where water mobility is significantly available, to give us insights into water accidents. Nairobi will provide adequate data on road crashes.

In addition, the colossal cost of traffic accidents in human and economic losses deserves all the attention that could be given because road and waterway crashes constitute significant killers of Africans. This burden is estimated to be more than 1% of our GDP. The desire to reduce annual carnage on our urban roads and waterways is the biggest motivation for choosing the topic.

Scholars' neglect of accidents on waterways, especially in Africa, is another inspiration for the study. There are very few mentions of accidents and their casualties on rivers. Although the volume of traffic and commuters on roads is far greater than the number on the water, we can obtain the proportional representation of the number and casualties of this mode to compare the safety index.

We shall examine the fitness of the concepts and frameworks of the following empirical works on inland water transport accidents and casualties conducted in low-income countries and in Bangladesh and adapt their methodologies and designs by Md. Imran Uddin and Zobair Ibn Awal (2018) Zobair Ibn Awal(2006) Empirical Studies on the burden of road traffic crashes, injuries and deaths in Africa by Adeloye, Thompson, Akanbi, Azuh, Samuel, Omoregbe, & Ayo, (2016).Boboye (2019), Odewumi. (2006) Asaju. Odewumi & Asenime (2015) On other related issues, we will examine in details the methods and conclusion in studies of Filani & Osayinmese (1979) Olawole, (2016). Impact of Weather on Road Accidents, Gbadamosi,(2002), Asaju Odewumi, and Odeleye (2015). Traffic Regulations and Road Traffic Accidents.

1.2 Research Questions and Objectives are:

The research questions are:

- (i) What are the numbers of accidents and casualties on the roads and waterways of the selected coastal cities?
- (ii) What are the causes and patterns of the accidents?
- (iii) What are the differences and similarities in the data among the cities and between the two modes;
- (iv) What are the differences and similarities in the safety regulatory framework in the three countries

The Research Objectives

- (i) Determine the number of accidents and casualties on the roads and waterways of the selected coastal cities;

- (ii) Describe the causes and patterns
- (iii) Compare the data among the cities and between the two modes;
- (iv) Evaluate and compare the safety regulation framework and safety education in the three countries

1.3 Methodology

By design, this is an exploratory survey and comparative research. We collect the primary data through interviews with relevant stakeholders like law enforcement agencies, drivers, and associations like the Road Transport Workers Union, Road Transport Employers' Associations, the Boat and Ferry owners' unions, and the waterways authorities. Field observations will be conducted over three months to document some cases of real-life incidents and casualties. This will entail working closely with identified relevant authorities. The sampling techniques for the survey shall be a multi-stage Stage, which will include starting Quota, systematic, clusters, and judgmental to convenience as we go from one broad data collection level to a micro level.

Our secondary data on the accidents and incidents for a period, as defined by archival data, is available in a usable format and common to all the study cities. This will be a longitudinal evaluation of archival material as available in the database of relevant agencies like Vehicle Inspection Services, Traffic Management Authorities, Waterways authorities, Bureau of Statistics, Highway Police, Motor Vehicle Plate Number Administration, and Ministries. All these will constitute the sources of our secondary data. Also, we will obtain the regulatory policy documents on the two modes of transportation as they relate to the cities of study. The data will be mapped, compared, and analysed. Microsoft Excel shall be employed to present the data graphically. We will employ Google Maps for our mapping.

1.4 Limitations of Study:

The study contended with some limitations, but we could minimise the effect on the conduct and deliverables of the investigation. These limitations include reliance on primary and secondary data sources across three countries, and the quality and completeness of secondary data from relevant authorities differ. Still, we tried to bring them to the same level. There are many incidents unreported once they occur outside the oversight of the relevant agency; many water transport accidents, especially those involving local artisanal boat and ferry operators, are often unreported. This underreporting can affect the trend analysis. However, we ensure we obtained enough data to assert that we have enough samples to represent the data. Our focus on selected cities for a limited time scope in Nigeria, Ghana, and Kenya may reduce generalisations for other areas. There could be some socio-economic factors influencing the data in each country that are not visible. And the perspectives of the stakeholders might have been influenced by undeclared interests. The comparative analysis of countries with different levels of infrastructure, institutional framework and cultural milieu cannot be accomplished without its challenges; however, being mindful of these limitations encouraged us to lessen their effects on the study.

1.5 Report Outline:

The study is presented in five chapters: Chapter One has the introduction, and Chapters Two, three, and Four present the three case studies of the selected cities in Nigeria, Kenya, and Ghana. Chapter Five provided the comparative analysis, conclusion, and recommendations.

CHAPTER 2: CASE STUDY OF LAGOS, NIGERIA

2.1. Background

Lagos state is Nigeria's economic hub. It serves as the gateway for the country's imports and exports. Lagos State has grown to become one of the largest agglomerations in Africa. It is the most urbanised part of the country and currently has an estimated population of 23 million (Lagos Draft Transport Master Plan, 2018). Lagos is the 6th largest economy in Africa and accommodates more than 65% of Nigeria's industrial output, making it a melting point for people from all walks of life (LASG, 2023). It has a triple gateway status from an active land border, an international airport, and a very busy seaport that handles more than 85% of all imports through the Apapa and Tin Can Island Ports. (Folarin, 2018) Consequently, with heavy traffic density, inadequate infrastructure, and heavily challenged enforcement, crashes on land and on water have become a perennial feature

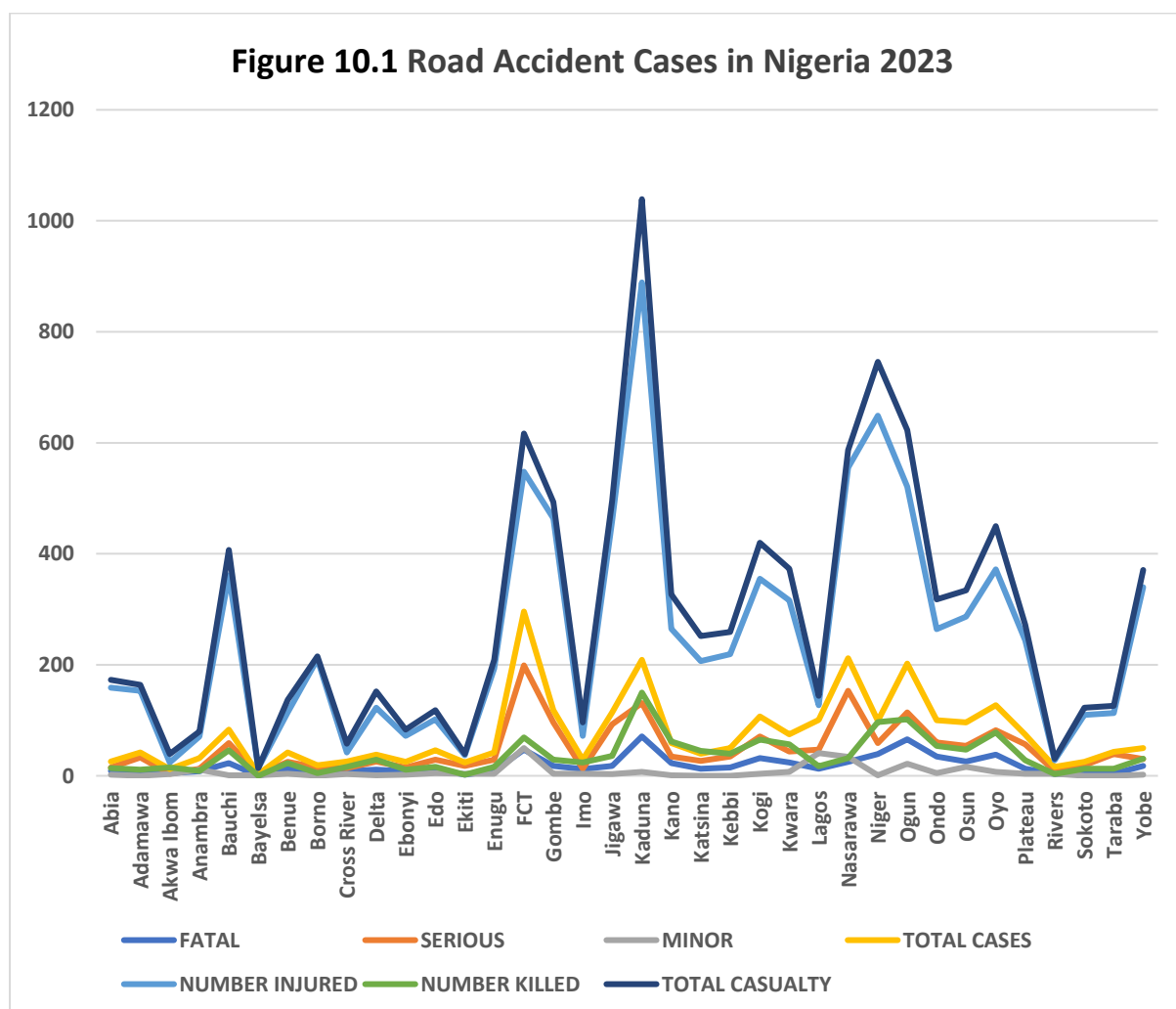
Within Nigeria's geographical landmass, the data in Table 2.1 might give the impression that the incidences of road crashes are ordinary, but when juxtaposed with the fact that Lagos occupies just 0.36% of the 923.768 km² that is the size of Nigeria. With such a small size, it accounts for 40% of the vehicles in the country, which is given as 11.8million (NBS,2023. It also has 180 kilometers of coastline and estuaries of rivers such as Osun, Ogun, and Ologe.

Table 10.1 Road Accidents in Nigeria, 2023

STATE	FATAL	SERIOUS	MINOR	TOTAL CASES	NUMBER INJURED	NUMBER KILLED	TOTAL CASUALTY	PEOPLE INVOLVED
Abia	9	15	2	26	159	14	173	298
Adamawa	9	33	0	42	153	11	164	327
Akwa Ibom	5	4	3	12	24	15	39	66
Anambra	8	13	11	32	71	9	80	288
Bauchi	23	59	1	83	361	46	407	657
Bayelsa	0	2	1	3	14	0	14	17
Benue	13	25	4	42	114	23	137	227
Borno	4	15	0	19	210	5	215	313
Cross River	9	14	3	26	42	16	58	130
Delta	11	26	1	38	123	29	152	303
Ebonyi	8	15	2	25	72	11	83	129
Edo	12	29	5	46	102	16	118	247
Ekiti	2	18	4	24	37	2	39	80
Enugu	9	29	4	42	193	16	209	332
FCT	47	199	50	296	548	69	617	1635
Gombe	18	96	4	118	464	29	493	827
Imo	12	13	4	29	72	24	96	197
Jigawa	18	93	3	114	460	36	496	769
Kaduna	71	131	7	209	889	150	1039	1838
Kano	23	35	1	59	265	62	327	461
Katsina	13	27	0	40	207	45	252	356
Kebbi	15	35	0	50	219	40	259	606

Kogi	32	71	4	107	355	65	420	1015
Kwara	24	44	7	75	316	57	373	605
Lagos	13	47	41	101	127	17	144	475
Nasarawa	25	153	34	212	555	32	587	993
Niger	39	59	1	99	649	97	746	1048
Ogun	66	114	22	202	521	102	623	1343
Ondo	35	60	5	100	264	54	318	704
Osun	26	54	16	96	287	47	334	712
Oyo	38	82	7	127	372	78	450	828
Plateau	13	57	4	74	244	28	272	461
Rivers	3	9	4	16	28	3	31	113
Sokoto	6	19	0	25	110	13	123	175
Taraba	4	39	0	43	113	13	126	214
Yobe	18	30	2	50	340	31	371	494
Zamfara	6	8	1	15	36	18	54	131
TOTAL	687	1772	258	2717	9116	1323	10439	19414

Source: Federal Road Safety 2024



Source: Federal Road Safety 2024

In Nigeria, 2,717 road accidents occurred in Q4 2023. Out of these, 687 resulted in deaths, 1,772 in serious injuries, and 258 in minor injuries. Additionally, 19,414 individuals were involved, with 9,116 sustaining injuries and 1,323 succumbing to their injuries. Lagos reported 101 cases, with 127 injuries and 17 fatalities, involving 475 individuals. This highlights the underreporting of accidents due to insufficient law enforcement.

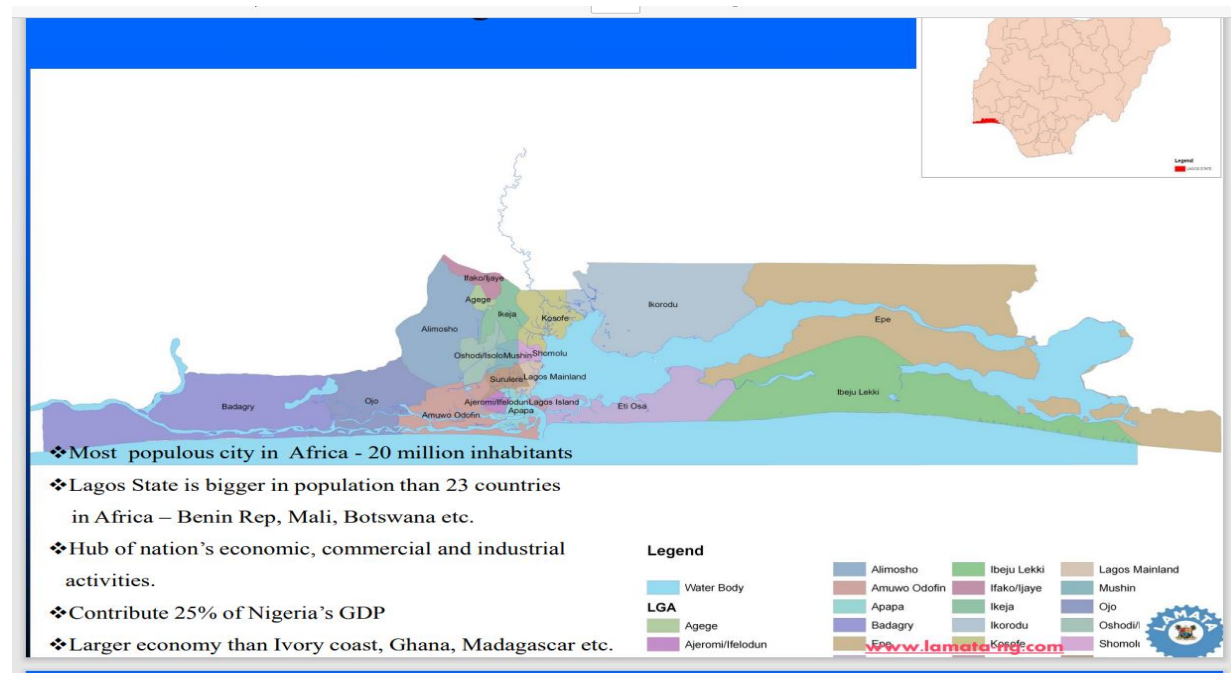
1.2 Motivation for the Study

The rising prevalence of traffic accidents in African urban areas such as Nigeria, Ghana, and Kenya has become paramount for public health and safety. The primary objective of this study is to conduct a comparative analysis of traffic crashes in specific cities throughout these nations. The goal is to discern shared and distinct factors contributing to these incidents. It is essential to comprehend these dynamics thoroughly to facilitate the implementation of targeted interventions and policies to diminish the frequency and severity of accidents.

2.2 The Study Area

Formerly a modest fishing port, Lagos State has blossomed into one of Africa's most significant urban centres. Situated in the southwestern region of Nigeria, it stands as the most densely populated area in the nation, boasting a population of roughly 23 million (Lagos State Transport Policy, 2024). Lagos, the 6th largest economy in Africa, is where over 65% of Nigeria's industrial output is located, attracting people from diverse backgrounds (Asenime, 2013). The city has a triple gateway status, with a functioning land border, an international airport, and a busy seaport that manages over 85% of all imports passing through the Apapa and Tin Can Island Ports (Folarin, 2018).

.Figure 10.2 Map of Lagos Sate



Source LAMATA 2023

2.3 Institutional Framework

Road Safety Agencies

Two agencies are directly involved in enforcing road safety regulations; one is for the federal government, the Federal Road Safety Commission (FRSC), while the second belongs to the Lagos State government, Lagos State Traffic Management Authority (LASTMA)

The FRSC was created by Decree No. 45 of 1988 as amended by Decree 35 of 1992, is officially known as the FRSC Act cap 141 Laws of the Federation of Nigeria (LFN). The aim was to reduce road traffic crashes to the barest minimum. The idea came to Prof Wole Soyinka when we were students at the then the University of Ife, now Obafemi Awolowo University, because there were regular occurrences of the students of the university being killed on the road, especially between Ibadan and Ile-Ife. The agency's mandate is to regulate, enforce, and coordinate all road traffic and safety management activities through sustained public enlightenment, promotion of stakeholder cooperation, robust data management, improved vehicle administration, prompt rescue services, and effective patrol operations.

LASTMA's responsibilities are very similar to those of the FRSC, except that due to the congested nature of metropolitan Lagos, there is more emphasis on traffic flow management. As its website states, its objectives are “to improve the State Transportation System to ensure smooth traffic flow and reduce accidents.”

1.3 Water Institutional Framework

In the case of water, four agencies oversee water administration in the study area. Two belong to the federal government and one to the state. The two federally owned are the National Inland Waterways Authority (NIWA) and the National Maritime Safety and Agency (NIMASA). As its name indicates, the first deals with the inland waterways, while NIMASA administers the international waters. Both agencies have a very strong presence in Lagos waters. The Lagos Waterways Authority (LASWA) and Lagos Ferry Services are the state agencies in Lagos. (LAGFERRY). The first is the regulatory agency for all transportation activities on Lagos Inland Waterways. LAGFERRY is the state's regulated water transport organization.

Federal Agencies: National Inland Waterways (NIWA)

From its record, the National Inland Waterways Authority (NIWA), hitherto the Inland Waterways Department (IWD) of the Federal Ministry of Transport, was changed into an Authority through an act of the National Assembly, CAP 47, Laws of the Federation of Nigeria (LFN), 2004 (Decree No. 13 of 1997). (NIWA, 2023) Its primary responsibility is to enhance and develop Nigeria's inland waterways for transportation, offer an alternative mode of transportation for economic goods and people, and execute the objectives of the national transport policy regarding inland waterways. It oversees industries such as oil and gas, energy, business services, and consumer products. The Regulatory Services enforce safety, order, and compliance on Nigeria's expansive inland waterways. It is involved in crafting and enforcing regulations governing all waterborne activities, from vessel registration and licensing to navigation protocols and environmental protection measures. Responsibilities include Vessel Registration and Licensing, Navigation Regulations, Environmental Regulations, Enforcement and Compliance, Port and Terminal Regulations, and Policy Development and Advocacy Port Services. NIWA's ports and services act as gateways to Nigeria's inland waterways; ports and Jetty services allow for efficient cargo handling and safe berthing for vessels of all sizes. It also provides for smaller jetties and landing points to ensure that maritime trade, passenger

transport, and recreational activities thrive along Nigeria's waterborne corridors. Its responsibilities include berth allocation and management, Cargo Handling and Storage, Pilotage Services, Tugboat and Towage Services, Port Facilities Maintenance, and Environmental Management.

Federal Agencies: Nigeria Maritime and Safety Agency (NIMASA)

This agency has been established as a regulatory and promotional body to oversee Nigeria's international waters. NIMASA came into existence in August 2006 through the amalgamation of the then National Maritime Authority and the Joint Maritime Labour Industrial Council. The main objectives are to oversee and administer international waters, ensure the safety of ships, and control pollution. Its area of jurisdiction includes the coastline of Lagos State, which is coterminous with that of the federation.

State Agencies: Lagos Ferry Services(LAGFERRY) and Lagos Waterways Authority (LASWA)

These are the two agencies in charge of operations and regulations. In 1983, only LAGFERRY was established as an operator and regulator. However, in 2008, to observe best practices, LASWA was created to regulate all operators, including LAGFERRY, in Lagos Waters. This is to avoid a situation where the same agency can regulate itself. LAGFERRY operates as a limited liability company solely owned by the state government. Although due to the problem of managing a public transportation outfit, the government intervenes occasionally to bail out the company whenever it deems fit.

2.4 Lagos Road Traffic Crashes Report

Preamble

Lagos has extensive road networks, a huge population estimated to be more than twenty million (LASG, 2021), and a coastline of 180 km. 25 % of the total surface area of 3,577 km² is water, comprising Lagoons and Creeks and a thriving water transportation system. Road traffic crashes (RTCs) are an unfortunate but inevitable part of daily life. They could occur anywhere, anytime, without giving a prior hint, and the severity of accidents grossly depends on some factors, like the intensity of the accident of the system and the intensity of the accident at a location.

Figure 10.3 Lagos State Road Network



Source: LAMATA, 2023

Oma Ofli (2008) opined that by precautions, most road crashes can be prevented, and rather than accidents implying an act of the gods, they are referred to as accidents involving road users, hence road traffic crashes (RTCs). For the location of road traffic crashes globally, one can rely on reports by the World Health Organization (2004) that over 1.2 million people are killed in road crashes and the cost of millions of maimed victims in hospitals, relatives, and friends which is estimated to be an excess of \$520 billion. About 60 million disabilities are attributed to road traffic accidents, which significantly contribute to the public health crisis facing the world (World Health Organization, 2004). That aside crashes kill 3,000 people every day and seriously injure 15,000 people; that is why it was said to be a significant public health problem.

WHO (2004) posited that over 85 per cent of all road deaths, which are people killed in crashes, occur in low, middle-income, and high-income countries that are home to half the world's population. The United Nations admitted that all health outcomes included in the Global Burden of Disease and injuries are unintentional, which accounted for 88 percent of the disability and premature death. The resolution of the United Nations shows that the aim of all their efforts to reduce the global disease burden is the change in road users' behaviour. Therefore, the resolution focuses on road safety and reviews the status of action-oriented forums for responding to the worldwide road safety problem. According to the United Nations resolution, which seeks to achieve a significant reduction of accidents and injuries in all modes of transport, in particular in developing countries, Member States will implement suitable strategies to reduce road traffic accidents and minimise environmental damage through trans-border agreements on the coordination of studies, research leading to the design, production, road-user behaviour, social and environmental impact on transport activities (United Nations, 2004). If road crashes and the many associated with them are significant problems for the nation's health and are a menace to road users and the public, they should be attended to in transit settings. Roads are needed to allow traffic flow that does not deter or limit the ability of

the mass critical placement to provide service to citizens and businesses. Such attention should include ways to reduce the occurrence of road traffic crashes. Therefore, information is needed, not only on the occurrence of road crashes but also on the factors associated with the location of road crashes, which is the objective of this research.

Lagos Road Traffic Causal Factors

The issue of road traffic crashes (RTCs) in Lagos State, Nigeria, is a major concern for public health and safety. As the largest city and economic centre of Nigeria, Lagos is struggling with significant traffic congestion because of rapid urbanization, population growth, and inadequate transport infrastructure

The examination investigates the root causes of road traffic crashes in Lagos, providing an understanding of the frequency of RTCs and their effects on the country's traffic fatalities and injuries. The Lagos State Traffic Management Authority (LASTMA, 2023) and Federal Road Safety Corps (FRSC) regularly document a high volume of accidents, frequently involving commercial vehicles, motorcycles (Okadas), tricycles (Kekes), and private cars.

The leading causes of road crashes, as explained by the stakeholders, include:

- The first and major factor in traffic accidents is **the human factor**. An accident is at the nexus between the man, the machine, and the environment. In most instances, man is at the centre of the error, either by omission or commission. Because even when the machine is implicated, man is likely to have been negligent in maintenance and observation. In the case of Lagos, we have issues with **reckless driving, over speeding, taking telephone calls on the wheel, and violations of traffic rules**. The use of drugs and alcohol has assumed an epidemic proportion, especially among commercial drivers. There is also the pressure on them to meet a target set by the vehicle owner. In the majority of the cases, the driver is not the owner. Therefore, they are usually impatient, particularly during rush hour because they normally have a figure to deliver.
- The basic component of the environment is the **infrastructure**. This is also essentially challenged for financial reasons. Transport infrastructure demands heavy investment that is not always available in the face of other competing demands. For instance, the Marina-Okokomaiko **expressway has been under construction for more than ten years, not completed, mainly because of financial constraints**. It is well mentioned that most of the Lagos city roads require attention for their **gapping potholes, overflowing drainages, and inadequate furniture and signages**.
- The Machine, the **Vehicle**, is the third leg of the tripod in the diagnosis of traffic crashes. Due to cost, most vehicles on Nigerian roads are “Tokunbo” fairly used or possibly at the very tail end of their service years. Thus, mechanical failures, breakdowns, blow-outs are regular features causing accidents
- An additional contributory factor is the **high density** of vehicles in Lagos. As noted above a small geographical size of just 0.36% of the nation's space yet housing over 40% of the 11.8million vehicles, cannot be but a harrowing experience occasioning collisions, scratchings, bumping into and brushings.

It must be mentioned that the government of Lagos State is making strenuous efforts to address the situation. The first two items on the “THEME” agenda of the Lagos State government are Transportation and Traffic Management. That shows the government's determination to mitigate the problems. LASTMA has been strengthened in number and welfare to deliver better service and overcome the challenges

Challenges and Areas for Improvement:

For the situation to improve, it is expected that attention should be paid to first, enlightenment and education. This has to be rigorous and consistent. There is a need for behavioural change on the part of all the stakeholders, not the drivers alone. There are many instances where the passengers encourage the drivers to drive against traffic and will further defend the driver against any traffic warden who dares to arrest such an erring driver. It is pertinent to note that because Lagos is the hub of Nigeria's economy, there is a large number of visiting drivers who are often not aware of the regulations daily. Therefore, we suggest that this enlightenment and education be taken to entry points like Ojota, Epe and Ikorodu to educate the drivers and the immigrants from the hinterland.

Robust and effective enforcement must accompany enlightenment. Only when laws are enforced can they serve as a deterrent. Concomitantly, data collection should be conducted to determine the trend for fact-based decision-making and planning. The Transport policy recently launched is a right step in the right direction. It must be observed, not in breach, to bring sanity to the chaotic situation in the state.

In summary, despite ongoing efforts to tackle the issue, road traffic crashes in Lagos continue to pose a complex challenge, necessitating a multifaceted approach involving government, stakeholders, and the public to enhance road safety and diminish the incidence of accidents.

Numbers of accidents and casualties on the Lagos roads from 2014 - 2022

The table and figure 2.4 show a steady rise in the number of cases. There has been a slight dip in 2017 and 2018, a lift in 2019, and a slight decrease in 2020, attributable to the locked-downs of COVID-19. It has been on a steady increase since then, peaking at 632 in 2022.

Table 10.2 Numbers of Road Crashes and Casualties in Lagos (2014 – 2022)

Year	Total cases	Number injured	Number killed	Total Casualty	Total number involved
2014	314	644	104	748	1864
2015	408	842	109	951	2503
2016	434	963	146	1109	3290
2017	334	735	82	817	2406
2018	344	734	96	830	2686
2019	553	892	122	1014	4133
2020	448	624	100	724	2298
2021	525	903	144	1047	2635
2022	632	952	150	1102	3615

Source: Extracted from the Federal Road Safety Corps (FRSC), LASTMA, and NBS Reports

Figure 10.4 Numbers of Road Crashes and Casualties in the Lagos (2014 – 2022)

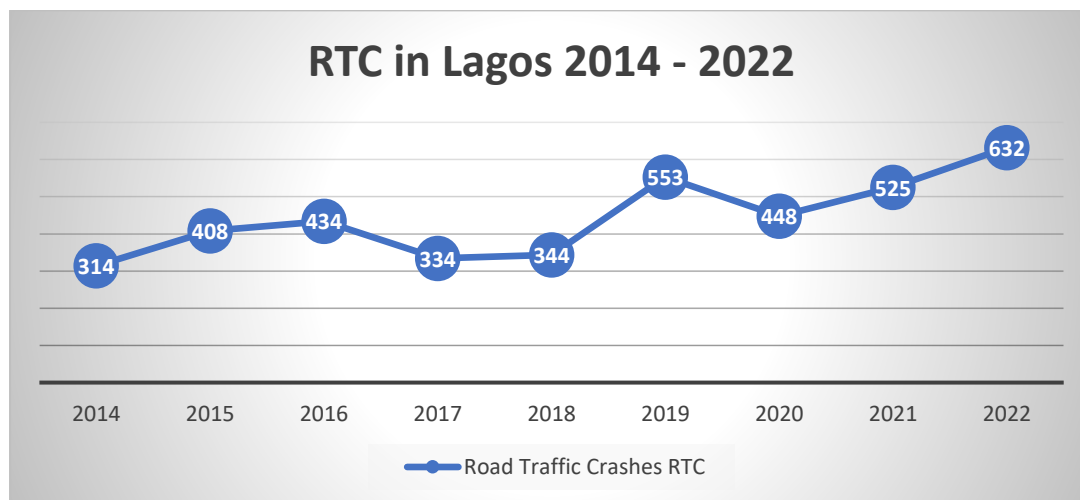
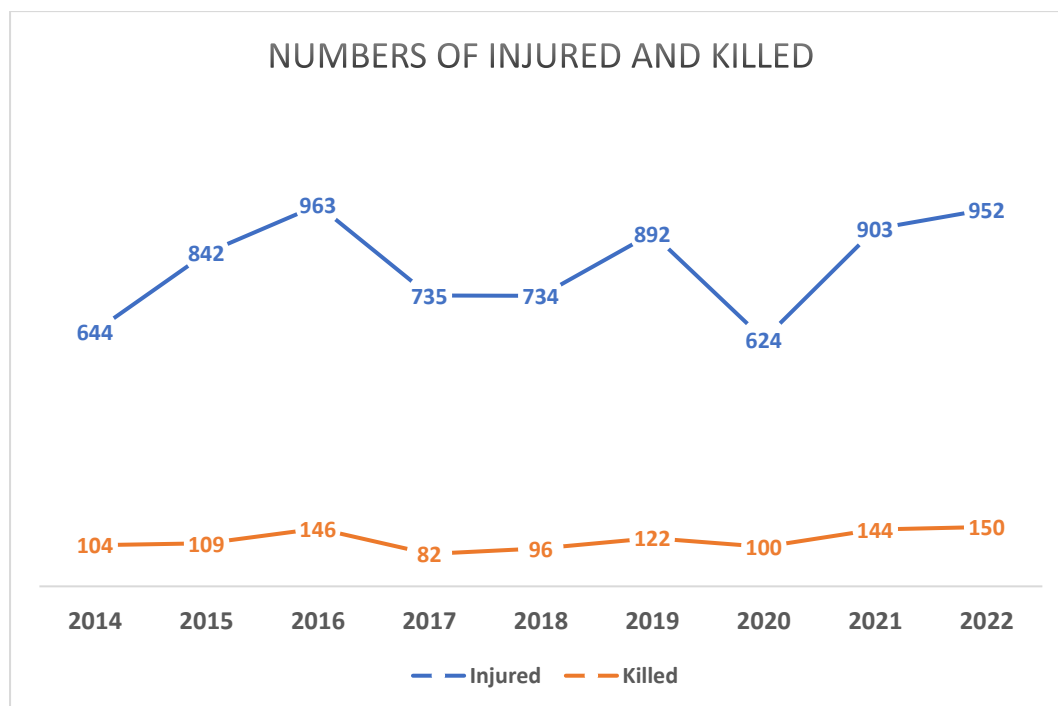
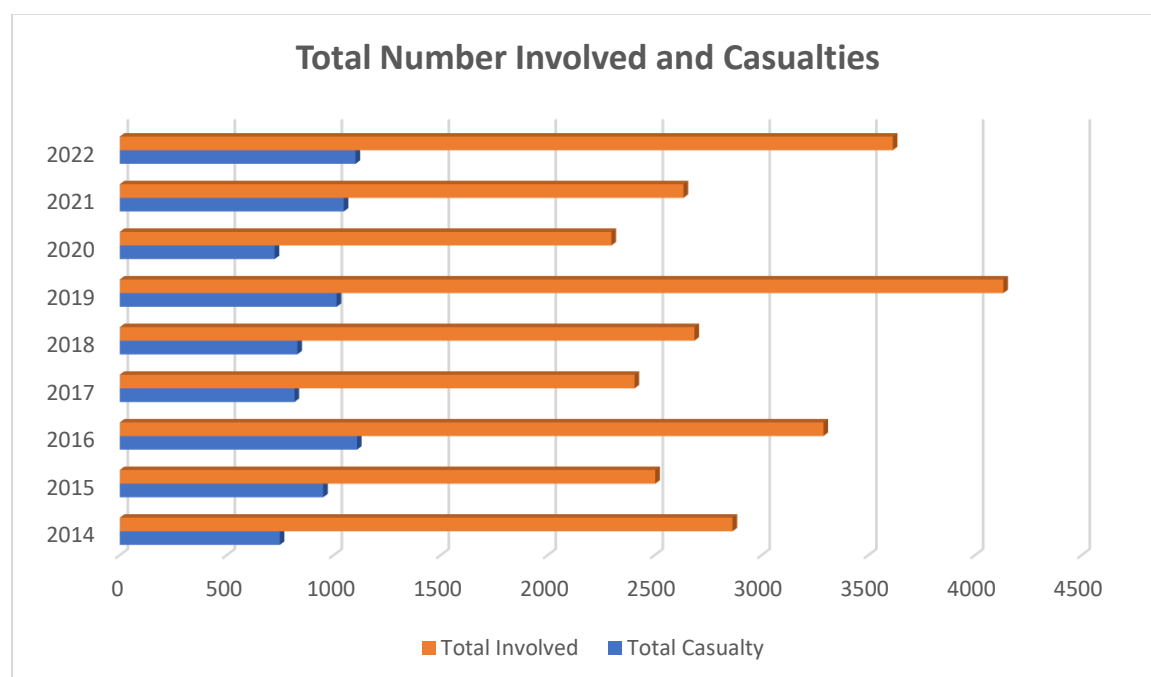


Figure 10.5 Numbers of Injured and Killed on the Lagos roads from 2014 - 2022



The number of the injured and killed, figure 2.5 also followed the same tend with the occurrences. Other variables, such as the number of people involved, also align with the number of cases.

Figure 10.6 Total Number Involved and Casualties on the Lagos roads from 2014 - 2022



The Causes and Patterns of RTC

The data shows the causative factors of Road Traffic Crashes (RTCs) in Lagos from 2014 to 2022. The major factors are speed violation, brake failure, dangerous driving, route violation, mechanically defective vehicles, wrongful overtaking, and tyre bursts.

The data underscores Speed Violation as the most critical and increasing factor in RTCs. This might be due to Lagos's urban setting, where varying speeds and congested roads create high-risk scenarios. Mechanical defects, including brake failures and tyre bursts, suggest vehicle maintenance is another crucial area needing attention. Dangerous Driving and Road Traffic Violations highlight issues with driver behaviour and law enforcement.

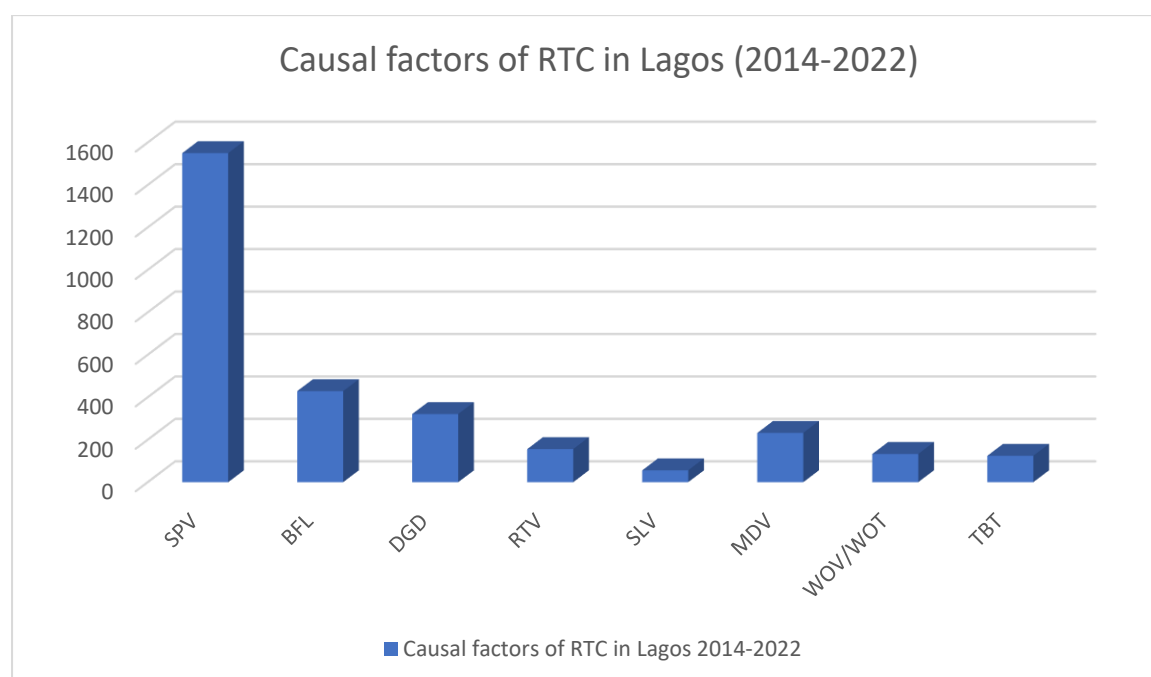
Table 10.3: Top Causative Factors of RTC in Lagos 2014 – 2022

S/N	Year	SPV	BFL	DGD	RTV	SLV	MDV	WOV/WOT	TBT	BRD	OTHERS
1	2014	75	43	43	16	16	9	11	13	NR	22
2	2015	61	36	40	21	26	15	4	19	NR	NR
3	2016	92	39	39	15	NR	17	NR	13	5	NR
4	2017	158	25	40	13	9	17	8	5	2	NR
5	2018	164	30	15	12	NR	26	13	17	NR	9
6	2019	214	45	44	24	2	37	16	13	NR	NR
7	2020	180	76	35	28	2	30	20	8	18	15
8	2021	280	49	39	12	1	39	33	14	NR	NR
9	2022	326	86	26	15	NR	42	28	22	NR	43
	TOTAL	1550	429	321	156	56	232	133	124	25	89

Source: Field Work

SPV: Speed violation; BFL: brake failure; DGD: dangerous driving; RTV: route violation; SLV: sign light violation; MDV: mechanically deficient vehicle; TBT: Tyre burst; WOV/WOT: Wrongful overtaking; BRD: Bad Road; Others (e.g. hit & run, fire, wire spark, crossing by the pedestrian, driving under the influence etc.)

Figure 10.7: Causal factors of RTC in Lagos (2014-2022)



Source: Field Work

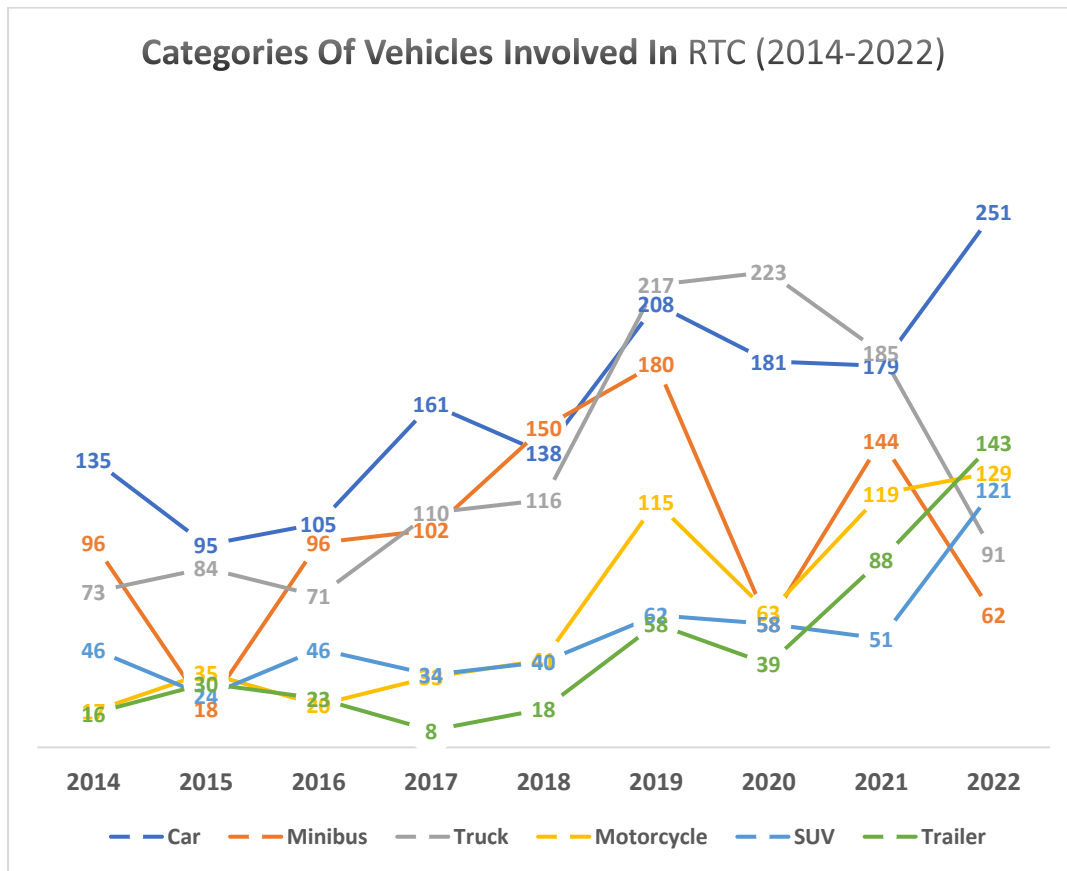
From Table 2.3 and Figure 2.7, it is clear that speed violations are the main element in accident causation, and members of the focus group discussion concurred. All other variables like brake failure, tire blow-out, and bad road contributed a tiny percentage of the causes. It is now widely accepted that bad roads contribute very little to fatal accidents, except for their damaging effects on vehicles. In most cases, accidents on bad roads are not fatal. It is when the roads are wide and well-paved that drivers overspeed and end up getting mangled in a fatal crash. The recent increase in the rate of deadly crashes on the third mainland bridge that is just recently rehabilitated is an example of this assumption.

Table 10.4 Top Categories of Vehicles Involved RTC in Lagos 2014 – 2022

Year	Car	Min i bus	High-capacity Bus	Truck	SUV	Minivan/ Pickup Van	Tanker	Trailer	Tri-cycl e	Motor cycle
2014	135	96	NR	73	46	13	16	16	6	17
2015	95	18	32	84	24	23	26	30	16	35
2016	105	96	NR	71	46	NR	25	23	9	20
2017	161	102	NR	110	34	NR	10	8	9	33
2018	138	150	3	116	40	118	13	18	4	41
2019	208	180	11	217	62	17	19	58	22	115
2020	181	58	2	223	58	9	35	39	20	63
2021	179	144	17	185	51	23	31	88	14	119
2022	251	62	155	91	121	49	44	143	53	129
TOTAL	1453	906	220	1170	482	252	219	423	153	572

Source: Extracted from the Federal Road Safety Corps (FRSC), LASTMA, and NBS Reports

Figure 10.8 Categories Of Vehicles Involved In RTC (2014-2022)



Source: Extracted from the Federal Road Safety Corps (FRSC), LASTMA, and NBS Reports

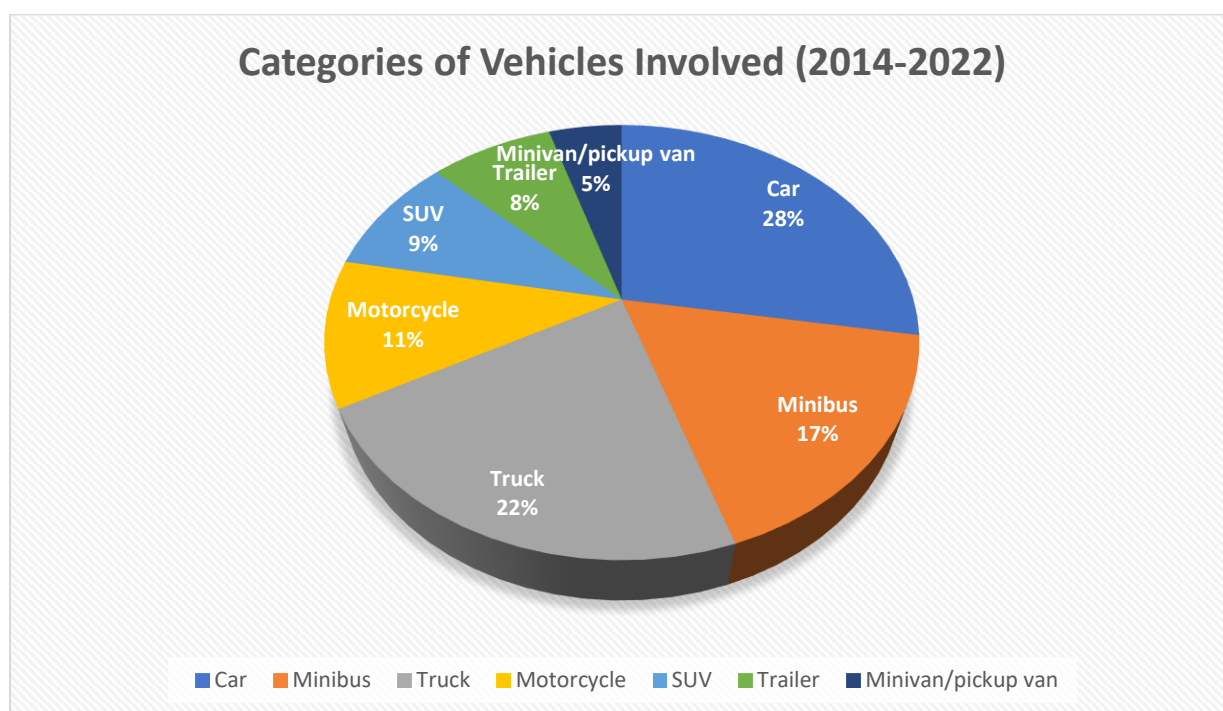
The data categorizes Road Traffic Crashes (RTCs) in Lagos from 2014 to 2022 based on vehicle type involved. A significant increase in incidents involving almost all vehicle categories can be observed over the years, notably with cars, trucks, and motorcycles. This upward trend is particularly stark from 2018 onwards.

The data indicates that cars and trucks are predominantly involved in RTCs, which could reflect the high numbers of cars and trucks on Lagos roads and their extensive use in personal and commercial transport. The significant incidents involving motorcycles and minibuses suggest frequent use in dense urban areas, where their maneuverability often leads to risky driving behaviours.

The high number of incidents involving cars and trucks aligns with FGD responses, where participants highlighted the frequent involvement of these vehicles in accidents, often attributing it to their recklessness and the high pressure of urban logistics.

At each vehicle type level, the private car continuously increases, starting with 135 in 2014 and recording 251 in 2022. The increasing number of private car ownership contributed to this. On the contrary, after peaking at 180 in 2019, the Minibus has shown a decline to 62 in 2022. Others have maintained a continuous and steady rise over the period.

Figure 10.9 Categories of Vehicles Involved (2014-2022)



Top Classes of Vehicles Involved in RTC in Lagos 2014 – 2022

The data illustrates patterns in RTC occurrences among different vehicle classes. The high number of RTCs involving commercial and private vehicles could be attributed to their dominance on the Lagos roads. Commercial vehicles are used extensively for intra-city and inter-city transport, while private vehicles reflect the personal mobility preferences of the Lagos residents. The low figures for government vehicle involvement in RTC may be attributed to better training of their drivers, lower usage, and adherence to traffic regulations.

Many responses from FGD participants agreed with the data showing high commercial vehicle involvement in RTCs. Many cited frequent observations of reckless driving, poor vehicle maintenance, and overloading. Some participants mentioned the increasing number of private vehicles and issues such as distracted driving and speeding as major reasons for having higher RTCs involving private vehicles in Lagos.

Table 10.5: Top Classes of Vehicles Involved in RTC in Lagos 2014 – 2022

S/N	Year	Commercial	Private	Government	Others (military)
1	2014	248	248	4	1
2	2015	202	140	11	23
3	2016	285	229	2	NR
4	2017	290	196	3	NR
5	2018	297	214	2	6
6	2019	575	296	3	12
7	2020	516	272	3	8
8	2021	606	285	3	8
9	2022	643	429	10	33
	TOTAL	3662	3570	411	91

Source: Extracted from the Federal Road Safety Corps (FRSC), LASTMA, and NBS Reports

Figure 10.10 Classes of Vehicles Involved in RTC (2014-2022)

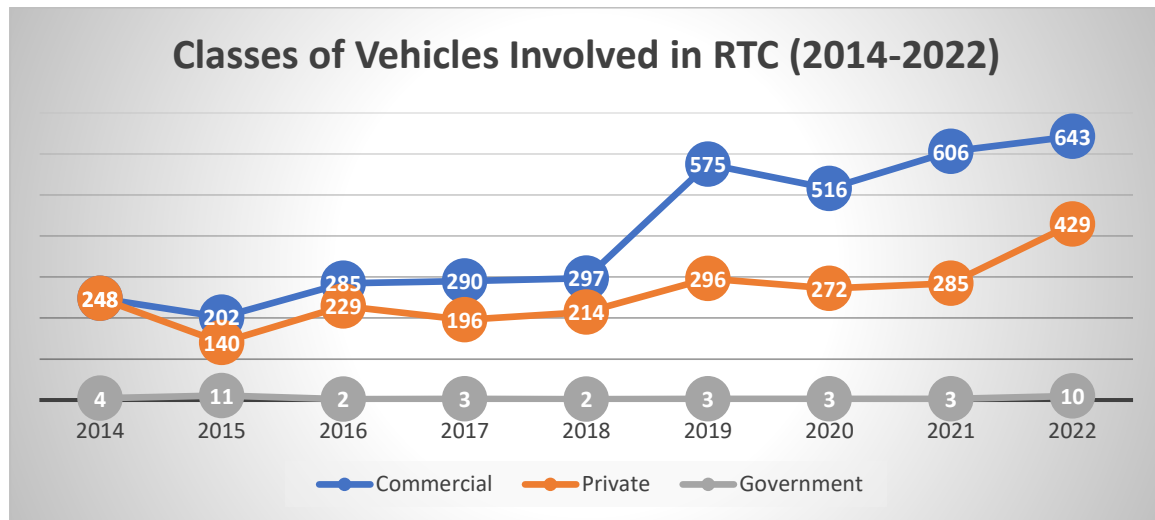


Figure 10.11 Total Classes of Vehicles Involved in RTC (2014-2022)

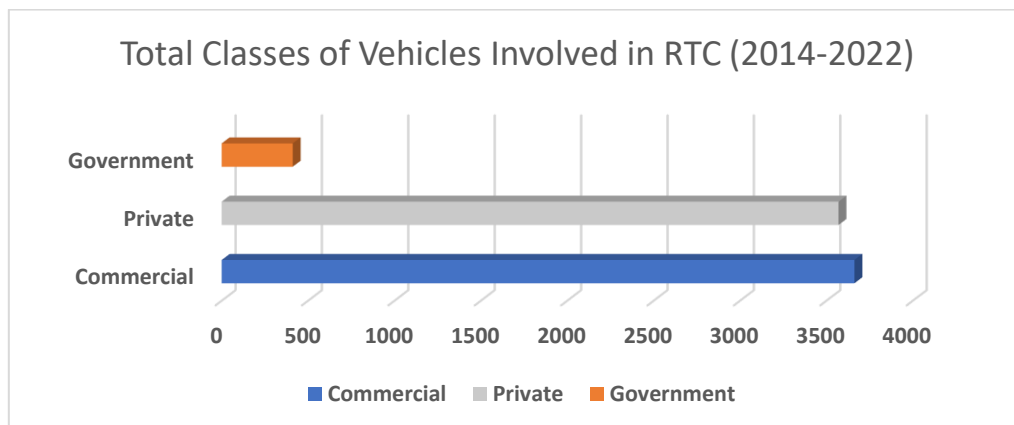


Table 10.6 Days of RTCs Occurrence in Lagos 2014 – 2022

S/N	Year	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1	2014	39	40	32	32	48	48	45
2	2015	35	54	25	41	53	41	42
3	2016	36	45	54	36	52	51	54
4	2017	48	40	40	45	39	40	33
5	2018	45	46	54	29	50	57	30
6	2019	88	77	55	79	65	89	87
7	2020	76	76	68	76	61	52	47
8	2021	73	85	69	69	73	96	59
9	2022	79	74	89	80	108	100	73
	TOTAL	519	537	496	487	549	574	470

Source: Extracted from the Federal Road Safety Corps (FRSC), LASTMA, and NBS Reports

The data provide details on the distribution of RTCs, broken down by day of the week.

There is overall general increase in the rate. Saturday and Sunday show exceptionally high variability, with peak numbers in 2021 and 2019, respectively. While Saturdays recorded the most incidents overall, weekdays, especially Tuesday and Friday, also show high numbers. The increase in RTCs on Fridays could be attributed to increased traffic as people commute home for the weekend and possibly engage in social activities post-work. Sunday shows the lowest number of RTCs, possibly due to reduced traffic volumes, as many businesses are closed, and fewer commuters are on the road.

The Focus Group Discussion (FGD) participants acknowledged heavy weekday traffic, especially on Fridays, due to weekend preparations and social outings, corroborating the high RTC numbers reported. Many agreed that the rush to get home often results in more aggressive driving behaviours, leading to accidents. It was also pointed out that leisure activities and social gatherings on Saturdays, which are part of our culture in Lagos, might contribute to these numbers.

Figure 10.12 Days of RTCs Occurrence in Lagos 2014 – 2022

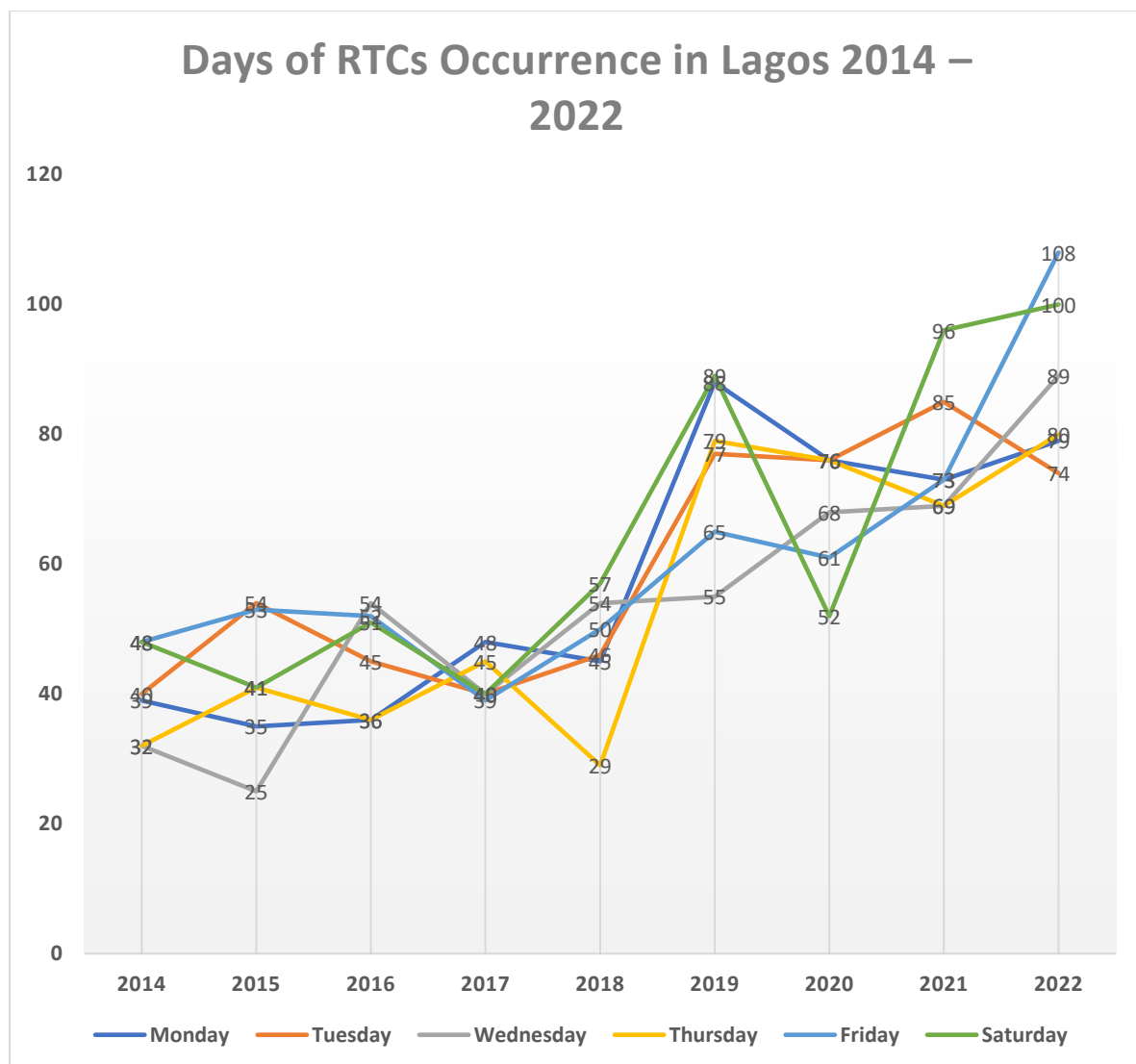


Figure 10.13 Days of RTCs Occurrence in Lagos (2014-2022)

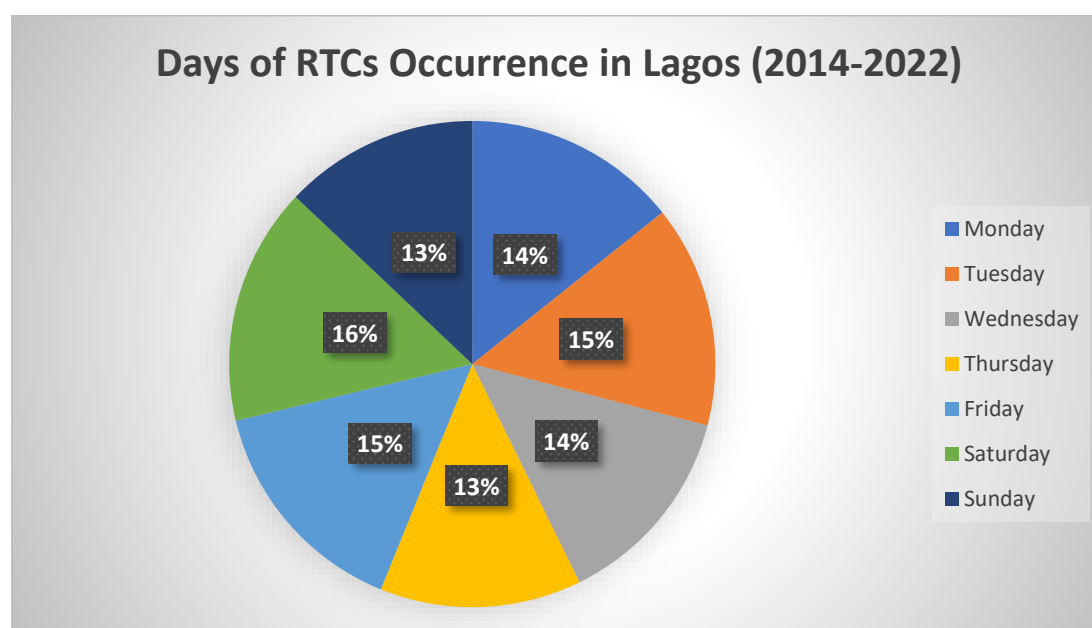


Table 10.7 Period of RTCs Occurrence in Lagos (2014 – 2022)

S/N	Year	Morning 12 am – 11.59 am	Afternoon 12 noon – 6.59 pm	Night 7 pm – 11.59 pm
1	2014	141	123	31
2	2015	127	116	74
3	2016	180	106	33
4	2017	145	114	23
5	2018	159	124	19
6	2019	269	227	53
7	2020	232	164	49
8	2021	254	212	54
9	2022	328	237	64
	TOTAL	1835	1423	400

Source: Extracted from the Federal Road Safety Corps (FRSC), LASTMA, and NBS Reports

The data presented represents the distribution of Road Traffic Crashes (RTCs) in Lagos between 2014 and 2022, categorized by the time of day: **Morning (12 am – 11.59 am)**, **Afternoon (12 noon – 6.59 pm)**, and **Night (7 pm – 11.59 pm)**. The morning period consistently recorded the highest number of RTCs compared to the afternoon and night periods. Over the period under review (2014-2022), the morning period accounts for the highest proportion (1,835 crashes, 50.14%), followed by the afternoon (1423 crashes, 38.9%), and the night period (400 crashes, 10.94%). There is a clear upward trend in the number of RTCs from 2014 to 2022, especially during the Morning and Afternoon periods, with major spikes in 2019 and 2022. The Night period remains relatively stable compared to the other periods.

The findings show that the Morning period is the most hazardous time for road users in Lagos, with more than half attributed to the period. This may be connected to the rush hours, poor visibility, fatigue, or lack of patience. The lower number of RTCs at Night suggests fewer vehicles; however, poor visibility and higher speeds may cause the few incidences to be severe. These findings align with the insights from the Focus Group Discussion participants, who consistently mention that the morning rush is a time of high stress, with many commuters

rushing to their destinations. The FGD participants agreed that drivers tend to be more conscious at night and drive slower due to reduced visibility and other unforeseen risks.

Figure 10.14 Period of Occurrence of RTC in Lagos (2014-2022)

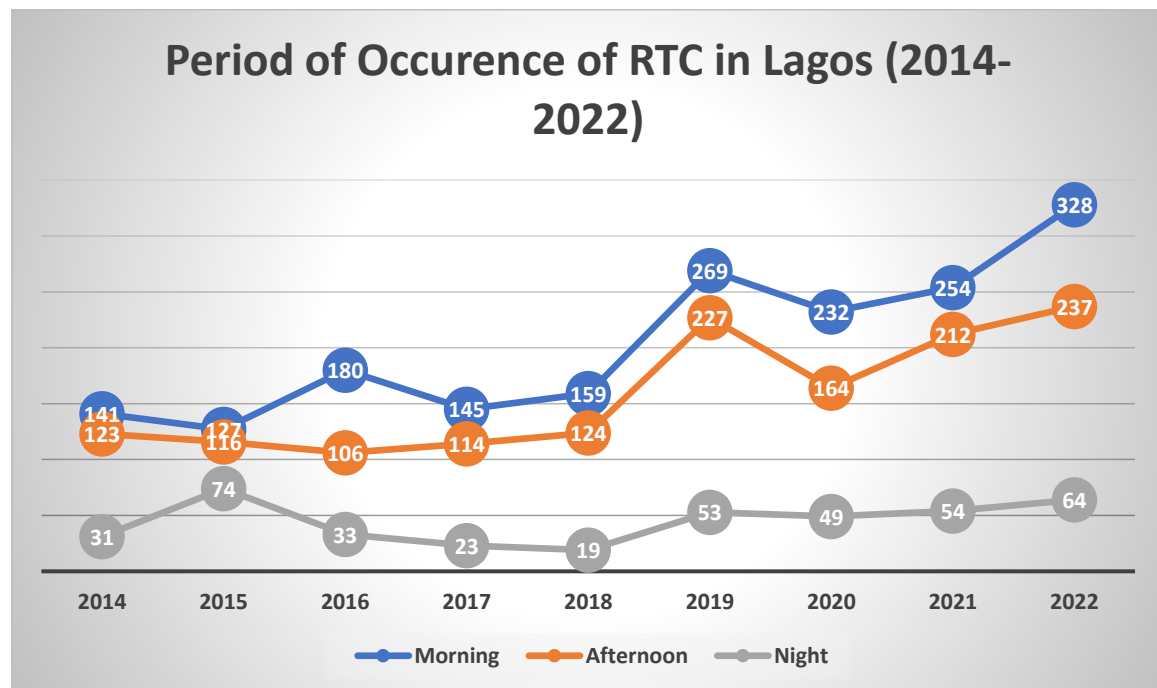
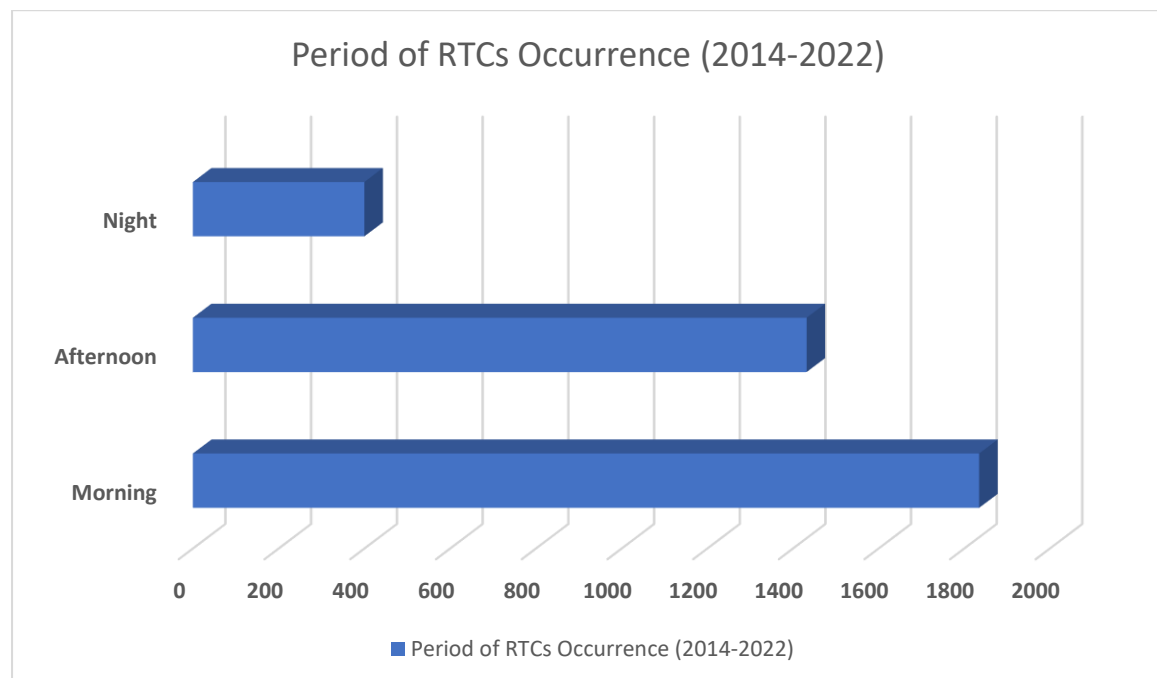


Figure 10.15 Period of RTCs Occurrence (2014-2022)



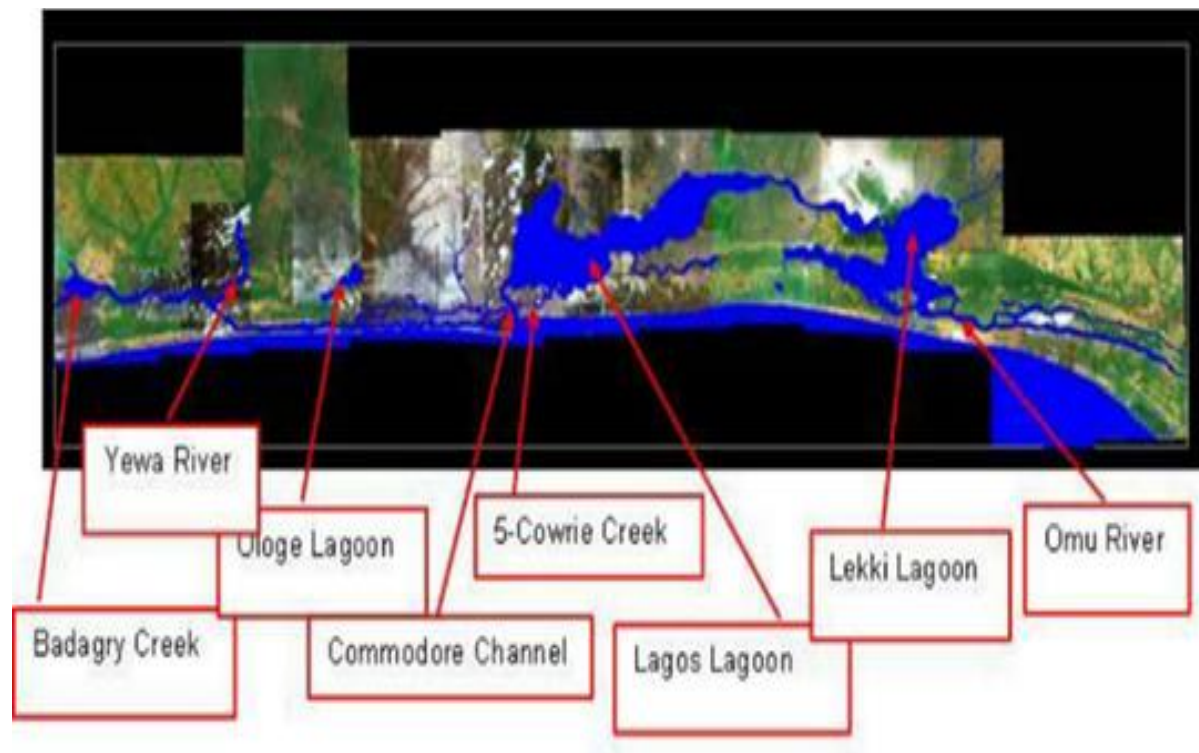
2.5 Lagos Water Crashes

The Study Area

The subject of this section is the coastal area of Lagos State, covering an estimated 3,475.1 square kilometres. This region constitutes a small portion of Nigeria's total landmass, approximately 0.4%. (Odewumi 2019) The Lagos Lagoon, spanning around 426.0 square kilometres, encompasses coastal areas and inland water passages. Various creeks are situated west of the lagoon, including Lighthouse Creek, Ologe Lagoon, Ilaje Creek, Badagry Creek, and the principal water routes leading to Badagry, specifically Port Novo and Cotonou. Another waterway, Five Cowrie Creek, links the southern section of the primary Lagos lagoon to the Atlantic through Victoria Island.

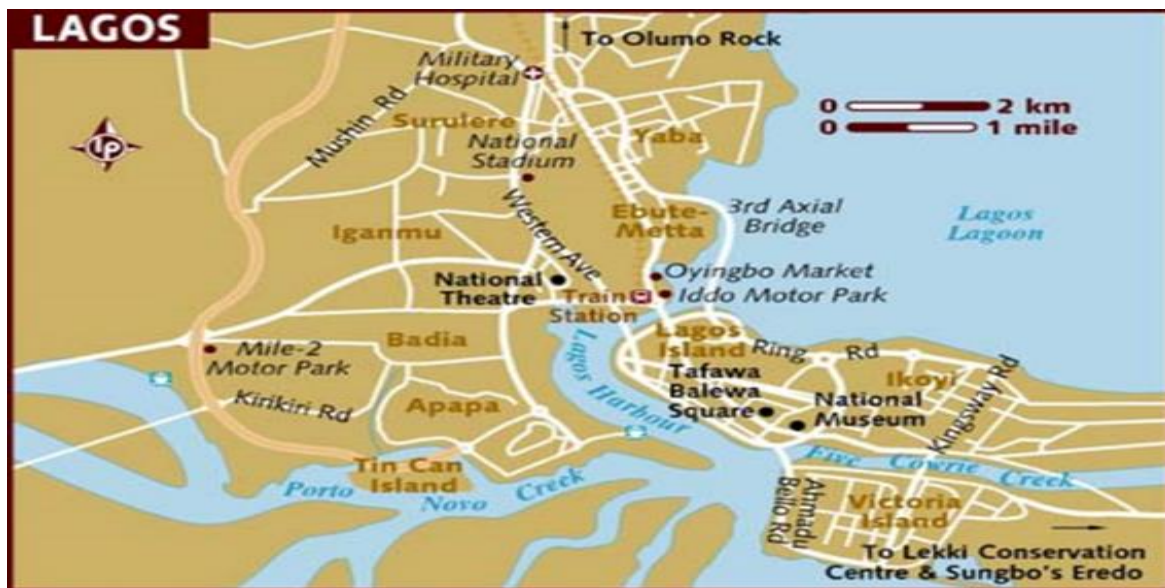
The northeastern boundary of the lagoon is defined by the Ikorodu local port, which connects to Epe and features several inlets from Ogun River, Majidun River, and Agboyi Creek. A secondary lagoon, the Kuramo waters, is situated east of the harbor and the bar beach, creating a division between the Atlantic Ocean and the lagoon. Badagry Creek, also known as Port Novo Creek, originates in Benin Republic and flows into the Commodore Channel in Lagos. It is bordered by Apapa, Ajegunle, Kirikiri, Mile2, Amuwo Odofin, Satellite Town, and Ojo. The source of the Badagry Creek can be traced back to Lake Nokoue in Benin Republic, and it discharges into the Atlantic Ocean via the Commodore Channel.

Figure 10.16 Lagos Coastal Waters



Source: LASG 2024

Figure 10.17 Lagos Creeks



Source LASG 2024

Lagos Water Traffic Crashes

Lagos, the fifth most populous city in the world, is in the heart of Nigeria's economy and is characterized by an extensive network of waterways, originating from a legacy of having been founded on a cluster of islands. The city is, therefore, a natural hub for water transportation, with a fair number of people initially choosing boat transportation as a preferred means of commuting. This stems from good regional planning by the government, which ensured that ferry services were viable and regular. However, over the years, as the city's population has rapidly expanded (estimated at around ten million people today) and as the use of traditional boats has declined, there has been a rise in large tonnage engine-powered craft, which has witnessed virtually no regulation in terms of water transport safety and security.

Available statistical data on water transport crashes (WTC) reveal a high fatality rate. However, it should be noted that although the data give a trend, the numbers are underreported. Some incidents are hidden from the regulatory authority, LASWA, to evade sanctions that come with guidelines violations, especially when neither police nor marine police presence is present during the incident. Furthermore, available information reveals an unhappy state of water transport regulation.

The data were compiled from the LASWA incident records for the seven years from 2014 to 2023. Then, 2023 was given a closer look to obtain monthly variability. Some irregular incidences of water recorded as Flimsies were also examined for the years 2018 and 2019. These incidents include suicide jumps into the Lagoon or floating corpses of unidentified persons.

Causal and Patterns of Water Traffic Crashes in Lagos State

Operators of water transportation include the state government commercial operator (Lagferry) with standard ferries and many private individuals operating with canoes and wooden boats, popularly called Banana Boats because of their shape. Compared to road transportation systems, little formal training is given to users of water transportation systems besides the government-operated Lagferry. The non-enforcement of life jackets, the non-existence of an adequate number of trained lifeboat personnel, and the non-compliance with the requirements

for certification for boat pilots constituted the three significant factors that account for the higher casualties in water traffic crashes. The causes of the crashes include uncleared wrecks and tree stumps, turbulences in high tides and habitual passengers overloading of boats and vessels that lacked basic safety amenities. In several instances, the commercial considerations override safety guidelines. The recklessness and inexperienced crews, lack of adequate navigational aids, and the surge of tugs and other giants ferries when maneuvering in some of the waterways are major factors. There is also the lagoon water pollution and obstruction caused by water weed, especially the water hyacinth.

Table 10.8 Lagos 30-Water Routes

SN	LAGOS JETTIES	SN	LAGOS JETTIES
1	AJAH - FIVE COWRIES - MARINA/C.M.S	16	EBUTE OJO - IREWE
2	BADORE - FIVE COWRIES	17	IJEGUN EGBA - IBASA
3	BADORE - IJEDE	18	LIVERPOOL - FIVE COWRIES
4	BAIYERU - AJAH	19	MARINA/C.M.S – LIVERPOOL
5	BAIYERU - VICTORIA ISLAND	20	AGBOYI KETU - FIVE COWRIES
6	EBUTE ERO - IKORODU	21	AGBOYI KETU - MARINA/C.M.S
7	EBUTE OJO - IJEGUN EGBA - MARINA C.M.S	22	AGBOYI KETU - MILE 12
8	IJEDE - MARINA C.M.S	23	AJAH - OWORONSHOKI
9	IKORODU - ADDAX/FALOMO	24	IJORA - EBUTE ERO
10	LIVERPOOL - IGBO ELEJO	25	IKORODU - OWORONSHOKI
11	LIVERPOOL - OLODI APAPA	26	MARINA/C.M.S - OWORONSHOKI
12	MARINA/C.M.S – IKORODU	27	MILE 2 - ADDAX/FALOMO
13	BAIYERU - LANGBASA	28	MILE 2 - MARINA/C.M.S
14	EBUTE OJO - IBASA	29	OWORONSHOKI - EBUTE ERO
15	EBUTE OJO - IJEGUN EGBA	30	OWORONSHOKI - FIVE COWRIES

Source: LASWA 2024

Table 10.9 Lagos Jetties

	NAME/LOCATION OF JETTY	TERMINAL/ JETTY	TYPES
	STATE OWNED TERMINALS – COMMISSIONED		
1	ELEGBATA/EBUTE ERO TERMINAL	TERMINAL	CONCRETE
2	EBUTE OJO FERRY TERMINAL	TERMINAL	FLOATING
3	OWORONSHOKI JETTY	JETTY	CONCRETE
4	IKORODU FERRY TERMINAL	TERMINAL	CONCRETE
5	BADORE FERRY TERMINAL	TERMINAL	CONCRETE
6	OSBORNE FERRY TERMINAL	TERMINAL	CONCRETE
7	MILE II TERMINAL	TERMINAL	CONCRETE
8	FALOMO FERRY TERMINAL	TERMINAL	FLOATING
	STATE OWNED JETTIES		
1	SAGBOKOJI JETTY, AMUWO-ODOFIN	JETTY WITH SMALL BUILDING	CONCRETE
2	IJEDE JETTY, IJEDE LCDA	JETTY WITH SMALL BUILDING	CONCRETE
3	IJEGUN EGBA FLOATING JETTY WITH CAR PARK	JETTY	FLOATING
4	YAFIN JETTY	JETTY	CONCRETE
5	AGBOYI KETU JETTY	JETTY	CONCRETE
6	IBESHE FLOATING JETTY, IKORODU	JETTY WITH SMALL BUILDING	FLOATING
7	BAIYERU JETTY	JETTY	CONCRETE
8	LIVERPOOL JETTY	JETTY	CONCRETE
9	IPAKODO 2 JETTY IKORODU	JETTY WITH SMALL BUILDING	WOODEN
10	TAKWA BAY JETTY	JETTY	CONCRETE
11	LANGBASA JETTY	JETTY	WOODEN

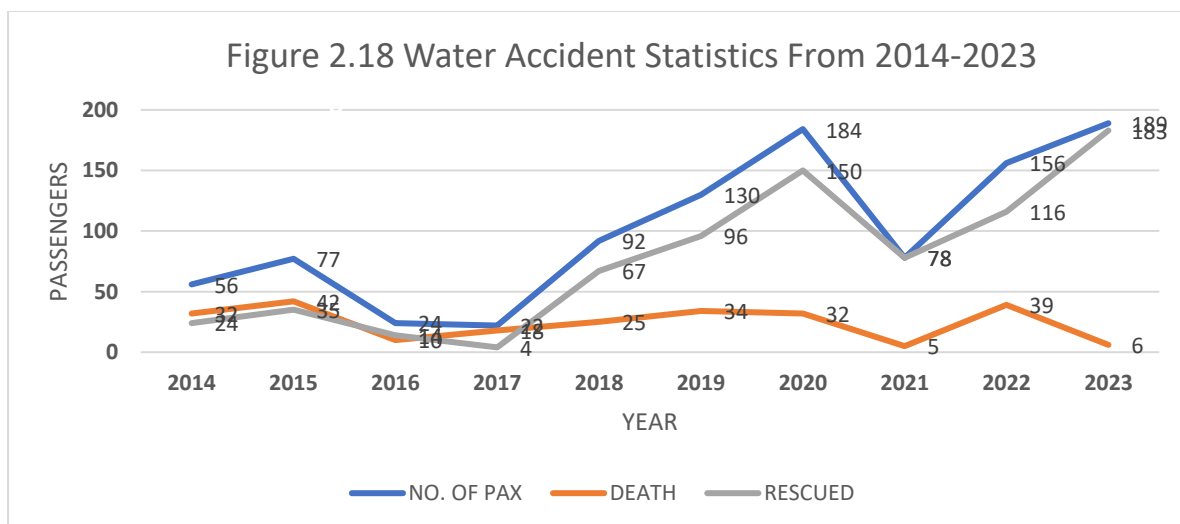
12	OKE IRA NLA (AJAH JETTY)	JETTY WITH SMALL BUILDING	CONCRETE
13	BADORE EAST	JETTY WITH SMALL BUILDING	CONCRETE
14	IBESHE 2 JETTY, IKORODU LG	JETTY	CONCRETE
	LANDINGS - PUBLIC ACCESS		
1	COCONUT LANDING	LANDING	LAND
2	SLAVE ROUTE LANDING	LANDING	LAND
3	ALEX JETTY, APAPA	LANDING	LAND
4	IJORA LANDING	LANDING	LAND
	NON - STATE OWNED JETTIES		
1	TEMIDIRE, AJEGUNLE	JETTY	WOODEN
2	ORIGIN JETTY	JETTY	WOODEN
3	ADDAX JETTY, VICTORIA ISLAND	JETTY	CONCRETE
4	C.M.S JETTY	JETTY	CONCRETE
	TERMINALS/JETTIES WITHOUT LASWA OVERSIGHT		
1	IJORA TERMINAL	JETTY	CONCRETE
2	OKUN KOBO JETTY, OJO LG	JETTY WITH SMALL BUILDING	CONCRETE
3	EMINA-SAGA JETTY,EPE	JETTY WITH SMALL BUILDING	CONCRETE
4	ABOMITI-NLA JETTY,EPE	JETTY WITH SMALL BUILDING	CONCRETE
5	IWORO AJIDO JETTY, BADAGRY	JETTY WITH SMALL BUILDING	CONCRETE
6	IGBOGBELE JETTY, BADAGRY	JETTY	CONCRETE
7	TEKUNLE JETTY, EPE	JETTY	CONCRETE
8	IGBONLA JETTY,EPE	JETTY	CONCRETE
9	OFFIN JETTY, IKORODU	JETTY	CONCRETE
10	IGBOLOGUN JETTY, OJO LG	JETTY WITH SMALL BUILDING	CONCRETE
11	EJIRIN JETTY, AGBOWA/IKOSI LCDA	JETTY WITH SMALL BUILDING	CONCRETE
12	AGURA LANDING, IKORODU LG	LANDING	CONCRETE
13	OJU-AGEMO JETTY, IMOTA LCDA	JETTY WITH SMALL BUILDING	CONCRETE
14	TOPO ISLAND JETTY, BADARY	JETTY	CONCRETE
15	OKE-AGBO JETTY, OTTO-AWORI LCDA	JETTY	CONCRETE
16	IREWE JETTY, OJO LG	JETTY	CONCRETE
17	IBESHE BEACH JETTY, ORI-ADE, LG	JETTY	CONCRETE
18	EPEME JETTY	JETTY	CONCRETE
19	IGBOLOGUN, IBEJU LEKKI LOCAL GOVT,	JETTY	CONCRETE
20	ISE WATER JETTY	JETTY	CONCRETE
21	ORETA WATER JETTY	JETTY	CONCRETE
22	AKARAKUMO JETTY	JETTY	CONCRETE
23	APA, BADAGRY LOCAL GOVT. AREA	JETTY	CONCRETE
24	EPUTU, IBEJU LEKKI LGA	JETTY	CONCRETE
25	DADILUM IN OLORUNDA LCDA	JETTY	CONCRETE
26	IJON JETTY	JETTY	CONCRETE
27	ETEBIN JETTY, OJO	JETTY WITH SMALL BUILDING	CONCRETE
28	ILADO JETTY,	JETTY	CONCRETE
29	ILASHE	JETTY	CONCRETE
30	TOLU AJEGUNLE	JETTY WITH SMALL BUILDING	CONCRETE

Source: LASWA,2024

Table 10.10 Water Crashes on Lagos Coastline 2014-2023

YEAR	NO. OF PAX	DEATH	RESCUED
2014	56	32	24
2015	77	42	35
2016	24	10	14
2017	22	18	4
2018	92	25	67
2019	130	34	96
2020	184	32	150
2021	78	5	78
2022	156	39	116
2023	189	6	183

Source: Compiled from LASWA Incident Report, 2024



Source: Compiled from LASWA Incident Report, 2024

As the data illustrates, accidents are increasing over time, rising from 56 in 2014 to 189 in 2023. There was a noticeable surge in 2020 (the peak period of COVID-19), the opposite of the road crashes that declined significantly. The implication is that more people took to water mobility as an alternative to the streets, where there were more effective traffic lockdowns. This is usually reflected anytime there is any obstruction or traffic gridlock on the road. However, it is gratifying to note that the number of rescued is rising so much that the number of deaths is declining.

The 2023 Year Data

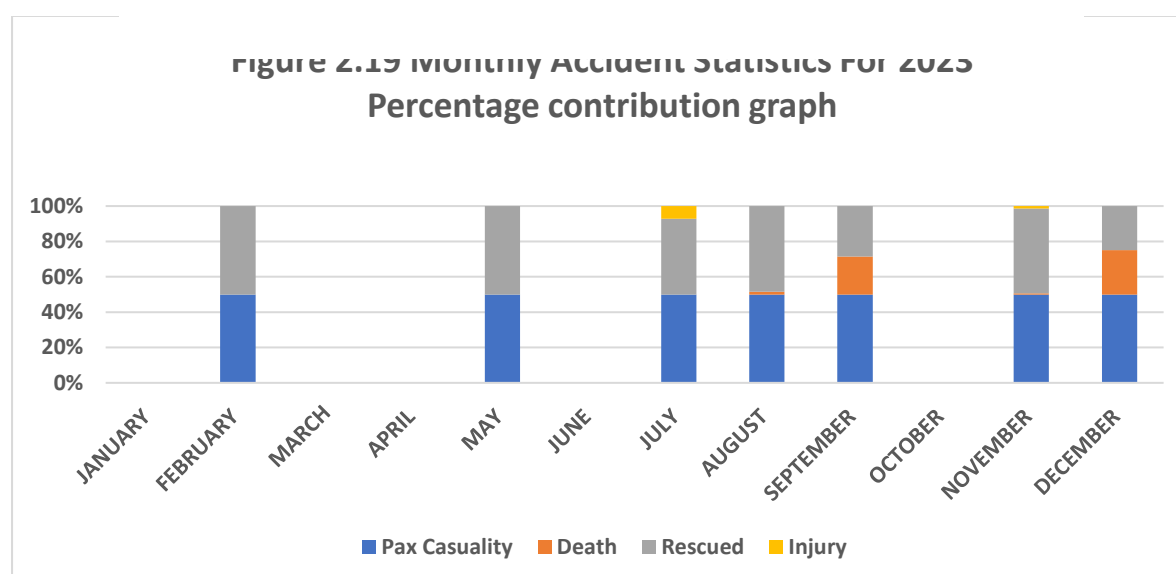
On closer examination of the year 2023, there appear to be three spikes between January and March, July and August, and October and December. The reasons for the spikes are multiple, including the water surge, seasonal high passenger demand, and congestion on the road, especially the main artery of Badagry to Marina to Epe and Ikorodu. Anytime there is gridlock

on the road, which is regularly caused by road construction and rehabilitation, many commuters take to water transport. It should also be noted that out of the 189 involved in the water crashes, 183 were rescued unhurt, while there were 6 deaths and 3 injuries. This speaks to the increasing efficiency of the regulatory authority, which has scaled up its enlightenment campaign and free distribution of life jackets.

Table 10.11 Water Crashes data for 2023

Month	Pax Casualty	Death	Rescued	Injury
JANUARY	0	0	0	0
FEBRUARY	19	0	19	0
MARCH	0	0	0	0
APRIL				
MAY	46	0	46	0
JUNE				
JULY	7	0	6	1
AUGUST	33	1	32	0
SEPTEMBER	7	3	4	0
OCTOBER	0			
NOVEMBER	75	1	72	2
DECEMBER	2	1	1	0
TOTAL	189	6	180	3

Source: Compiled from LASWA Incident Report, 2024



Source: Compiled from LASWA Incident Report, 2024

Table 10.12 Water Crashes Incidents and Causes 2023

S/N	DATE	TIME	LOCATION	BOAT TYPE/NAME	NO. OF PAX .CASUALTY /FATALITY	BOAT CAPACITY	RESCUE	INJURY	DEATH	ACCIDENT STATUS	CAUSES
FEBRUARY											
1	20/02 /2023	7:16 am	Third Mainland bridge	Fazma Logistics (Pelumi)	17 pax. 2 crew	17pax	19p ax	Nil	Nil	No casuality recorded as MV Pelumi got sunk and another boat was sent for rescue	Sinking
MAY											
2	05/03 /2023	3:35 PM	Liverpool	wooden boat	10 pax(including captain)	10	10	Nil	Nil	All passengers were rescued by passing boat	capzised
3	05/08 /2023	08:0 5A M	Oworosh oki	Lagferry (BOLA TINUBU)	30	50	30	Nil	Nil	Rescued by passing by boat and some other own boat	Engine pulled out on motion
4	27/05 /2023	09:4 0am	Ibeshe/O ffin	MRS boat	4 (2 Crew)		6	Nil	Nil	Released after 5 days of kidnapping with crew onboard	Kidnappi ng
JULY											
6	28/07 /2023	07:0 5AM	Ipakodo Terminal	Savvy Marine 6	1 Deckhand and a Captain	33	2	Nil	Nil		Hit by submerge d moving fish
7	30/07 /2023	11:3 0P M	Falomo bridge		1			1	Nil	A lady was pushed by her boyfriend	Pushed by boyfriend
8	31/07 /2023	07:0 3P M	Ipakodo Terminal	Kemkaya Marine	4		4	Nil	Nil	4 got stucked along waterways	Bad engine and insufficie nt fuel
AUGUST											
9	08/01 /2023	09:2 8A M	Elegbata	Toluwani Marine 2	17 PAX. 2crew	17pax	19	Nil	Nil	Legacy Marine rescued Toluwani Marine 2 at Makoko axis	hit by submerg e object
10	08/06 /2023	9:00 PM	Etegbini Axis	Paddle boat	4		3	Nil	1	A boat was capsized and out of 4 passengers, 1 of them died	Capsize
11	08/07 /2023	4:35 pm	Epe Axis	Fibre boat	10	12	10	Nil	Nil	A fibre boat ran into fishing net after being conveying passengersfrom Epe Aiyetoro to Ondo State	Fibre boat ran into a fishing net
SEPTEMBER											
12	15/09 /2023	9:05 :00 PM	Igbolobi, Ojo Axis	Wooden boat	7		4	Nil	3	7 Passengers boat capsized along Agaja Irewe Ojo Axis.	Capsize
NOVEMBER											

13	11/06/2023	06:25 PM	Ebute Ero	Lagferry boat (Eko Akete)	23 pax	50	23	Nill	Nill	Lagferry boat (Eko Akete) was drown with 23 pax along Makoko Oworo Axis	Drown
14	11/07/2023	08:48 AM	Ipakodo Terminal	Oyebola Marine	17pax. 2 crew	17pax	17	2	NIL L		
15	11/07/2023	6:57 PM	Badagry ferry Terminal	Sea Lion Marine	1	20	NIL L	NIL L	1	Explosion of fire at Badagry Ferry Terminal due to bunkry boat discharging fuel at thr Terminal	Fire, Bunkry activities
16	11/10/2023	5:15 AM	Ipakodo Terminal	Lagferry boat (Babatunde Fashola)	30 with one deckhand and a captain	30	32	Nill	Nill	Lagferry boat (Babatunde Fashola) got capsized close to ipakodo ferry Terminal with full pax including Laswa staff (items lost such as laptop, Phone, Bags e.t.c)	Capsized
					DECEMBER						
17	13/12/2023	6:13 PM	Badagry Axis	One with God (W19)	2		1	Nill	1	One with God capsized along Badagry Waterways with luggage . Two men onboard, captain and deckhand. Captain survived but deckhand died.	Capsized
							94	1	4		

Source LASWA, 2023

The outline of some of the incidents as documented with date, time, and causes by LASWA officials are:

- MV Pelumi got sunk, and another boat was sent for rescue; no casualty was recorded
- In other accidents listed, all passengers were rescued by passing boats.
- The victim of the kidnap was released after five days of being kidnapped with crew onboard; a lady was pushed by her boyfriend got drowned,
- Four got stuck along waterways and were rescued;
- Toluwani Marine 2 got stuck at Makoko Axis Legacy and was rescued rescued,
- A boat capsized, and out of four passengers, one of them died,
- A fibre boat ran into a fishing net conveying passenger from Epe Aiyetoro to Ondo State,
- Seven passengers boat capsized along Agaja Irewe Ojo Axis,
- Lagferry boat (Eko Akete) drowned with 23 pax along Makoko Oworo Axis,
- The explosion of fire at Badagry Ferry Terminal due to bunkering, that is, a boat discharging fuel at the Terminal;
- Lagferry boat (Babatunde Fashola) got capsized close to Ipakodo ferry Terminal with full pax, including LASWA staff (items lost such as a laptop, Phone, Bags,
- One with God, a boat, capsized along Badagry Waterways with luggage. Two men onboard, captain and deckhand. The captain survived, but the deckhand died

The causes of the accidents and deaths were listed as follows: Sinking and capsizing of the

S/N	DATE	TIME	LOCATION	NAME	CASUALTY	DEATH	CAUSES
1	April 6th	6:15PM		John Doe	1	1	Unknown
2	May 3rd	6:00PM		John Doe	1	1	Unknown
3	May 30th	1:30PM		John Doe	1	1	Unknown
4	October 1st		Queens Drive Ikoyi	John Doe (Falomo barrack)	2	1	Resuce/drown
5	October 1st		Admiralty way lekki	seacoach Security (Mr.Peter)	1	1	Unkown
6	October 2nd		Third Mainland bridge	Mr. Nurudeen Mesioye	1	1	Suicide
7	October 24th		Takwa Bay Beach	John Doe	1	1	Unknown
8	November 2nd		Third Mainland Brigde	Mr.Oladejo Ojuolape. .R.	1	1	Suicide
9	December 27th	11:28	Atlas Cove, Takwa Bay	unknown(shot by Navy)	1	1	bunkry(killed by Navy)
					9	8	

boats for unexplained reasons; Engine pulled out in motion, Kidnapping attack, Hit by submerged moving fish; death caused by the deliberate pushing of a girl into the water by boyfriend; Bad engine and insufficient fuel, hit by submerge object, Fibre boat ran into a fishing net, Drown of a passenger falling off the boat, Fire outbreak as a result of fuel bunkering-stealing fuel through trans-loading from pipelines.

Plate 10.1 Safety Awareness Campaign and free distribution of Life jackets by LASWA



Source: LASWA, 2024

Table 10.13 Incidents documented as Flimsies by LASWA

Source: Compiled from LASWA Incident Report, 2024

The location of some incidents on water were also tabulated as flimsies by LASWA with such events documented as unknow, suicide, bunkering, shot by navy, Influence of drugs, depression and found dead with both hands tied

Table 10.14 Incidents documented as Flimsies by LASWA

S/N	DATE	TIME	LOCATION	NAME	CASUALTY	RESCUE	INJURY	DEATH	CAUSES
1	January 23rd	0947hrs	Carter Bridge/Elebrata	Muhammed Jafar	1		Nil	Nil	Influence of drugs
2	April 2nd	0730hrs	Third Mainland/Ilaje	female(No Name)	1		Nil	Nil	depression
3	May 22nd	061hrs	Ilaje Bariga jetty	Female	1	1	Nil		Recuse by fisherman and hand to LRU
4	June 2nd	1015hrs	Ilaje Bariga jetty	Male	1		Nil	1	John Doe
5	June 25TH	1040hrs	Falomo bridge	sheni Charles	1	1	Nil	Nil	Regret of bad deed,
7	August 16th	01815hrs	Fiki Jetty	No detail	1			1	found dead with both hands tie
					6			2	

Source: Compiled from LASWA Incident Report, 2024

2.6 Conclusions And Recommendations

Conclusions:

High road traffic crashes plague the prevalence of Road Traffic Crashes (RTCs) in Lagos State. These are predominantly attributed to human factors such as reckless driving, over speeding, and non-compliance with traffic regulations. The condition of the roads, lack of proper signage, and the presence of unroadworthy vehicles further compound the issue.

Water traffic crashes also pose a significant problem in Lagos. They are often caused by unsafe boating practices, overloading, lax safety regulation enforcement, and inadequate navigational aids. The surge in water traffic crashes in 2020 underscores the shift towards water transport as an alternative during the peak COVID-19 pandemic lockdowns. This occurs at any other time whenever there is road congestion or lockdowns.

Both road and water traffic crashes result in significant loss of life and injuries, placing a heavy burden on the healthcare system and leading to substantial economic costs due to medical expenses, loss of productivity, and property damage.

Strengthening enforcement and compliance is essential. Despite the active efforts of agencies like LASTMA, FRSC, and LASWA to manage traffic safety, persistent challenges remain regarding consistent enforcement, public compliance with regulations, and insufficient infrastructure improvements.

There are yawning gaps in data collection and analysis. This study has identified the pressing need for improved data collection and analysis to understand better the causes and trends of traffic crashes, which is vital for designing targeted interventions.

Recommendations

The study recommended strengthening enforcement and regulation. Traffic law enforcement should improve, including imposing stricter penalties for violations like speeding, drunk driving, and using mobile phones while driving.

Pay greater attention to vehicle inspection processes to ensure roadworthiness and advocacy for using life jackets and other safety measures in water transport.

A critical need exists for Infrastructure Improvements. Investment in the upkeep and expansion of road infrastructure, including repairing potholes, enhancing signage, and ensuring functional traffic signals, is necessary.

There should be more regular clearing of obstructions and more navigational aids on waterways to reduce accidents.

Consistent public education and awareness campaigns in the state are essential. These campaigns should specifically target high-risk groups, including commercial drivers and motorcyclists, by transforming driver behaviour and fostering a road and water safety culture.

The state should enhance its data-driven approaches to transport management and develop robust data collection, analysis, and dissemination systems to inform policy decisions. This

includes using technology for real-time monitoring and reporting traffic incidents on roads and waterways, as the Lagos Traffic Radio currently does.

Citizens should be encouraged to use alternative transport modes, such as the Bus Rapid Transit (BRT) system and safe water transport options, to alleviate the strain on road networks.

Expanding ferry services with stringent safety compliance can provide viable alternatives to road travel.

Collaboration among government agencies, transport unions, private sector stakeholders, and civil society should be further enhanced to create a coordinated approach to traffic safety. Communities' engagement in developing and implementing local traffic safety initiatives should be institutionalized.

The state should regularly review and update traffic safety policies and interventions to adapt to Lagos's evolving urban landscape and transportation needs. This includes conducting periodic safety audits and impact assessments of existing measures. Implementing these recommendations will help address the root causes of traffic crashes in Lagos and contribute to safer and more efficient urban mobility.

CHAPTER 3: CASE STUDY OF NAIROBI AND LAKE VICTORIA, KENYA

3.1 INTRODUCTION

3.1.1 Background

The enduring and continuing traffic congestion in most cities in Africa creates very common and regular situation of traffic jams and accidents that has led loss of life, depression as well as economic losses. At the same time, vehicles, motorbikes, boats, and ferries are poorly maintained whereas the roads and waterways are dilapidated and are not well taken care of. Indeed, it has been estimated that low-income countries to which Africa belongs, lose about 1 percent of Gross Domestic Product (GDP) due to accidents and injuries (Federal Road Safety Corps (FRSC), 2018; Tiwari, Khayesi, Mitullah, Kobusingye, Mohan, & Zuidgeest (2020)). Specifically, Nigeria, Kenya, and Ghana annually lose about \$450 billion, \$97 billion, and \$11.6 billion, respectively.

There are many studies on road traffic accidents (Tiwari, et al., 2020) and well formulated and facilitative policies within the road sector, but policies and studies on accidents on waterways are rarer. Cities such as Mombasa and Kisumu with water bodies have urban forms with peculiar safety and environmental challenges. Undeniably, safety policies for water transportation, especially for the local artisanal boat and ferry operators mostly patronized by the urban poor are limited.

The motivation of this study is the need to reduce annual carnage on our roads and waterways, and as a result loss of life, and economic losses. Hence, the study seeks to examine the travel accidents on roads in Nairobi City and waterways at Nyang'oma Kogelo in Siaya County. It will also entail evaluation of the safety regulations, enforcement, and enlightenment. This study is, therefore, expected to contribute to the understanding of the mobility safety issues in cities with road and water transport system and contribute to policy guidelines on how to minimise the accidents.

3.1.2 Research Questions

Arising from the need to reduce casualties and accidents on the roads and waterways, this exploratory research survey will answer the following questions:

- (i) What are the **numbers** of accidents and casualties on the roads in Nairobi City and waterway at Nyang'oma Kogelo?
- (ii) What are the **causes and patterns** of the accidents?
- (iii) What are the **differences and similarities in the data** among the two modes of transportation; and
- (iv) What are the differences and similarities in the safety regulatory framework in Nigeria, Ghana, and Kenya.

3.1.3 Project Objectives

The general objective of this exploratory survey research is to examine the causes of the travel accidents on roads and waterways in Nairobi City and Nyang'oma Kogelo town, respectively. The specific objectives will be to:

- (i) Determine the number of accidents and casualties on the roads and waterways;
- (ii) Describe the causes and patterns of the accidents and casualties on the roads and waterways;
- (iii) Compare the data among the the two modes of transportation;
- (iv) Evaluate and compare the safety regulation framework and safety education in the two modes of transportation; and
- (v) Compare data among Nigeria, Kenya and Ghana among the two modes of transportation.

3.1.4 Scope of the Project

It is particularly worrying of the high incidences of public bus/minibus and motorbikes accidents in African countries where passengers are a significant road user group at risk of road traffic accidents and injuries (Odero, Khayesi & Heda, 2003). In Kenya, most of these public bus/minibus and motorbikes are found in Nairobi City and this has made Nairobi City to be ranked among the five most congested city in the world and with it, therefore, comes the highest road accidents within the country. Studies indicate that drivers, pedestrians, and vehicle defects fundamentally affect the possibility of an accident, human error especially on the part of drivers and pedestrians is the leading accident cause in Kenyan roads. While drivers have, however been blamed for careless or even drunken driving, pedestrians have been known to spurn traffic rules by crossing the streets at non-assigned points and disrespecting the traffic lights. It is for these reasons that Nairobi City has been chosen as one of the study areas. In addition, Nairobi City will provide adequate primary and secondary data on road accidents.

The second area of study regarding waterways as a mode of transportation will focus on Lake Victoria, which is the second largest freshwater body in the world. Over the last four decades, however, the lake has faced several environmental problems, including pollution, biodiversity loss, habitat destruction and soil erosion. In addition, there has been increased cases of boat accidents and deaths caused by overloading, poor maintenance of boats, paying little attention to weather forecasts, and failure by passengers to put on lifejackets. Specifically, the study will be conducted in Nyang'oma Kogelo town in Siaya County where there is a significant availability of water mobility to give us insights into water accidents.

3.1.5 Project Deliverables

The project is expected to provide predictive tool for preventing road traffic crashes and boat accidents so that needless deaths, injuries, and economic losses could be significantly reduced in Kenya as well as other countries within the continent. Consequently, study will contribute to effective road and waterways traffic management by informing policy, guidelines, and strategy especially on the waterways that is not receiving enough research attention hitherto.

Secondly, the findings of this project will contribute to the body of knowledge on mobility safety in urban roads and especially in the waterways where studies are less common, and guidelines less promoted for public enlightenment. This will further provide pedagogical tool for teaching in safety issues in road and waterways transportation aside from being an instrument for public enlightenment and education on traffic safety.

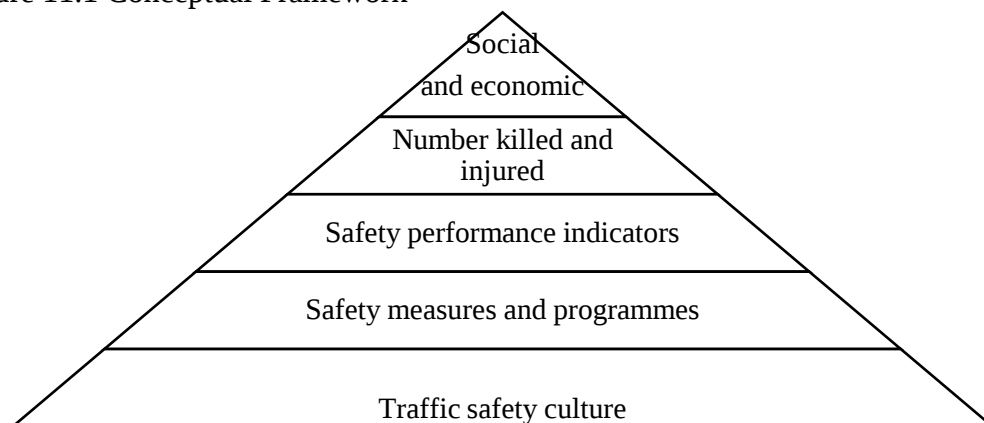
Thirdly, this is a continental and transdisciplinary study and offers a unique opportunity to improve and enhance our research skills in scope and methodology hence assisting in building of research networks and relationships. This will impact on the quality of research methods and the related curriculum content and expose young academics across gender divides to the best practice in large scale research. The publications that will emanate from this study will be disseminated through academic publications, books, conferences, seminars, social and traditional media so that literature can be enriched and pushed forward to the next research frontier.

3.2 Approach and Methodology

3.2.1 Approach

Traffic safety culture is an important part of the entire traffic system as it is a complex internal factor that can affect the behavior of road users. Based on the consideration and analysis of its impact, a safe system approach will be built, including the basic measures based on traditional traffic safety improvement methods. Grounded on the original 3Es of engineering, education, and enforcement as the three main traffic safety measures, more Es (emergency, safety, and elderly) will be taken into account, which include establishing a more efficient emergency response system, analyzing and evaluating traffic safety, and paying special attention to elderly and young people. In addition, these new Es also provide a more detailed implementation direction for the system approach as the approach is the most important means of traffic safety strategies today. It abandons the traditional approach that originally attributed the responsibility for road traffic crashes to humans and proposes the concept that every stakeholder in society should take responsibility for the traffic safety system. Figure 1 below provides a summary of the approach that the Kenyan team will adopt.

Figure 11.1 Conceptual Framework



As shown in Figure 1 above, the common vision of road safety at the top of the triangle also represents the ultimate goal of eliminating or minimizing death due to road traffic crashes. Toward this goal, a set of indicator systems are needed to help supervise the traffic safety status and formulate traffic safety policies more effectively. Such an indicator system is based on a safety system, which includes a series of detailed measures focusing on different directions. Finally, since traffic safety culture has a complex impact on traffic safety, it forms the basis and background of our approach.

The term "traffic safety culture" is the shared beliefs, attitudes, and norms relevant to safety and is an important part of the entire traffic system as it is a complex internal factor that can affect the behavior of road users. Traffic safety cultures often differ among regions and countries and changing the status of traffic safety by studying safety culture is still a challenge that will involve the setting and evaluation of complex cultural indicators, as well as cooperation and exchange between different countries. Traffic safety culture may have great potential for improving traffic safety. For example, the analysis based on peer groups can provide the most favorable foundation for targeted traffic safety interventions since people can improve traffic safety by intervening with someone who is engaged in potentially dangerous behaviors, which means that if more people choose to avert the dangerous behaviors of others, traffic safety is likely to be significantly improved.

The social and economic costs; number killed and injured; and safety performance indicators provide levels of road safety performance, whereas safety measures and programme; and traffic safety culture focuses on policy performance indicator and policy context, respectively. Moreover, number killed and injured; safety performance indicators and safety measures and programmes and are the key indicators for implementation performance. Together, these elements constitute a conceptual framework for road and water traffic safety.

3.2.2 Methodology

The desire to reduce annual carnage on roads and waterways, and as a result loss of life, and economic losses is the biggest motivation for this study. Consequently, the study seeks to examine the travel accidents on the roads and waterways of three selected regions in West and East Africa. In particular, the study shall determine the number of accidents and casualties on the roads in Nairobi City and waterways Nyang'oma Kogelo town; describe the causes and patterns; compare the data among the three countries and between the two modes; and evaluate and compare the safety regulation framework and safety education in the three countries. This study is, therefore, expected to contribute to the understanding of the mobility safety issues in cities with road and water transport system and contribute to policy guidelines on how to minimise the accidents.

In order to address the objective of this study, an exploratory survey research will be done and both primary and secondary data will be collected. Primary data will be collected through interviews with relevant stakeholders and field observations to document some cases of real-life incidences and casualties over a three-month period. On the other hand, secondary will be from the appropriate authorities.

By design this is an exploratory survey and comparative research, where primary and secondary data will be used. The primary data will be collected through a questionnaire (see Appendix I). In addition, interviews with relevant stakeholders like the law enforcement agencies, drivers and their associations like Matatu Owners Association (MOA), Boda Boda Association (BBA) of Kenya, Association of Bus Operators (ABO) of Kenya, Lake Victoria Tourism Association (LVTA), the boat and ferry owners' unions and the waterways authorities will be done. There will be field observations for three months to document some cases of real-life incidences and casualties. This will entail working closely with identified relevant authorities. The sampling techniques for the survey shall be multi-stage which will include, starting with quota, systematic, clusters, judgmental to convenience as we go from one broad data collection level micro level.

The secondary data on the accidents and incidents for a period as defined by archival data available in usable format and common to all the cities of study will be collected. This will be a longitudinal evaluation of archival material as available in the data base of relevant agencies, such as, Kenya Urban Roads Authority (KURA), Kenya National Highways Authority (KeNHA), Kenya Police Service (KPS), waterways authorities, and Kenya National Bureau of Statistics (KNBS). All these will constitute the sources of the secondary data. Further, secondary data and information will be obtained from the regulatory policy documents on road and waterways modes of transportations as they relate to Nairobi City and Nyang'oma Kogelo town as well as evaluation of the safety regulations, enforcement, and enlightenment.

This study will, therefore, seek to obtain the number, pattern, causes, injuries and fatalities of road and water accidents in the identified counties so that a comparative analysis of the data among the counties and between the modes in Kenya can be compared together with a comparative analysis between analysis from Nigeria and Ghana. The data collected will be mapped, compared, and analysed and presented in graphs and tabular form. In addition, comparisons of means (for example, t-tests) and Analyses of Variance (ANOV) will be done.

Three phases approach in examining number of accidents and casualties on the roads in Nairobi City and waterways in Nyang'oma Kogelo town will be adopted and will provide an insight on the approach that will be adopted while engaging in this assignment. This involves a facilitated and interactive process with meaningful stakeholder participation, inclusion, and leadership through joint dialogue, diagnosis, and learning. This enhances action and implementation as well as ownership, commitment, and sustainability. The envisaged three stages in delivering the assignment are shown in Table 1 below:

- Phase I: Mobilize and setup
- Phase 2: Situational analysis
- Phase 3: Develop, design, and validate

Table 11.1 Summary of Key Activities and the Expected Output

Phase	Key Activity and the Expected Output
Phase I	Inception Report (Mobilize and Setup)
Objective	Establish close partnerships between research teams in Nigeria, Ghana and Kenya to ensure shared vision and objectives.

Phase	Key Activity and the Expected Output
Key activities	- Comparative study inception report covering: - Hold a kick-off meeting with key researchers; - Evaluate the objectives and scope of the assignment; - Agree on timelines, outputs, task allocation, and logistics; - Identify the key stakeholders to be interviewed and invited to the validation workshop. - Define risks and set the process for managing and addressing assignment issues. - Agree on the design of data collection tools
Deliverable	Inception Report
Phase II	Interim Comparative Study Report (Situational Analysis)
Objective	Evaluate number, pattern, causes, injuries and fatalities of road in Nairobi City and water accidents in Nyang'oma Kogelo town
Key activities	- Review archival material as available in the data base of relevant agencies, as well as evaluation of the safety regulations, enforcement, and enlightenment. - Hold focused group discussions and interviews - Carry out mapping and data analysis.
Deliverable	Interim Comparative Study Status Report
Phase III	Develop, Design, and Validate the Comparative Study
Objective	Develop, design, and validate the comparative study
Key activities	- Hold workshops to engage stakeholders and researchers on the draft comparative study - Finalize the comparative study based on input from stakeholders through workshops and written comments
Deliverable	Comparative Study

Work Plan and Schedule

Table 11.2 Work Plan and Schedule

	Schedule of Activities
1	Coordination
1.1	Hold a kick-off meeting with key researchers.
1.2	Evaluate the objectives and scope of the assignment.
1.3	Agree on timelines, outputs, tasks allocation, and logistics
1.4	Identify the key stakeholders that will be interviewed and invited to the validation workshop
1.5	Agree on the design of data collection tools
2	Inception Report
2.1	Prepare list of relevant policy documents
2.2	Collection and compilation of policy documents
2.3	Qualitative analysis of data collected on policy documents
3	Policy Documents Report
3.1	Prepare template for data collection
3.2	Descriptive analysis of information collected
4	Coordinating Agencies Report
4.1	Preparation of template to collect data on roads and waterways accidents
4.2	Actual collection of data from relevant sources
4.3	Compilation of data collected
4.4	Quantitative data analysis
5	Accidents Data Report
5.1	Prepare questionnaires

5.2	Formation of teams
5.3	Administer questionnaires
5.4	Data cleaning and Data analysis
6	Primary Data Report
6.1	Stakeholders' consultations
6.2	Compilation of final report
7	Comparative Study Report

3.3 Analysis and Findings

3.3.1 Introduction

The primary objective of this study was to examine the causes of the travel accidents on roads and waterways in Nairobi City and Lake Victoria, respectively. This section presents analysis of the data collected and the findings and data analysis proceeded in three parts; first was evaluation of existing policies, laws, and regulations in both road and water sectors; second was road and water safety situation in Kenya; and third was review of current road and water safety situation in the identified study areas. Content and descriptive statistics (tables and graphs) analysis was done in-order to address the study objectives.

3.3.2 Evaluation of Policies, Laws, and Regulations in Road and Water Sectors

There are several policies, laws, and regulations that govern the road and water sectors in Kenya. On safety and security of road and water some of the policies include:

- (i) Kenya Roads Act No. 2 of 2007 revised edition 2012 (2007) - An Act of Parliament to provide for the establishment of KeNHA, KURA and the Kenya Rural Roads Authority (KeRRA), to provide for the powers and functions of the authorities and for connected purposes
- (ii) The Traffic Act (Cap 403) in exercise of the powers conferred by section 119(g) of the Traffic Act Revised, Cap 403 ,2012, the Cabinet Secretary in the Ministry of Roads and Transport makes the following regulations: The Motor Vehicle Inspection Regulations, 2023 draft
- (iii) The National Transport And Safety Authority Act No. 33 of 2012 Revised Edition 2012 - An Act of Parliament to provide for the establishment of NTSA to provide for the powers and functions of the authority, and for connected purposes. (Act No. 33 of 2012, Legal Notice 136 of 2012, Act No. 19 of 2014)
- (iv) County Government of Vihiga boda-boda policy (2018) draft

Some of the enforcement strategies include:

- (i) Heavy commercial vehicles industry in Kenya: regulation or deregulation (2005)
- (ii) Non motorized transport policy- Nairobi City County Government (2015) - this non-motorized transport policy strives to facilitate a mobility environment where all transport modes are of equal importance.
- (iii) National Police Service Act No. 11A of 2011 Revised Edition 2017 (2011) - Kenya Police to maintain order on roads
- (iv) The NTSA regulations (2022) for transport network companies, owners, drivers and passengers
- (v) Sessional Paper No 4 of 2009 on the Nairobi Urban Toll Road Concession Project

- (vi) Sessional Paper on Integrated National Transport Policy November 2010 - the policy covers all transport systems
- (vii) The Traffic (Drunk Driving) Rules, 2023

Amongst the enlightenment programmes includes:

- (i) The project on Integrated Urban Development Master Plan for the City of Nairobi in the Republic of Kenya- Urban Transport Development Plan (2014)
- (ii) United Nations Conference on Trade and Development (UNCTAD) Policy Action Plan for Transport Services in Kenya
- (iii) Road Infrastructure Policies in Kenya: Historical Trends and Current Challenges - Infrastructure and Economic Services by division Kenya Institute for Public Policy Research and Analysis KIPPRA Working Paper No. 1 (2001).

However, as it has been pointed out in various studies and research, implementation of these policies and regulations and application of the law falls short of expectations. Table 2 below summarizes the key statutes and regulations governing the transport sector in Kenya.

Table 11.3 Key Statutes and Regulations Governing the Transport Sector in Kenya

Mode of Transport	Title of Relevant Act	Date Revised or Amended	Summary of Act
Overarching statutes affecting all modes of transport	Constitution of Kenya	Promulgated 2010	Contains provisions guiding various activities in the country
	Kenya Police Act Cap 84	Revised 2010	Contains regulations concerning formation of the police force, its functions including erection of road barriers, control of traffic on Kenyan roads, inspection of vehicles etc.
	Administration Police Act	Revised 2010	Contains regulations concerning the power of administration police including power to erect barriers, stop vehicles without warrant, arrest without warrant etc
	Wayleaves Act cap 292	Revised 2010	Contains regulations relating to wayleaves for sewage, drains and pipelines, compensation for private property affected and handling of objections by owners of private property.
	State Corporations Act Cap 446	Revised 2012	Contains regulations concerning establishment and management of state corporations including those in transportation sector
	Environmental and Management Co-ordination Act No. 8 of 1999.	Revised in 2012	Contains regulations on establishment of NEMA, environmental protection, conducting environmental impact assessments, water pollution prevention
	Kenya Revenue Authority Act No. 2 of 1995	Revised 2018	Provides for the establishment, functions and powers of the Kenya Revenue Authority
	Insurance Act Cap 487	Revised 2018	Contains regulations for the establishments of Insurance regulatory authority, Kenya Re-insurance corporation, insurance advisory board of Kenya, premiums, claims etc.
	Privatisation Act No 2 of 2005	Revised 2016	Contains regulations relating to establishment of privatisation commission, privatisation programme, proposals and appeals tribunal
	Public Procurement and Disposal Act No 33 of 2015	Revised in 2022	Contains regulations for establishment of regulatory bodies and how to conduct public procurement in Kenya.
	Public Private Partnership Act No. 14 of 2021		Contains regulations for establishment of PPP committee, PPP procurement methods, County PPP arrangements etc
	Lake Basin Development Act Cap 442	Revised 2012	Provides for the establishment of the Lake Basin Development Authority, its functions and composition

	Exchequer and Audit Act, Cap 412	Revised 2012	Contains regulations relating to utilisation of public funds by various government agencies, audit and functions of various government funds including Government Commuter Bus Services Fund
	Various Regional/International Road and Maritime legal instruments		
Road Transport	Kenya Roads Act (2007)	Amended 2019	
	Transport Licensing Act (1979)	Revised 2012	Provides guidelines for licensing of forms of transport, provisions with regard to licenses, offences and prosecutions
	Kenya Roads Board Act No. 7 of 1999	Revised 2012	Provides for the establishment of Kenya Roads Board and allocation of funds to roads agencies
	Road Maintenance Levy Fund Act No.9 of 1993	Revised 2012	Provides for the establishment of the road maintenance levy, mode of collection, penalties for defaulters, registration of remitters and how to deal with defaulters
	This Act may be cited as the Public Roads Toll Act, 1984.	Revised 2012	Provides guidelines for establishment of toll stations on public roads, appointment of toll collectors, toll rates in PTA and COMESA regions as well as offences relating to tolls
	Kenya Finance Act 2005		Provided for review of various taxes and duties affecting road transport sector
	Public Roads and Roads of Access Act No. 3 of 1951	Revised 2010	Provides regulations for appointment of District Road Boards and construction of public roads and access roads
	Local Government Act, Cap 265	Revised 2010	Provides regulations on certain powers, duties and provisions relating to roads and ferries that can be exercised by local governments such as Municipalities and Counties relating certain duties,
	Kenya Roads Act No. 2 of 2007	Revised 2012	Provides for establishment of KeNHA, KeRRA and KURA
	Traffic Act. Cap 403	Revised 2015	Provides regulations concerning registration of vehicles, traffic offences, driving licences and PSVs
	Streets Adoption Act, Cap 406	Revised 2012	Provides regulations concerning adopted and unadopted streets
	Valuation of Rating Act Cap 266	Revised 2012	Provides regulations on preparation of valuation rolls and supplementary valuation rolls
	Rating Act Cap 267	Revised 2012	Contains regulations on rates chargeable to properties in different locations and rating criteria
	Wildlife Conservation and Management Act, Cap 376	Revised 2009	Contains regulations on declaration, conservation and management of national parks
	Local Authorities Transfer Fund (LATF) Act No. 8 of 1998	Revised 2012	Provides regulations for establishment and management of LATF
	Agriculture Act, Cap 318	Revised 2012	Provides regulation for protection, management and conservation of Agricultural land
	Physical Planning Act No.6 of 1996	Revised 2012	Contains regulations for development and approval of Physical development plans including transport infrastructure
	Local Authority Services Charge Act Cap 274	Revised 2012	Provides regulation on administration of services charge
Shipping, and Inland waterways transport	Kenya Maritime Authority Act 2006	Revised 2012	Provides for the establishment of the Kenya Maritime Authority, its functions and management
	Kenya Ports Authority Act Cap 391	Revised 2012	Provides for the establishment of the Kenya Ports Authority, its functions and regulations
	Carriage of Goods by Sea Act Cap 392	Revised 2012	Contains regulations on bills of lading, rights and immunities of parties, risks, liabilities and responsibilities relating to carriage of goods by sea
	Fisheries Act Cap 378	Revised 2012	Contains regulations concerning registration of local and foreign fishing vessels as well as offences and enforcement
	Lake Victoria Act 2007		Contains regulations concerning registration of vessels, certificates of competency, crew management, carriage of bulk and dangerous

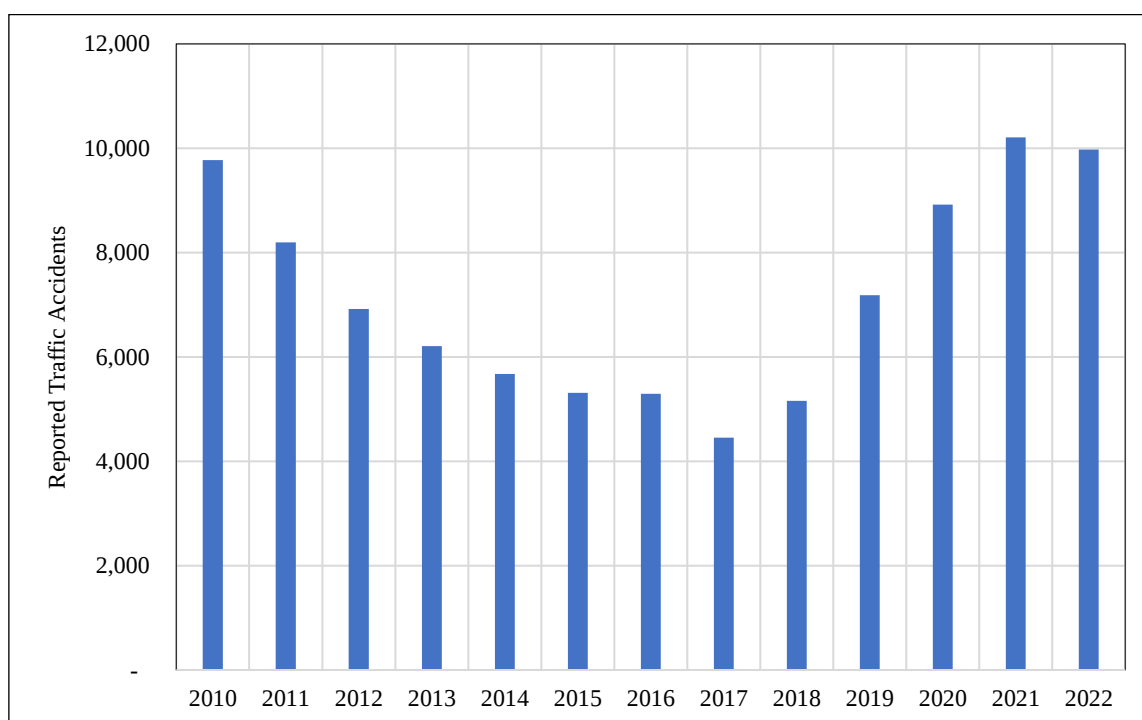
			goods, safety of navigation, seaworthiness, prevention of pollution from vessels among others
	Merchant Shipping Act No. 4 of 2009	Revised 2012	Provides regulations relating to registration of ships, transfer of ownership and tonnage measurement
	Ferries Cap 410	Revised 2012	Contains regulations on powers of the road authority relating to ferries, penalty for carrying ferry services in prohibited areas, agreements made before commencement of Act No. 2 of 1952 and rules
	Marine Insurance Cap 390	Revised 2018	Contains regulations relating to marine insurance, insurable interest, disclosure and representations, rights of insures, voyage etc.
	Mtwapa Bridge Act Cap 402		To ratify and provide for carrying out an agreement between the Government of Kenya and Mtwapa Bridge Limited respecting a bridge over the Mtwapa Creek, and for purposes incidental thereto and connected therewith
	Judicature Act Cap 8 OF 1967	Revised 2012	Contains regulations concerning mode of exercise of jurisdiction, protection of judges

From Table 2 above, it is apparent that the legal and regulatory framework in Kenya with respect to water transport is limited. For a competent administration to conduct marine casualty and incident investigations in a compulsory and legal way, there is a need for regulatory and legal framework to be put in place to facilitate the same. Further, there is a need to separate maritime casualty investigation from all the other administrative duties and create an independent body to specifically conduct investigations. The legal framework in Kenya consists of both national legislation and international instruments. In addition, the marine casualty investigation currently as stipulated in KMA Act, shall be conducted by KMA, which means that the same institution that does the inspections and surveys, ends up conducting the casualty investigations.

3.3.3 Road Safety Situation in Kenya

The World Health Organization (WHO) estimates that more than 1.35 million people die every year on the world's roads, and another up to 50 million sustain non-fatal injuries as a result of road traffic crashes. They are the leading cause of death for people aged between 5 and 29 years and place an immense socio-economic burden on communities. In Kenya, as in other low and middle-income countries, the road safety problem has been driven by rapid increases in human and vehicle populations, which have in turn led to rapid increases in traffic. The whole road traffic system in Kenya in its current state cannot cope, and as a result, there has been, over the years, an increase in traffic accidents as Figure 2 below shows.

Figure 11.2 Reported Traffic Accidents: 2010-2022

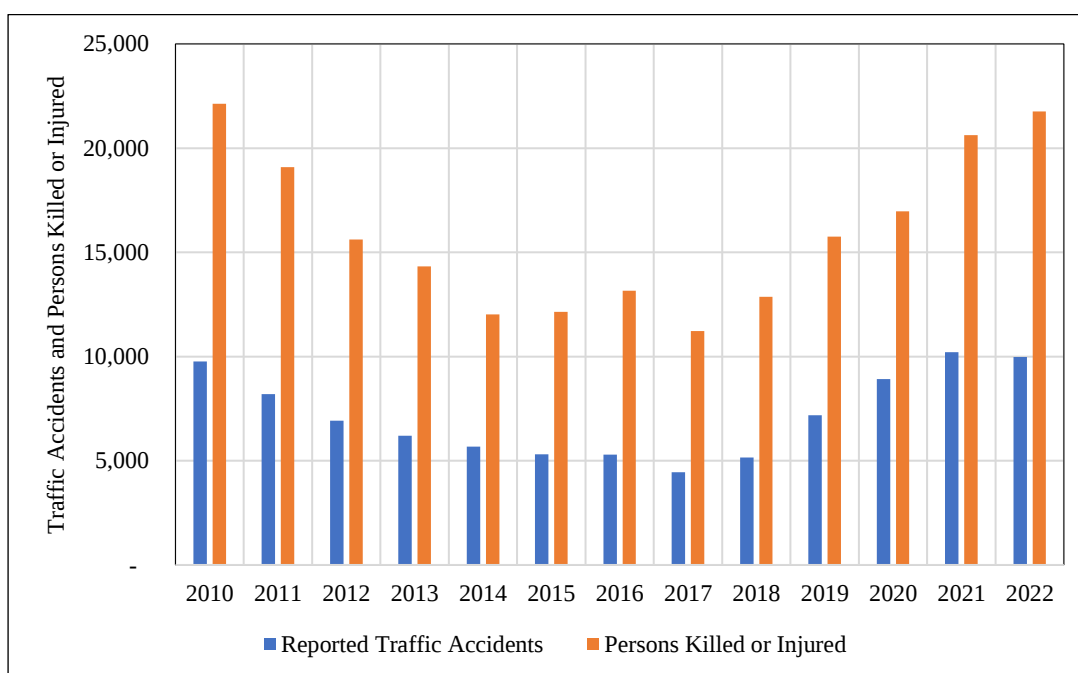


Source: Traffic Department – Kenya Police Service

Figure 2 above shows a continual decrease from peak of just less than 10,000 in 2010 to a low of 4,500 reported accidents in 2010 and 2017, respectively. For the last five years however, the reported accidents have been rising reaching a high of slightly over 10,000 in 2021 and 10,000 in 2022. This pattern, given the sustained increases in exposure to road traffic injury risk through increased human and vehicle populations raises concerns of increasing reported accidents, which could translate to fatalities, as Figure 1 below shows, unless certain measures are put in place.

From Figure 3 below, on the number of reported road accidents, persons injured and fatalities there was a slight decrease in the number of reported road accidents from 10,210 reported in 2021 to 9,976 in 2022. There was, however, an increase of 5.5 percent in number of road accident casualties from 20,625 in 2021 to 21,757 in 2022. The number of persons slightly injured decreased from 10,050 in 2021 to 9,935 in 2022, while the number of deaths arising from traffic accidents rose by 2.4 percent to 4,690 during the period under review. This data should, nonetheless, be seen within the backdrop that although reported crash fatalities have been growing significantly over the last five years, data limitations hinder the understanding of the true situation on Kenya's roads. The WHO estimates suggest that crash fatalities are under-reported and could be up to four times higher than official estimates.

Figure 11.3 Traffic Accidents Reported and Persons Killed or Injured: 2010-2022



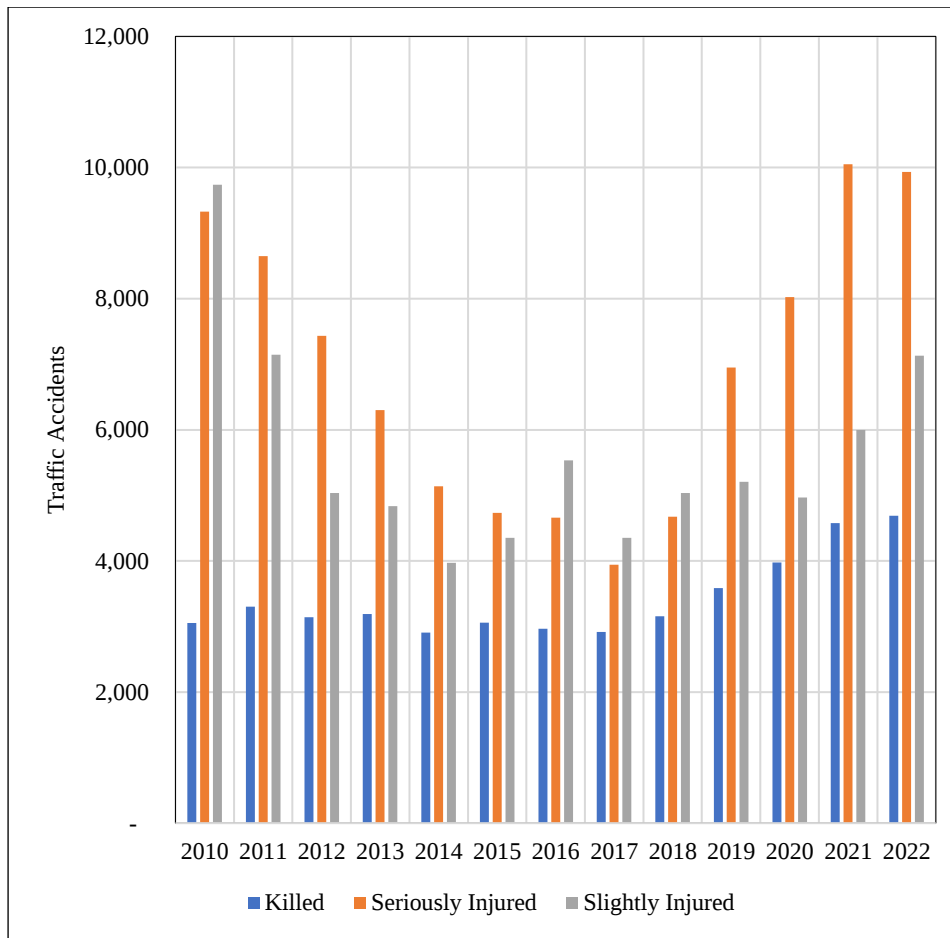
Source: Traffic Department – Kenya Police Service

Breaking further Figure 3 above by traffic accidents by type from 2010 to 2022 into persons killed, seriously injured, and slightly injured indicates that persons killed, and seriously injured have increased by about 53.5 percent (3,055 to 4,690) and 6.5 percent (9,327 to 9,935), correspondingly from 2010 to 2022. The persons slightly injured have, conversely, decreased by 26.8 percent (9,739 to 7,132) over the same period. As shown in Figure 4 below, the number of persons killed remained below 3,300 from 2010 to 2018 but started increasing in 2019 to reach a high of 4,690 deaths in 2022. In addition, the persons seriously injured decreased from about 9,000 in 2010 to slightly below 4,000 injuries in 2017 but picked up again in 2021 to 10,050 injuries – the highest reported injuries between 2010 and 2022. On the other hand, the highest and lowest numbers of slight injuries were 9,739 and 3,971 in 2010 and 2014, respectively.

The current road safety situation is concerning, especially in the face of a rapidly growing vehicle fleet. Vulnerable road users, especially pedestrians and motorcyclists are the most at risk, as indicated in Figure 4 below. That being the case, pedestrian and motorcyclist (and pillion) safety is a major and ongoing concern, and the road environment needs to be made much safer for them.

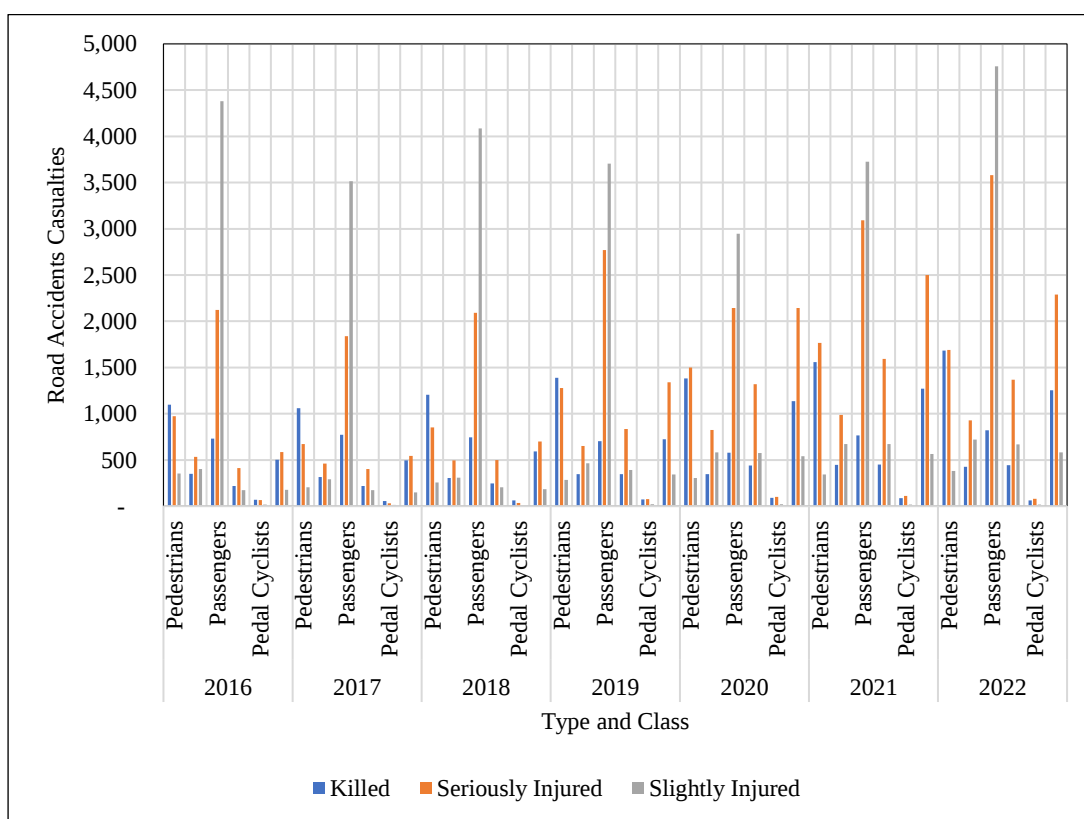
In addition, Figure 5 below shows the number of casualties from reported road accidents by type and class for the period 2016 to 2022. Passenger casualties increased by 20.8 percent from 7,586 victims in 2021 to 9,161 victims in 2022. Over the same period, the number of pedal cyclist casualties declined by 26.4 percent to 159. The number of pillion passenger casualties decreased by 8.6 percent from 2,716 in 2021 to 2,483 in 2022. The number of pedestrian casualties increased by 2.3 percent from 3,667 to 3,752, over the same period, whereas the casualties from passengers accounted for 42.1 percent of the total victims.

Figure 11.4 Traffic Accidents by Type: 2010-2022



Source: Traffic Department – Kenya Police Service

Figure 11.5 Road Accidents Casualties by Type and Class: 2016-2022



Source: Traffic Department – Kenya Police Service

Fatal crashes are highly concentrated in few locations and approximately 31 percent of fatalities are located in Nairobi, Kiambu, Nakuru, and Machakos counties representing 21 percent of the population (Table 3 below)¹. As Table 3 below shows, Nairobi County had the highest fatal crashes then followed Kiambu County.

Table 11.4 Fatal Crashes in Nairobi, Kiambu, Nakuru, and Machakos Counties: 2022

County	Population (Million 2019)	Fatal Crashes (2022)	Fatal Crashes per 100,000	Fatal Crashes per County (Percent)
Nairobi	4.2	474	10.78	10.11
Kiambu	2.4	440	18.20	9.38
Nakuru	2.2	326	15.08	6.95
Machakos	1.4	214	15.05	4.56

Source: Traffic Department – Kenya Police Service

Over and above the fatal crashes as shown in Table 3 above, crashes are concentrated on specific roads, which are shown in Table 4 below. Among these roads, many crashes occur on the northern corridor, which drives the large percent of fatalities that occur in the counties that this corridor crosses. Five roads in Nairobi County, representing 2 percent of the road network, account for 36 percent of all fatal crashes in the county.

¹ Fatality data is based on 2022 police national fatal crash (4,690) records and population data is based on the 2019 (47.6 million) national census

Table 11.5 Fatal Crashes by Roads: 2022

County	Road	Fatal Crashes	Fatal Crashes per County (Percent)
Nairobi	Thika	56	11.81
	Outering	54	11.39
	Waiyaki Way	29	6.12
	Eastern Bypass	24	5.06
	Northern Bypass	23	4.85
Kiambu	Thika	99	22.50
	Nairobi to Naivasha	82	18.64
	Eastern Bypass	18	4.09
	Thika-Matuu	15	3.64
	Thika-Garissa	14	3.18
Nakuru	Nakuru-Eldoret	50	15.34
	Nakuru-Nairobi	40	12.27
	Nakuru-Nyahururu	23	7.06
	Nakuru to Gilgil	22	6.75
	Mai Mahiu-Naivasha	13	3.99
	Nairobi-Naivasha	13	3.99
Machakos	Nairobi-Mombasa	54	25.23
	Kangundo	25	11.68
	Matuu-Thika	20	9.35
	Machakos-Kitui	14	6.54
	Matuu-Mwingi	11	5.14

Source: Traffic Department – Kenya Police Service

Fatal crashes are highly concentrated in time with 26 percent of crashes in Nairobi (30 percent of crashes for the whole country) are concentrated between 19:00 hours and 22:00 hours. These hours are after the main rush hour period when congestion tends to decrease allowing for higher speeds. During these later hours lack of visibility and alcohol can play an important role. For example, based on 198 breathalyzer tests conducted in Nairobi in 2023, 52 percent of those that were above the legal limit never appeared in court. At the same time, video data collected at 38 blackspot locations in Nairobi in 2023, only 24 percent of pedestrians use the designated crosswalk when it is available. Pedestrians may not use crosswalks because drivers may not stop at these locations, making them unsafe for crossing. In addition, the data show that while helmet use is high among boda-boda riders (82 percent), only 26 percent of pillion passengers wear a helmet even though helmets are 41 percent effective at preventing death for passengers and reduce the risk of injury by 69 percent². The presence of a helmet alone is not necessarily enough; ensuring helmets are of adequate quality and properly worn is important for their effectiveness.

There is an important interaction between enforcement and behavior as Kenya's previous road safety initiatives have established a strong platform to unite upon. It is now crucial to, however, dedicate more focused and integrated efforts to enhance the safety of roads and streets for all users, particularly pedestrians and motorcyclists. It is imperative for everyone to collaborate as a nation and within communities to mitigate

² <https://www.cdc.gov/transportationsafety/mc/index.html#print>

the immense pain, suffering, and economic losses caused by road crash fatalities and injuries. It is, therefore, important to factor in the user behaviour when developing effective road safety policies.

.3.4 Water Transport Situation in Kenya

Passenger vessels, especially domestic passenger ferries have been utilized worldwide to connect islands and are considered as an efficient means of transport. They have hugely contributed towards time and distance reduction through their operational efficiency by creating shortcuts between islands. Kenya has access to both the Indian Ocean and inland waters which include lakes, dams and rivers and passenger vessels in Kenya entail ferries, boats and cruise ships calling at the country's main ports. There has been numerous passenger vessel accidents experienced in the country due to various reasons and in most cases, massive losses have been experienced in these accidents. However, the data on safety from the water transport in Kenya is limited, scanty and wanting. For example, on September 3, 2019, five people died in a passenger boat accident between Bukasa Island in Kalangala District and Mukono District; on April 3, 2020 six people died on Lake Victoria when a boat in which they were traveling capsized; and on January 24, 2021, seven people drowned after a boat they were sailing in capsized.

From the literature review, some the common domestic factors contributing generally to water transport accidents in Kenya include:

- (i) **Faulty design and construction of vessels** - the root to a safe vessel begins at the design stage;
- (ii) **Overloading and overcrowding** - even though the carrying capacity of a ferry or boat is known, overloading is still done by operators despite knowing that they are violating the rules. As long as the regulators continue to fail preventing the operators against carrying passengers and cargo in excess, more accidents will still occur;
- (iii) **Maintenance** - passenger vessels may have undetected defects obtained either during their construction or wear and tear. In addition, the physical aging of vessels may cause accidents since many of the boats and ferries used in passenger movement are old and have many defects.
- (iv) Crew competence knowledge - experience and training by the crew plays a significant role in the vessel safety but formal training facilities is minimal;
- (v) Inadequate regulations and enforcement – the failure of regulatory bodies and organizations to **continuously monitor** the integrity and accuracy of their regulations and policies has lead to an unsafe regime of passenger vessel operations;
- (vi) Weather - unsafe weather conditions, rough lakes, seas and storms when travelling by water always pose unavoidable risks and improving weather information systems and simultaneously making them more affordable even to small passenger vessel owners in the industry could prevent accidents and save thousands of lives; and
- (vii) Low freeboards - passenger vessels are designed in such a way that their cargo access doors are low and close to the waterline in order to make it easy to load and unload. However, if the vessel stability is affected, it is most likely that the water will enter vessel due to the access threshold being below the waterline.

For a competent administration to conduct marine casualty and incident investigations in a compulsory and legal way, there is a need for regulatory and legal framework to be put in place to facilitate the same. Further, there is a need to separate maritime casualty investigation from all the other administrative duties and create an independent body to specifically conduct investigations.

3.5 Current Road Safety Situation in Nairobi County

The study sought to establish road crashes in Nairobi County, Kenya and primary data was collected from a sample of 40 respondents divided into two categories. First category comprising of 20 operators where 10 were motorcycle operators and the other were 10 public service vehicle operators in Nairobi. The second category comprised of 20 passengers where 10 were pillion passengers and the other 10 public service vehicle passengers. The operators and passengers were randomly selected from three busy locations within Nairobi County, that is Westlands, Muthurwa and Nyayo Stadium bus termini. The findings are presented in the next section.

3.5.1 Findings on Operators

On operator characteristics, data on socio-demographics such as gender, age, education status, number of years in public transport, mode of operation, other sources of income, insurance, average daily trips and average daily income was collected through a question as well as Focused Group Discussions (FGDs). This information and data is summarized in Table 5 below.

Table 11.6 Socio-Demographics Characteristics of Operators (Percent)

Socio-Demographic	Characteristics	Public Service Vehicle	Motorcycle
Gender	Female	10	0
	Male	90	100
Age (years)	Below 30	20	70
	30 to 40	40	20
	40 to 50	30	10
	50 to 60	10	0
	Over 60	0	0
Education	None	10	0
	Primary	30	10
	Secondary	40	60
	Tertiary	20	30
Duration in public transport (years)	Below 5	10	60
	5 to 10	40	30
	10 to 15	40	10
	Over 15	10	0
Mode of operation	Full time	90	70
	Part time	10	20
	Occasional	0	10
Other services of income	Yes	10	40
	No	90	60
Insurance status	Comprehensive	0	100
	Third party	100	0
	None	0	0

Average daily trips (days)		6	12
Average daily income (KSh)		22,000	3,000
Levies paid (KSh)	Unions	3,000	1,000
	Government	6,000	2,000
Challenges	Careless motorists and passengers	30	20
	Extortionist gangs	50	40
	Bad roads	60	70
	County government harassment	70	80
	Police harassment	80	60
	High cost of fuel	90	80
Vehicle ownership	Personal	0	100
	On hire	0	0
	Daily delivery to owner	100	0
Involvement in accidents	Yes	40	20
	No	60	80

The operators were requested to indicate their gender and two options were provided. The results are presented in the Table 5 above revealed that 90 percent of PSV operators were males compared to 10 percent who were females. On the other hand, all the 10 motorcycle operators who took part in the study were males. This implied that the public transport sector in Nairobi County is dominated by male operators. On age, the operators were required to indicate their age and the responses were classified into four categories and as Table 5 above shows, there was significant difference relating to age of operators in both PSVs and motorcycles, which shows that 40 percent of PSV operators were 30 to 40 years old, 30 percent were 40-50 years old, 20 percent were below 30 years old whereas only 10 percent were 50 to 60 years old. Results for the age of motorcycle operators revealed a different trend where 70 percent of the operators were below 30 years old, 20 percent were 30 to 40 years old, and 10 percent of the operators were 40 to 50 years old. Among the motorcycle operators, none was above 50 years old whereas among PSV operators none was found to be above 60 years old. The results established that the motorcycle operators are relatively younger compared to PSV operators in Nairobi County. In both public service vehicle and motorcycle operators, a reduction in the number of operators is witnessed as the age advances. A significant trend observed among the motorcycle operators is the sharp decline of the operators between those below 30 years and those above 30 years. This may serve as a red flag of high mortality rate among the motorcycle operators because of road crashes.

With respect to education, the study sought to establish the educational status of the operators both in PSVs and motorcycles. The operators were required to tick the relevant option from among four options representing no education, primary, secondary, and tertiary. The results are presented in Table 5 above and the findings revealed that 40 percent of PSV operators had secondary education, 30 percent had primary education, 20 percent had tertiary education whereas 10 percent had no formal education. On the contrary, results on motorcycle operators revealed that 60 percent of the operators had secondary education, 10 percent had primary education and 30 percent had tertiary education. There was no motorcycle operator who had no formal education.

The operators were requested to indicate the duration they had been in operation in the public transport sector. The question required a specific number to be provided by the respondent and the data on years in public transport operations were converted into four classes and the findings are presented in Table 5 above. The study results on duration the operators have been in the public transport sector revealed that 40 percent of PSV operators had been in operation for 10 to 15 years, a similar 40 percent had been in operation for 5 to 10 years, 10 percent had been in operation for more than 15 years and 10 percent for a duration of less than 5 years. A significant variation was observed in the results of motorcycle operators where 60 percent of the operators had been in public transport for less than five years, 30 percent for 5 to 10 years and 10 percent for 10 to 15 years. No motorcycle operator had been in operation for over 15 years. This illustrated a significant drop in the number of motorcycle operators as the duration in public transport operations gets longer.

On mode of operation, the study sought to establish the mode of operation adopted by the operators. The options provided to the respondents were full time, part time and occasional and the results relating to the question are presented in Table 5 above. The findings on mode of operation of the operators revealed that 90 percent of PSV operators were engaged in the business on a full-time basis whereas 10 percent of the operators were engaged in the business on a part time basis. Results on the mode of operation of motorcycle operators established that 60 percent of the operators were engaged in the work on full time basis, 20 percent on parttime basis whereas 10 percent did this work occasionally. A comparative analysis between PSV and motorcycle operators revealed that many operators among PSVs operated on full time. Some of the motorcycle operators who indicated that they operate on part time basis confirmed being engaged in some other income generating activities, consequently, the operators were required to indicate whether they had any other source of income other than public transport. The results are presented in Table 5 above and the results established that 90 percent of PSV operators relied entirely on the income, hence did not have alternative sources of income. Only 10 percent of the operators confirmed that they have other alternative sources of income. The motorcycle operators on the other hand revealed that 60 percent had no alternative income and thus relied entirely on income from the business whereas 40 percent of the operators confirmed that they had other alternative sources of income.

Regarding vehicle insurance status of both the public service motor vehicles and the motorcycles, was an issue of interest in this study. The options provided included comprehensive, third party and no insurance at all and the results are presented in Table 5 above. The findings on status of motor insurance of the operators established two different aspects that for all PSV operators, it was evident that they had only third-party insurance cover. Conversely, all the motorcycle operators had comprehensive insurance cover for their motorcycles. With respect to area of operation, the results revealed that all the operators were operating within Nairobi County. The motorcycle operators operated mostly between the Central Business District (CBD) and neighboring estates within a radius of 3 kilometers from CBD. The PSVs on the other hand operated between CBD and neighboring estates within a radius of between 5 to 30 kilometers from CBD. In addition, as Table 5 shows, PSV operators made an average of six trips per day whereas the motorcycle operators made an average of 12 trips a day which is twice the trips made by PSVs. This implied that the frequency of movement among the motorcycles is higher than that of PSVs in Nairobi County.

The operators were required to state their average daily income and from the amount mentioned by each one of them, it was used to calculate an average for both PSVs and motorcycles. From Table 5 above, operators of PSVs earned an average income of KSh 22,000 before accounting for the operating costs of the day. On the other hand, the motorcycle operators earned an average of KSh 1,680 per day before deducting the operating expenses. The average operating expenses for PSV operators were estimated at KSh 14,000 while those of motorcycle operators were estimated as KSh 600 per day. The study further established that 70 percent of the operators worked or six days in a week whereas 30 percent operated for seven days a week. Further, the operators were required to indicate the money paid to the government and unions in form of levies. An average was calculated based on the amounts indicated and the results as shown in Table 5 above revealed that PSVs paid high levies to the government which averaged KSh 6,000 per month and levies to the unions or Savings and Credit Cooperative Organisation (SACCOs) which averaged KSh 3,000 per month. The motorcycle operators on the other hand paid levies of KSh 2,000 to the government per month and KSh 1,000 levies to the unions or SACCOs per month.

On operational challenges faced by operators, Table 5 above shows that the major operational challenge was the cost of fuel by both PSV and motorcycle operators. From the results, 90 percent and 80 percent of PSV and motorcycle operators considered, respectively high fuel cost as a major challenge. The other challenges included police harassment, county government harassment, bad roads, extortionist gangs and careless motorists and passengers with 80 percent, 70 percent, 60 percent, 50 percent, and 30 percent, in that order.

From Table 5 above, all the public service operators who participated in the study did not own the vehicles but were employed to work as drivers hence delivered them back to the owners on a daily basis. On the contrary, all the motorcycle operators who took part in the survey owned the motorcycles they were riding at the time of the study. Finally, PSV operators and motorcycle operators were asked whether they had been involved in accidents. As Table 5 above reveals, 40 percent of PSV operators acknowledged that they had been involved in accidents whereas 60 percent of PSV operators declined having been involved in accidents. Further, the results on motorcycle operators who had been involved in accidents established that 20 percent had been involved while 80 percent had never been involved in accidents.

3.5.2 Findings on Passengers

On passenger characteristics, data on socio-demographics such as gender, age, monthly income, education level, mobility challenges, average trip frequency, duration of using public transport in years, accidents witnessed, insurance claim received, and whether one has been involved in an accident was collected through a question as well as FGDs. This information and data is summarized in Table 6 below.

Table 11.7 Socio-Demographics Characteristics of Passengers (Percent)

Socio-Demographic	Characteristics	Public Service Vehicle	Pillion
Gender	Female	40	80
	Male	40	20
Age (years)	Below 30	30	30

	30 to 50	50	60
	Above 50	20	10
Monthly income (KSh)	Below 20,000	20	10
	20,000 to 40,000	30	60
	Above 40,000	50	30
Education	Primary	10	20
	Secondary	30	30
	Tertiary	60	50
Means of mobility	Bus	80	0
	Tricycle	20	10
	Motorcycle	0	90
Mobility challenges	Traffic jam	90	10
	Hiking of fares	80	40
	Obscene music	70	30
	Drunk and careless drivers	50	60
	Bad weather	20	70
Average trip frequency	Daily	80	60
	Weekly	10	10
	Occasional	10	30
Duration of using public transport (years)	Below 5	10	40
	5 to 10	20	20
	10 to 15	40	20
	15 to 20	20	10
	Over 20	10	10
Accidents witnessed	Less than 5	20	10
	5 to 10	50	30
	Over 10	30	60
Insurance claim received	Yes	20	0
	No	80	100
Involved in an accident	Yes	40	40
	No	60	60

A total of 20 passengers participated in the study, who were randomly selected from two clusters. The first cluster comprised of the pillion passengers where 10 were selected and the second cluster comprised of PSV passengers where a similar number of 10 passengers were also selected. The passengers were selected from three bus termini in Nairobi County, which included Westlands, Muthurwa and Nyayo Stadium. The findings relating to passenger responses are presented in Table 6 above.

On gender, the findings as illustrated in Table 6 above revealed that 60 percent of PSV passengers were males and 40 percent were females. The pillion passenger findings revealed a different trend where majority of the pillion passengers (80 percent) were females and only 20 percent were males. This implied that majority of females prefer using motorcycles as a means of transport. Regarding the age of passengers, the results as shown in Table 6 above, revealed that for PSVs, 50 percent of the passengers were 30 to 50 years old, 30 percent were below 30 years, whereas 20 percent were above 50 years. The findings on age of pillion passengers established that 60 percent of the passengers were 30 to 50 years old, 30 percent were below 30 years, while 10 percent were above 50 years. On their monthly income, Table 6 above shows that 20 percent of PSV passengers earned less than KSh 20,000 per month compared to a smaller percentage (10 percent) of pillion passengers who earned the same amount. The PSV passengers who earned KSh 20,000 to 40,000 were 30 percent and the pillion

passengers who earned the same amount were 60 percent. It was further observed from the findings that 50 percent of PSV passengers earned more than KSh 40,000 compared to 30 percent pillion passengers who earned the same amount.

The results on educational status of the passengers are presented in Table 6 above and showed that that 60 percent of PSV passengers had tertiary level of education whereas 50 percent of the pillion passengers had the same level of education. It was further evident from the findings that 30 percent of PSV and pillion passengers had secondary level of education while 10 percent and 20 percent of PSV and pillion passengers, respectively had attained primary level of education.

Concerning means of mobility and related challenges experienced, the results as shown in Table 6 above revealed that 80 percent of PSV passengers preferred using a bus as a means of mobility whereas 20 percent preferred using the tricycle as means of mobility. For the pillion passengers, it was established that 90 percent preferred using a motorcycle as means of mobility whereas 10 percent preferred using the tricycle for mobility purposes. With respect to mobility challenges, the results indicated that 70 percent of the pillion passengers considered bad weather as the biggest challenge, followed by drunk and careless drivers at 60 percent. The third challenge faced by pillion passengers with regard to mobility was hiking of fares as supported by 40 percent of the passengers, fourth challenge was obscene music supported by 30 percent of the passengers and the least challenge for pillion passengers was traffic jam supported by only 10 percent. For PSV passengers, 90 percent considered traffic jam as the biggest challenge, 80 percent considered hiking of fares as the second biggest challenge, 70 percent considered obscene music videos as the third most serious mobility challenge, 50 percent considered drunk and careless driving as the fourth biggest mobility challenge and 20 percent considered bad weather as the least challenge faced by PSV passengers.

On the trip frequency, the study findings revealed that 80 percent of PSV passengers made daily trips, 10 percent made weekly trips and 10 percent made occasional trips. For the pillion passengers, 50 percent made daily trips, 10 percent travelled weekly using motorcycles while 30 percent were occasional users of the motorcycles (see Table 6 above). The significant variation noted was the difference in the daily users of PSV and motorcycles that PSVs have more daily users compared to motorcycles. In addition, the study sought to find the duration the passengers had used public transport and the results are shown in Table 6 above. The findings on the duration passengers had used public transport revealed that 40 percent of PSV passengers had used public transport for 10 to 15 years, 20 percent for 5 to 10 years and 15 to 20 years, and 10 percent for 0 to 5 years and over 20 years. For the pillion passengers, 40 percent had used public transport for less than 5 years, 20 percent for 5 to 10 and 10 to 15 years whereas 10 percent for 15 to 20 years and over 20 years.

Finally, the study looked into number of accidents witnessed by passengers but not involved; insurance claim received by passengers; and number of times passenger was involved in an accident. The results, as shown in Table 6 above, established 50 percent of PSV passengers had witnessed 5 to 10 accidents, 30 percent had witnessed over 10 accidents and 20 percent had witnessed less than 5 accidents. On the other hand, 60 percent of the pillion passengers had witnessed over 10 accidents, 30 percent had witnessed 5 to 10 accidents while 10 percent had witnessed less than 5 accidents. Among the pillion passengers who participated in the survey, there was none who had

ever received insurance claim. Among PSV passengers, however, there were two passengers who had been involved in accidents and the first passenger received an insurance claim of KSh 950,000 after going through a laborious court process of over five years. The second passenger also received an insurance claim of KSh 750,000 but is yet to receive the funds, at the time of this study, since the lawyer is said to have embezzled the funds. The findings on the number of times that PSV and motorcycle passengers had been involved in accidents revealed that only five out of the 20 passengers had been involved in accidents of various magnitudes. However, only two out of the five passengers sustained injuries that resulted to compensate from insurance companies. The rest of the passengers were involved in minor accidents that did not lead to serious injuries or fatalities.

3.6 Current Water Safety Situation in Lake Victoria

The area of interest was Lake Victoria region specifically in Siaya, Kisumu and Homabay Counties. Data was collected using questionnaires and interviews and semi structured questionnaires, and an interview guide were developed that entailed details on water transport accidents and related information along Lake Victoria region. One-to-one interviews were, therefore, conducted on the targeted participants who were drawn from the relevant agencies where one senior official from Lake Victoria Basin Commission (LVBC), Kenya Maritime Authority and County Government of Siaya County from each of the agencies. One union representative from the Beach Management Units (BMU) of Usenge beach was also included in addition to six operators as well as 10 passengers who were randomly selected for the study.

3.6.1 Findings on Agencies

From the findings on agencies, three heads of agencies were interviewed, who were the county head of public works, the county leader of the disaster team, and maritime safety officer at LVBC. The respective agencies have been in operation for more than 10 years and they are established under the Constitution of Kenya and the East Africa Legislation Assembly Act 2007. The counties are mandated to manage transport in the lake as a devolved function. The enforcement of transport safety regulations is done by KMA, while the county government works with BMUs, local chiefs and village elders to improve transport safety in the lake. The disaster management unit works with Kenya Red Cross (KRC) to respond to emergencies. The Siaya, Kisumu, and Homabay Counties have, however, not prioritized water transport and has been slow at developing policies.

The main water transport vessels used in Lake Victoria are boats/canoes, water buses, ferries and motorboats. The types of water transport accidents witnessed include capsizing of vessels due to overloading and bad weather, man overboard, and animal attacks, while some people jump off the vessels to commit suicide. The factors contributing to the accidents include overloading, and bad weather especially when windy and rainy. Other causes are human errors, drunkenness, and negligence. Many of these accidents occur in afternoons when it is stormier as well as the rainy seasons from January and August.

According to the county officials. the main challenges faced include weak enforcement of regulations; lack of places to do repairs and maintenance of vessels; unreliability of water as a mode of transport especially during stormy weather; and unavailability of clear departure and arrival schedules. Some of the safety measures in place include use

of BMUs, setting of operating times for vessels like not allowing night transport on the lake. The meteorological department also gives early warning signals about forecasted stormy weather. In addition, the weaknesses and gaps in the current safety practices include low levels of sensitization on safety; lack of continuity plans especially when there is changeover of office bearers especially among BMUs; non-adherence to warnings by some crews and passengers; high maintenance cost for the vessels and operating costs for the water ambulance. The county government does not have qualified divers for emergency response and when there is drowning, BMUs depend on experienced volunteers to recover bodies.

The LVBC has a mandate to coordinate maritime safety in Lake Victoria under Lake Victoria Integrated Water Resources Management Programme (LVBIWRMP), a regional programme coordinated implemented in the four Lake Victoria partner states of the East African Community (EAC) - Uganda, Kenya, Rwanda and Tanzania through High Priority Investments (HPIs) in Kampala, Uganda; Mwanza, Tanzania; Kisumu, Kenya; and Kigali, Rwanda. Enforcement of safety regulations is the responsibility of the individual and data on accidents in the lake is also maintained by the member state agencies, namely KMA in Kenya; Surface and Marine Transport Regulatory Authority (SUMATRA) - formerly known as Tanzania Shipping Agencies Corporation (TASAC) in Tanzania; and Ministry of Roads and Transport in Uganda. The commission has installed 86 aids to navigation in Lake Victoria and LBVC is in the process of setting up a mechanism of accident data collection. They are also currently setting up a Lake Victoria search and rescue centre in Mwanza to be operational by December 2024 with sub-centres in Kisumu Kenya and Entebbe Uganda. The emergency response procedures in place for dealing with accidents on the water coordination with BMUs include provision of fuel for ambulance, use of experienced volunteers, availing of ambulatory boat services. Other mechanisms in place are vessel inspection and surveillance patrols by Kenya coast guard. The agencies responsible for providing assistance during accidents include the Kenya Red Cross Society (KRCS), the national government through the police, intercountry coordination committee, county disaster committees, and the coast guard.

The measures to take to prevent water transport accidents on Lake Victoria should include having mechanisms in place to ensure coxswains, pilots, captains and crew have required training, licensing and experience to operate vessels; implementation and enforcement of safety protocols for navigation, loading/unloading, machinery use, and hazardous weather; regular maintenance checks of vessels and have repair contingency plans; installing of technology like radar, Global Positioning System (GPS) tracking, weather/waterway alerts and aids to navigation on the lake; and design adequate protocols and infrastructure to avoid overcrowding in vessels. Further mitigation should include ensure rescue teams and medical first responders are trained and ready to deploy in case of disaster; clear emergency contingency coordination plans across water transport authorities, health centers, and law enforcement; emergency response drills and exercises to test and improve readiness; ensure vessels are equipped with the correct lifesavers, distress signals, and firefighting systems; develop infrastructure to allow safe docking in normal circumstances and in case of accidents; and have a post-accident support system like trauma center capabilities, and victim advocacy services.

Some of the ways to improve water transport safety culture among operators, passengers and other stakeholders include county and national government agencies

commitment to prioritize safety through development of policies, investment, metrics, incentives and recurring communication on water transport matters; training to ensure all operators, crew and responders are competent in safety protocols, risk mitigation, equipment inspections and developing a preventative mindset; open reporting and learning from accidents, near misses and hazards early before harm occurs; facilitation and strengthening of safety teams to spearhead risk identification, inspections surveillance and response; recognize and reward safety observation reporting and program contributions to motivate stakeholders; analyze incidents and accidents root causes to derive safety improvements; highlight safety performance visibility through signage, statistics displays and regular discussions to sustain safety culture.

Leveraging on advancements in **technology can improve safety** for Lake Victoria transport such as aids navigation; navigation and tracking systems such GPS and radar, and satellite tracking provide real-time navigation assistance, and position updates; onboard monitoring systems such as cameras, and sensors to monitor weather changes, passenger issues and alert crews to risks; communication advances such as use of digital Very High Frequency (VHF) radio and dedicated emergency alert networks expand coverage, redundancy, speed of transmission and assistance coordination; dockside surveillance to help agencies have better oversight on vessel traffic and conditions.

The resources needed for effectively providing emergency assistance after lake transport accidents include rescue vessels with trained personnel for quickly reaching accident scene and evacuating victims from vessels or lake; emergency medical teams on call, such as doctors, nurses, paramedics to provide immediate trauma care and triage; sufficient medical supplies; lifesaving gear and equipment; emergency coordination center for coordinating large multi-agency response; ambulances ready to rush injured victims to hospitals; victim support systems, for example, social workers and volunteers providing services and help to for victim families.

3.6.2 Findings on Operators

Regarding findings on operators, they were all manning motorboats except for the ferries and the waterbus. All the motorboat operators were male aged between 24 and 43years. These men had a secondary school education apart from one who had tertiary level of education. In addition, all the operators were working full time in the water transport sector except for two who were involved in fishing and one who was both a part time coxswain as well as a fisherman. In the water transport sector, only the waterbuses and ferry were comprehensively insured, which indicates that there was no insurance cover for the motorboats or any other water transport. The most common routes of operation by motorboats included Usenge to Mageta; Usenge to Lolwe (in Uganda). Other routes by the ferries included Mbita to Luanda K'otieno while the waterbus operated in five routes namely Homa Bay to Luanda; Mbita to Luanda K'otieno; Mbita to Mfangano to Ringiti Island; Mbita to Remba Island; Remba to Mfangano to Kibuogi to Sindo; Ringiti to Remba to Sori to Migori and Usenge to Mageta. Of these routes, Luanda Kotieno Mbiata was the busiest. Soon, there will be new routes from Kisumu to Kendubay, and Kisumu to Mbita.

The average number of daily trips was one round trip for all the motorboat operators except for the one who had two round trips. These trips resulted into an average income of KSh 6,000 per trip except for those going to Uganda that generated KSh 9,000 per trip. All the motorboat operators worked daily throughout with the exceptions of the

times when the customers are few. Generally, it should be noted that there is a schedule that is followed for the operators to allow equal chances of landing. However, due to the current economic crisis in the country, the number of customers had markedly declined resulting in fewer working days per operator than seven days a week. On average, the daily expenditure was estimated as KSh 2,500. The water bus and the ferry on the other hand operated seamlessly daily on schedule. There are no fixed government levies per month, but there were license fees of KSh 7,000 per annum by KMA; landing fees of KSh 200 per day by BMUs, and union fees for the motorboat operators at KSh 500 per month. These are fees payable by every transporter who operates in the lake.

The major operational challenges encountered by the motorboat operators included extreme weather conditions, low cash flow, high fuel prices, lack of training for coxswain skills and inadequate life jackets. There have been instances when strong winds and storms have directly affected the operations of the water vessels within the lake. Indeed, frequent storms, and strong winds threaten safe navigation and contribute to accidents through waves and impaired visibility aside from hyacinth in Lake Victoria that easily entangles vessels causing delays or immobilizes vessels altogether until removal. As a result, operators have repeatedly been forced to delay or postpone trip due to bad weather. All the operators indicated that they have never been involved in an accident except one who was in an accident in 2001 and in 2022, the waterbus was involved in an accident where 15 passengers on board were all rescued on the Usenge to Mageta route.

Additionally, the ferries and water bus operators complained about inadequate infrastructure for docking and hence it becomes expensive for them to operate and maintain their vessels. Another challenge was that much of the lake vessels lacked modern safety features and were prone to mechanical issues. There are limited aids to navigation on the lake such as buoy markers and navigation charts. Underdeveloped regulations and maritime oversight frameworks regarding crew standards, safety laws, vessel inspections for enforcement and compliance were also cited as other challenges.

Out of all the motorboat operators, only one had coxswain training since the operators could not financially afford the training which is done by KMA in Mombasa, and the operators are expected to pay for the training. There are efforts, however, to take the training to Kisumu which will be nearer for the operators, but the operators are not keen on the training since there is no regulation on or incentive for training. Those trained as well as those who are not trained end up competing equally for transport opportunities in the lake. Finally, there have been cases of sub-standard and inadequate life jackets in the market, especially for the motorboat operators unlike with the waterbus and ferry operators who are provided with adequate life jackets. However, the waterbus has some unique challenges and the biggest challenge they face is the lack of skills when hiring staff to operate them. Further, there is the infrastructural challenge especially in landing points and the company has been forced to put up their own jetties in some areas; there is a lot of filth including fishing nets on the beach at the landing sites that directly affects gearboxes of the vessels; and the expectation by BMUs to pay landing fees at every landing site is also another operational challenge for the waterbus company.

3.6.3 Findings on Passengers

Most of the passengers were males except for three females aged between 23 and 60 years and had an education spanning from primary, secondary, and tertiary levels. In addition, all the passengers were waterborne and could relate very well with water transport activities and experiences. They, however, encountered several mobility challenges that affected their decision to uptake water as a mode of transport. Some of these challenges included harsh weather conditions, hippopotamus attacks, poor quality life jackets, high fares, inadequate quays, overloading, mixing passengers with goods, discomfort especially for open vessels, pirate attacks, fear of accidents and lack of health services within the water vessels. Passengers were also faced with harsh sunny weather as well as rainy weather when using open water vessels such as motorboats considering that the trips take at least an hour. During the rainy season, there is also poor visibility that increases risk of accidents.

Regarding passenger safety, there was a lot of concerns and ignorance in terms of safety on the lake. For example, life jackets were inadequate in both quantity and quality especially among the motorboats; and the quays have been reported to be of poor quality that some passengers are afraid to using them. Consequently, passengers did not find the need to wear the life jackets since they were of low quality and were not confident that they could save lives. There has been the **practice of overloading** motorboats where they carry both passengers and commodities, and this has led to discomfort for passengers with no clear safety handling. Further, there has been reported cases on piracy attacks, and even boat engines have been stolen midway in the journeys leaving passengers stranded, especially in the month of December. In addition, there have been increased fares in the recent past caused by the high fuel prices in the country and this challenge has snowballed to the extent that there are diminishing numbers of customers on all routes.

Passengers reported that they used the water transport daily, weekly, and occasionally in that order of importance. It was also reported that the passengers had used the water transport for a range of 5 to 20 years. All passengers reported to have not witnessed or been involved in any accident in water transport except for one passenger, who had witnessed boat capsizing twice. The accidents were mainly caused by overloading and engine failure due to stormy weather in 2012 and 2019, respectively. None of the passengers in the accidents claimed any accident insurance because motorboats are not insured.

3.6.4 Findings on Unions

According to the union executive interviewed, some of the challenges faced by Lake Victoria transporters union members included the limited capacity by some vessel operators who do not have capacity to do the regular maintenance leading to frequent breakdowns and disruptions. There was insufficient infrastructure for docking storage facilities, and cargo handling equipment, which led to delays, higher costs, and accidents. The union further indicated that the safety inspection was poor; there was no crew certification requirements, and route/vessel coordination regimes by responsible agencies authorities. This means that much of the Lake Victoria vessels are not licensed to operate.

Extreme weather such as storms with strong winds, waves, lightning coupled with reduced visibility increase risk of accidents especially for the small vessels operating in places like Usenge to Mageta, were cited as other challenges. Other mentioned

challenges included overcrowding and overloading vessels with passenger and cargo volumes; increasing fuel and maintenance costs, coupled with low fares charged; hyacinth in Lake Victoria that causes clogging of engines and immobilizes vessels leading to delays until removal is done; and most coxswains are untrained and have no licenses to operate. Also, lack of clear guidelines on water transport; weak sensitization on the policies; harassment from government agencies like coastguard; lack of search, and rescue resources were given as other challenges. The union officials, nevertheless, said that accidents involving passenger transport vessels are very rare and most of them involve fishing crew and vessels, but indicated that there was need for emergency response and patrol boats; sensitization of passengers to wear life jackets and use them correctly as well as inspections of vessels.

3.7 Conclusion and Recommendations

3.4.1 Conclusion

The purpose of this study was to examine the causes of the travel accidents on roads and waterways in Nairobi City and Lake Victoria, respectively. The specific objectives were to evaluate the existing policies, laws and regulations; determine the number of accidents and casualties on the roads and waterways; describe the causes and patterns of the accidents and casualties on the roads and waterways; compare the data among the two modes of transportation; evaluate and compare the safety regulation framework and safety education in the two modes of transportation; and compare data among Nigeria, Kenya and Ghana among the two modes of transportation. The study objectives were addressed except the last objective, which will be done at the next stage.

On the road transport sector, Kenya has more than enough policies, laws, and regulations for governing the sector, but they are often at conflict and requires urgent harmonization and above all, implementation, and adherence to the letter. For example, there have been cases of breathalyzer tests conducted in Nairobi, but those that were above the legal limit never appeared in court. In addition, while helmet use is high among boda-boda riders is mandatory, only a few riders and pillion passengers wear a helmet even though helmets are effective at preventing death for passengers and reduce the risk of injury. The presence of a helmet alone is not necessarily enough; ensuring helmets are of adequate quality and properly worn is important for their effectiveness. Other challenges that need to be looked into include harassment by both police and county government; bad roads; extortionist gangs; and careless motorists and passengers.

In order to reduce accidents in the road sector, there is need to leverage on an important interaction between enforcement and behavior of Kenya's road users. It is now crucial to, however, dedicate more focused and integrated efforts to enhance the safety of roads and streets for all users, particularly pedestrians and motorcyclists. It is imperative for everyone to collaborate as a nation and within communities to mitigate the immense pain, suffering, and economic losses caused by road crash fatalities and injuries. It is, therefore, important to factor in the user behaviour when developing effective road safety policies.

On the water transport in Lake Victoria, the lake is underutilized especially on the Kenyan side despite the high potential that if effectively exploited can address some

transport problems and challenges experienced around the lake basin. With the introduction and expansion of the waterbus that caters for passengers, there is tremendous hope that there will be more confidence by users and therefore lessen the travel time across several areas along the lake. There is also potential of having cruise ships and larger vessels that can be useful in movement of cargo even to the neighbouring countries within the lake basin.

The legal and regulatory framework in Kenya with respect to water transport safety is, however limited and need to be addressed urgently. For example, there is a need to separate water transport safety investigation from all the other administrative duties and create an independent body to specifically conduct investigations. This will, among other things, go a long way in addressing some of the major causes contributing to water transport accidents in Africa and in particular Kenya, such as weather conditions such storms with strong winds; many unlicensed operating vessels and have inadequate regular mechanical checks; overloading vessels due to lack of regulations and enforcement against exceeding capacity raises capsizing and sinking risks; and unqualified crew due to unavailability of marine technical education. In addition, crews often learn hands-on without enough training on safety procedures; limited aids to navigation such as markers navigation charts and GPS increase chances of accidents in bad weather; lack of oversight and minimal adoption of basic operational safety standards like issuing life jackets; loading procedures and emergency drills; and passenger and crew misconduct and negligence such as ignoring prohibitions, overloading, riding dangerously on vessels heighten individual drowning risks.

It is not easy for a study like this to get all the facts together that contribute to an accident since the nature of a human being during an accident investigation tends to be protective and therefore what a person reveals about the casualty is limited. In most cases, the major cause of an accident is masked and necessary the evidence destroyed. Owners of vehicles, motorcycles, motorboats, waterbuses, and commercial vessels may also reveal less information to protect their interests and in most cases hide behind classification society certificates and some may never even report a casualty. This has seen non genuine links created between owners and other stakeholders like the government, the insurance and the users because they see accident reporting as a reflection of their weaknesses. The drivers, riders, crew also does not want to take the responsibility for the accidents for fear of being fired or replaced and therefore not reporting is the easiest way to avoid blame. There is need, therefore, to carefully approach and manage the road and water safety chain in order to achieve road and water transport safety through effective and efficient casualty investigation.

3.4.2 Recommendations

From the findings of this study, the following recommendations can be made with respect to road transport safety, which are:

- (i) **Enforcement targeting unsafe behaviour** - improve enforcement of unsafe road user behaviours, using a general deterrence approach supported by targeted promotion campaigns, especially to reduce speeding, increase the appropriate use of quality helmets, decrease alcohol use, and establish norms around pedestrian crossings. This could be addressed through the change of cultural/behavioural norms through integrated multi-faceted approach with

particular focus on scaling-up traffic safety enforcement operations and promotional campaigns. Stronger focus to ensure safer speed, improved bodaboda and motorcycle management, better compliance and enforcement, focused education and promotion, improved driver training, testing and licensing as well as evidenced based children road safety and education would help to improve the overall situations;

- (ii) **Vehicle safety standards and compliance** - develop and implement regulations that align vehicle safety and environmental standards with global best practice, such as procedures to manage the importation of second-hand vehicles; establishing compliance regimes that ensure vehicle inspection and certification at the point of entry to the country; and assessing options and procedures for retiring older vehicles;
- (iii) **Infrastructure safety** - improve the safe classification, design, and use of the road network, scale-up safety engineering measures in designated high-risk demonstration corridors and urban areas with emphasis on setting safe speed limits and providing enhanced protective features for all users as well as ensuring safer road environments and improving overall situation of non-motorised road users;
- (iv) **Post-crash services** - improve the provision of post-crash services in the context of emergency response, such as crash scene injury diagnosis and stabilization, fast transport to hospital or treatment centres, effective emergency and trauma care, and longer-term rehabilitation, giving particular focus on reducing crash response times and improve victim recovery and rehabilitation services in designated high-risk demonstration corridors and urban areas;
- (v) **Risk targeting** - improve the risk targeting of road safety interventions by road type and road user, with a focus on high-risk demonstration corridors and urban areas and paying particular attention to enhancing the safety of vulnerable pedestrians and motorcyclists;
- (vi) **Comprehensive road safety database, monitoring, evaluation and learning systems** - improve the road safety data collection and analysis system to enhance its functionality and accessibility, starting with improved recording and input of crash data as reported by police and accurate geo-referencing of crash locations, and enhanced diagnostic tools. Particular focus should be given in monitoring and evaluating road safety performance in designated high-risk demonstration corridors and urban areas; and
- (vii) **Coordination of delivery partnerships** - improve the lead agency management of horizontal and vertical partnerships and coordination processes, with emphasis on the periodic tracking of performance and enhancing of partnership responsibility and accountability for the delivery of safety interventions through stronger partnership and collaborations across partners and improving legislations.

On the **water transport** safety, the following recommendations, arising from the study, can be made, which are:

- (i) **Sensitization of all stakeholders on safety** - all stakeholders including KMA, coast guards, county governments, vessel owners (motorboats, waterbus, ferries) and operators around the lake region, as well as the community should be sensitized on search and rescue drills. There is also need for sensitization of the public regarding safety, such as the use of life jackets and it is important that the operators undergo lifesaving and survival training in an effort to mitigate any potential disasters;

- (ii) Enhanced safety measures – there is urgent need to have modern and safe quays for all water transport users; install watchtowers and regular and reliable coast guards to promote security along the lake; ensure that the water vessels used on Lake Victoria are comprehensively insured; and both national and county governments should be more involved in Lake Victoria transport provision and management;
- (iii) Partnerships and coordination of operators at both national and county governments - improve leaderships, mainstream road safety, through stronger partnership and collaborations across partners and improve legislations so as to improve the overall situation;
- (iv) **Establishment of an independent accident investigation body** – safety in water transport sector has been entrusted with the maritime administration. In order to have transparency and to avoid conflict of interest, accident investigation in Kenya need be separated from the responsible administrative organization that regulates and enforces policies. A team of experts should also be established with proper academic qualifications and experience to carry out the duties as required during investigations with an aim of not to blaming or faulting but to identify the causes of water transport casualty and make recommendations to avoid similar accidents and incidents in the future so as to improve water transport;
- (v) **Water transport safety database, monitoring and evaluation systems** - improve the water safety data collection and analysis system, starting with improved recording and input of accident and incident data as reported, and enhance diagnostic tools. Particular attention should be given in developing an Integrated Management Information System (IMIS) with the purpose of managing multiple aspects of water transport sector operations in line with several standards, such as, safety, environmental, and health management. Further, the safety database should share data and information in order to ensure that all relevant stakeholders receive the accident investigation reports and also serve as reference material during future investigations;
- (vi) Audit of the existing water transport vessels - a thorough inspection of the current domestic passenger vessels against the required standards and according to the national regulations as stipulated in the merchant shipping act as this can eliminate unsafe acts of violations based on risk assessment, failing to comply with manuals, operating when unauthorised and violating standing orders and regulations. Audits can also prune out unqualified crews leading to water transport vessels that are equipped with competent crew that can ensure that they are run in a safer manner. Also, if the owners and operators of the vessels could work hand-in-hand with KMA, take caution and follow the rules and regulations developed for their safety rather than focus too much on making profits, they can improve safety;
- (vii) **Training** - training based on the team approach targeting the reduction of human error related accidents is necessary. This can be achieved through targeting various categories of stakeholders that include the administrative staff, the vessel owners and operators, the crew and the passengers or public in general. A more intensive and incentive based training is recommended for all captains and crew vessels within Lake Victoria and in the country that involves low cost technologies and more intuitive items to help them learn the latest trends in the industry and how they can use the latest technology in line with their duties to help reduce accidents. The investigators should also be trained, qualified and

must be totally objective and uphold the utmost integrity when applying the standards during investigation;

- (viii) Weather reporting system - even though general weather is usually broadcasted by media houses, special water transport weather should be given an up-to-the-minute broadcasting priority specifically to sea-going personnel for adequate planning. Together with IMIS, a system that is capable of broadcasting daily and hourly and developing weather updates at lake is necessary so as to enable the operators and seafarers to prepare adequately. Unsafe weather conditions, strong winds and tides, and storms pose safety danger to all vessels at the lake. An improved affordable weather information system will help even small business owners in the water transport industry to have situational awareness and in the long run improve safety and prevent loss of life due to weather related factors;
- (ix) **Control of overcrowding and overloading** - the vessels offering services at Lake Victoria are the cheapest as compared to the other means of transport, which has made transport by water the most preferable among many residents accessing the islands and mainland. This has, however, led to overcrowding and overloading of the vessels and increase in the number of passengers is an underlying risk and with time combined with one active failure can contribute towards an accident. The KMA should play a huge role by having more strict regulations and penalties to the operators against overloading. On the other hand, it is easier to educate the public in general by holding campaigns on the ground and through media about their own safety and how they can contribute actively to ensure they are not part of the problem but rather a solution; and
- (x) Mass rescue operations and post-crash services – improve on the multi-agency approach towards response, and the provision of post-crash services for accident scene injury diagnosis and stabilization, fast transport to hospital or treatment centres, effective emergency and trauma care, and longer-term rehabilitation. Involvement of other organizations, such as KRCS will improve the rescue services and minimize the number of fatalities. Mass rescue operations coupled with cooperation among the several state and non-state agencies is necessary in order to ensure faster and more robust rescue services in order to minimize water transport accidents.

CHAPTER 4: CASE STUDY OF KRACHI EAST AND WEST DISTRICTS OF GHANA

4.1. Introduction

Efficient transportation networks are crucial for socioeconomic development, logistics, and transport planning, ensuring the smooth movement of individuals and freight between different locations. (Boadu et al., 2021). Despite the importance of transportation to economic growth and development, it also has some negative impacts on the lives of people such as pollution, and congestion, and notable among them is road traffic crashes (Chatti, & Majeed, 2022).

Studies on road traffic crashes are extensive but studies on accidents in waterways are rarer (Nze et al., 2023). Cities with water bodies have urban forms with peculiar safety and environmental challenges. Safety policies are usually well formulated and regularly communicated to enlighten citizens, but this is less so for water transportation, especially for the local artisanal boat and ferry operators mostly patronized by the urban poor. Hence accidents are common, with many of them unreported.

The study explores Ghana's inland water and road transportation in the Krachi East and West Districts of Ghana to understand the causes of road and water accidents in Ghana as well as the operation of road and water transport in the two districts.

4.2. Research Methodology

4.2.1 Study sites and location

Dambai and Kete-Krachi are the district capitals located in the Krachi East and West respectively in the Oti Region of Ghana. Dambai is located on the eastern coast of Volta Lake and is noted for being the fastest-growing town in the Oti Region. Dambai has fertile lands for farming and rearing livestock. The Oti River also provides ample water to help in farming and livestock rearing. The town hosts a lively market on Mondays and Tuesdays, attracting people from Krachi East District and Togo, primarily engaged in farming and fishing on the River Oti. Farming and fishing are the most common economic activity in the Krachi East District.

Kete-Krachi is the administrative capital of the Krachi West District. The area is a key agricultural product marketing centre in Ghana, known for its yam output as well as the potential to boost other crops like cassava, maize, rice, sorghum, soybean, and vegetables. It also boasts a thriving market for yams and cereals, with market women traveling from the south and north of Ghana to Krachi to load enormous trucks of yams. The people are predominantly engaged in farming and livestock rearing.

Dambai and Kete-Krachi are noted for their in-land water transportation systems where ferries and canoes help in the movement of people especially farm produce to and from neighbouring communities.

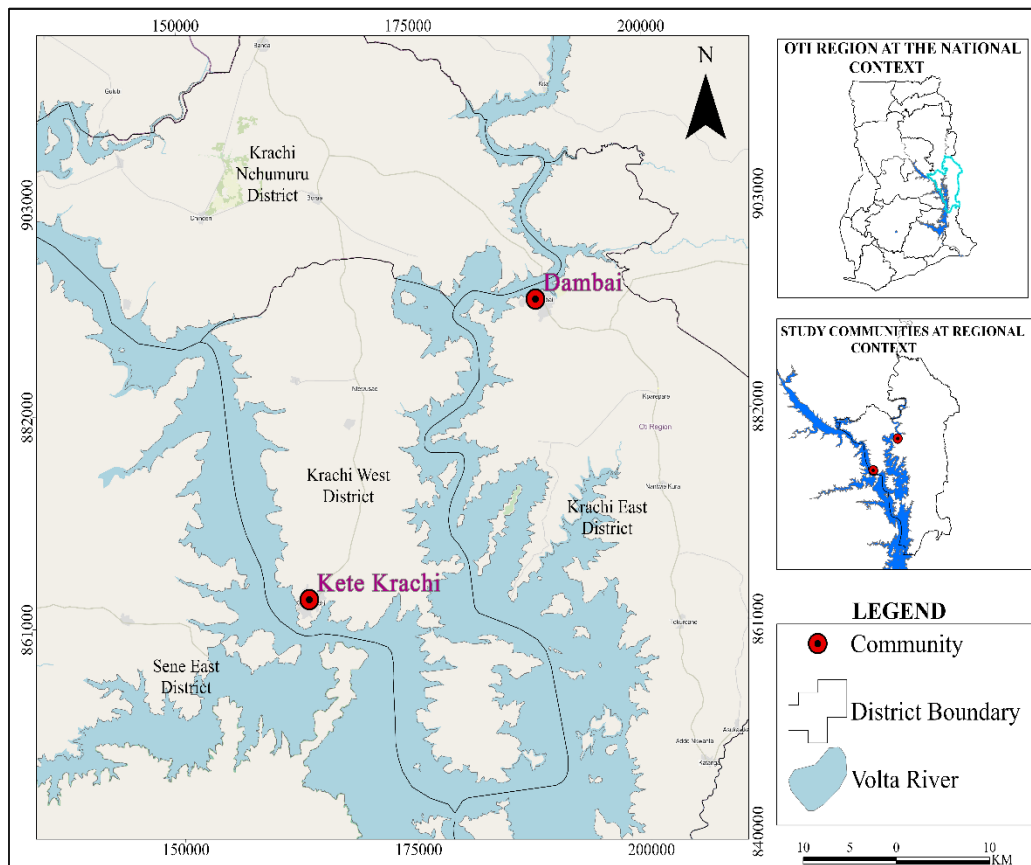


Figure 12.1: Study area map showing Kete Krachi and Dambai

4.2.2 Data Collection Method

4.2.2.1 Questionnaire for Passengers

With the quantitative data, 205 responses were gathered for the **primary data questionnaire for passengers**. 103 responses were recorded in Dambai and 102 responses in Kete-Krachi. Questionnaires for relevant agencies were also given to the Motor Traffic and Transport Department of the Ghana Police Service (MTTD) for both Dambai and Kete-Krachi, Pontoon operators of both towns and executives of Commercial Driver Unions.

4.2.2.2 Focus Group Discussions

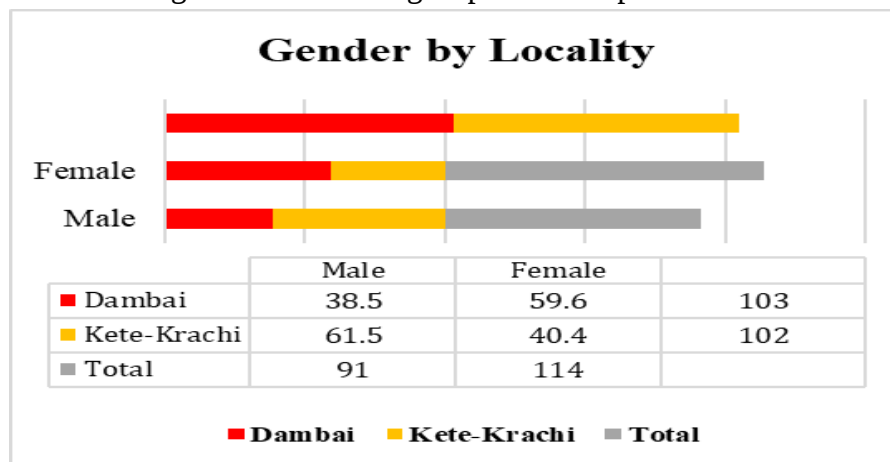
A total of five (5) focus group discussions were conducted. In Dambai, a focus group discussion was conducted for stakeholders which included representatives from the Motor Traffic and Transport Department of the Ghana Police Service (MTTD), Ghana Private Road Transport Union (GPRTU), National Road Safety Authority (NRSA), Assembly Member, VIP Transport, Boat Operators Union, Volta Lake Transport Company Limited, and representation from the Krachi East Municipal Assembly. Another focus group discussion was conducted for Boat Operators. In Kete-Krachi FGDs were conducted for boat operators, stakeholders of both road and water transport, and an FGD for transport operators with the Ghana Private Road Transport Union (GPRTU).

4.3 Summary of Findings

4.3.1 Demographic Characteristics of Boat and Pontoon Users

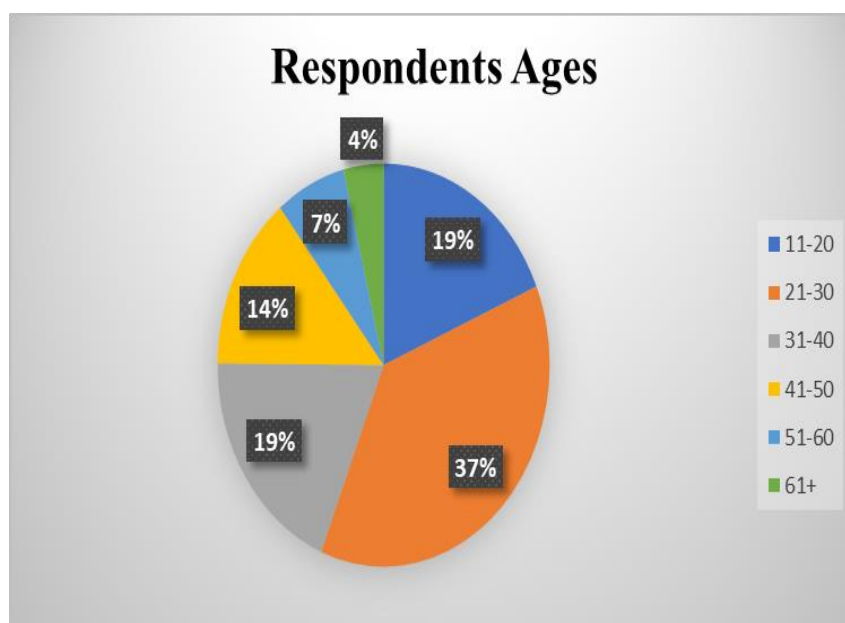
A total of 205 passengers responded to the survey for the two study areas. In terms of distribution per each study site, 103 respondents were sampled from Dambai and 102 respondents from Kete-Kraachi. From the data, there were more females (114) than males (91). Out of 91 males sampled for the study, majority (61.5%) was taken from Kete-Krachi. Contrary, majority of the female sample (59.6%) were sampled from Dambai. In terms of age distribution, majority of respondents were between the ages of 21-30 (37%) while 60+ accounted for 4 percent of the sample.

Figure 12.2: Showing respondent's spatial distribution



Source: Fieldwork, 2023

Figure 12.3: Showing Respondents by Age categories



Source: Fieldwork, 2023

Data on respondents' level of education reveals that majority of respondents had obtained junior high school education certificates (22.9%) and middle school leaving certificates (27.3%). About 17.1 percent had obtained tertiary education. Primary education holders accounted for 14.6 percent while one respondent reported having obtained vocational/technical education. On the contrary, 17.6 percent had no form of formal education.

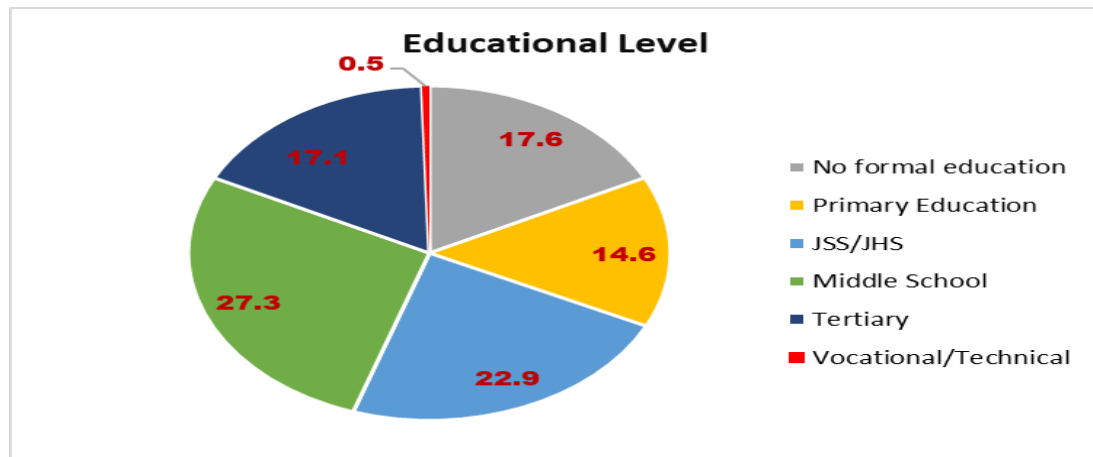


Figure 12.4: Showing respondents level of education. **Source:** Fieldwork, 2023

On respondents' income, 14.6 percent reported zero income from economic activities. Other respondents reported earning between 1-100 Ghana Cedis (10.2%), 101-1000 (55.1%), 1001-2000 (14.1%), 2001-3000 (3.4%), 3001-4000 (1.0%), and 4001-5000 (1.5%).

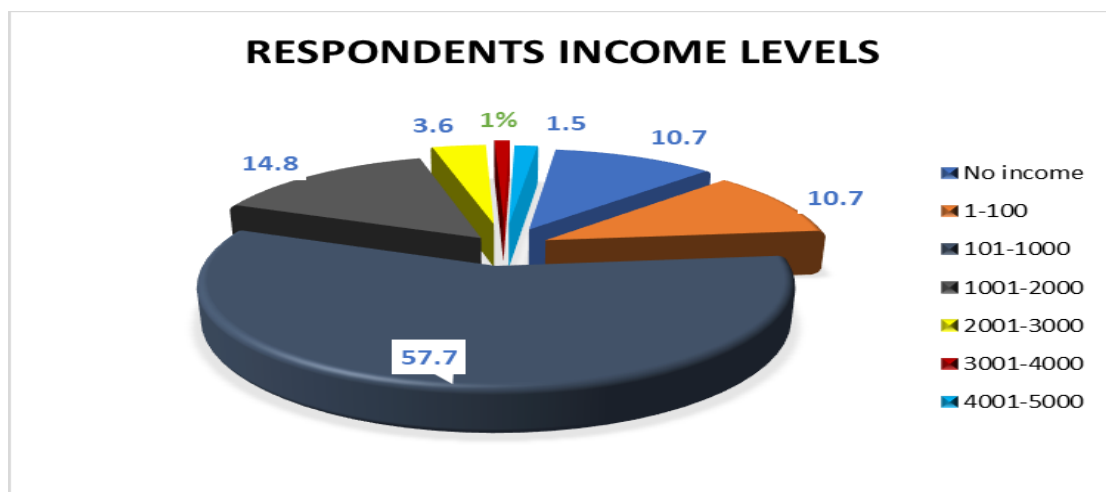


Figure 12.5: Showing respondents level of Income

Source: Fieldwork, 2023.

4.3.2 Travel Characteristics of Respondents

This section briefly discusses respondents' travel mode choice, trip frequency, number of accidents involved in by respondents, and mobility challenges. In line with the objectives of the study, respondents were asked to select among several mode choices what applied to them. From the results, water as a mode of transport accounted for 35 percent of all trips made by

respondents. Road transport was reported to be the dominant mode with the use of buses representing 18.5 percent of respondents trips. This is followed by the use of motorcycles (17.3%), Tricycle (16.6%), and Taxis (12.4%). The use of private vehicles (0.2%) was the least used means of travel among study participants.

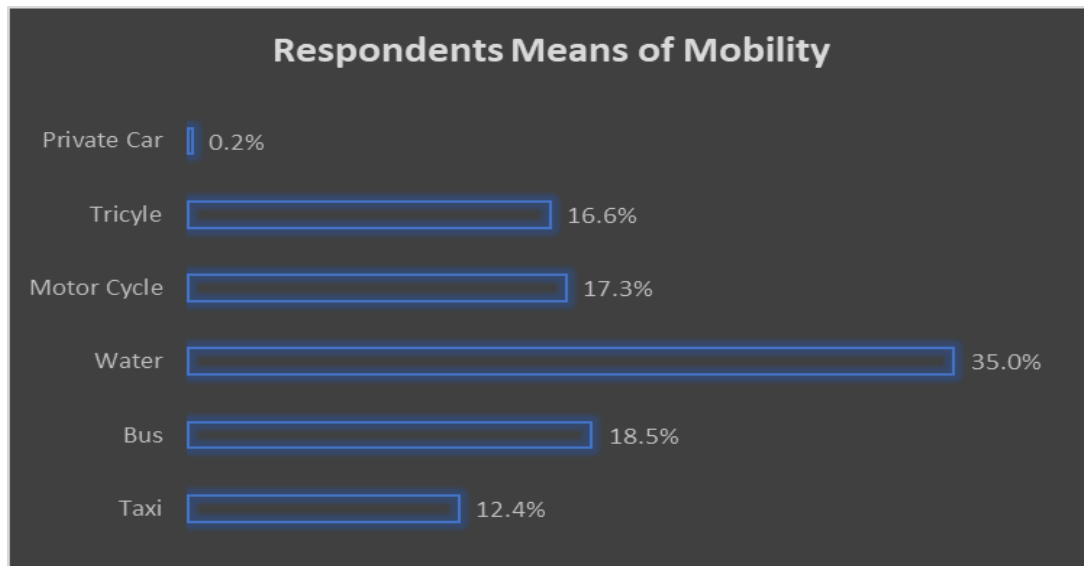


Figure 12.6: Showing respondents mobility means Source: Fieldwork, 2023

Respondents' trip frequency was analysed to understand their travel patterns. The data revealed that respondents mostly travelled weekly (37.1%) in the study communities and the pattern matches market days. Daily travels accounted for 34.6 percent while 28.3 percent of respondents indicated they travelled occasionally. The data further revealed that females travelled more than males. For instance, more females (43%) than males (29.7%) made weekly trips in the two study areas. For daily and occasional travels, the results are as follows; females (30.7%), males (39.6%); females (26.3%), and females (30.8%).

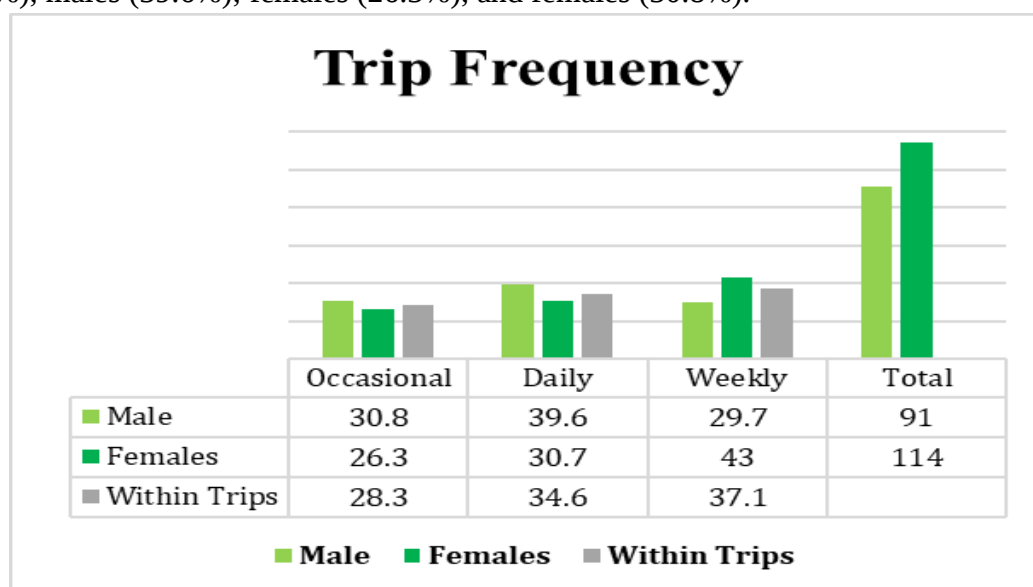


Figure 12.7: Showing respondents trip frequency Source: Fieldwork, 2023.

It became imperative to explore respondents' risk of accidents given the nature of their travel patterns. Respondents were asked to select whether they have ever been involved in road or water accident or both. The data indicates that 47.9 percent of respondents had been involved in land-based accidents while 65.9% had been involved in water-based accidents. It is interesting to note that 32.6 percent had been involved in both. A more gendered dimension is presented in Figure 8.

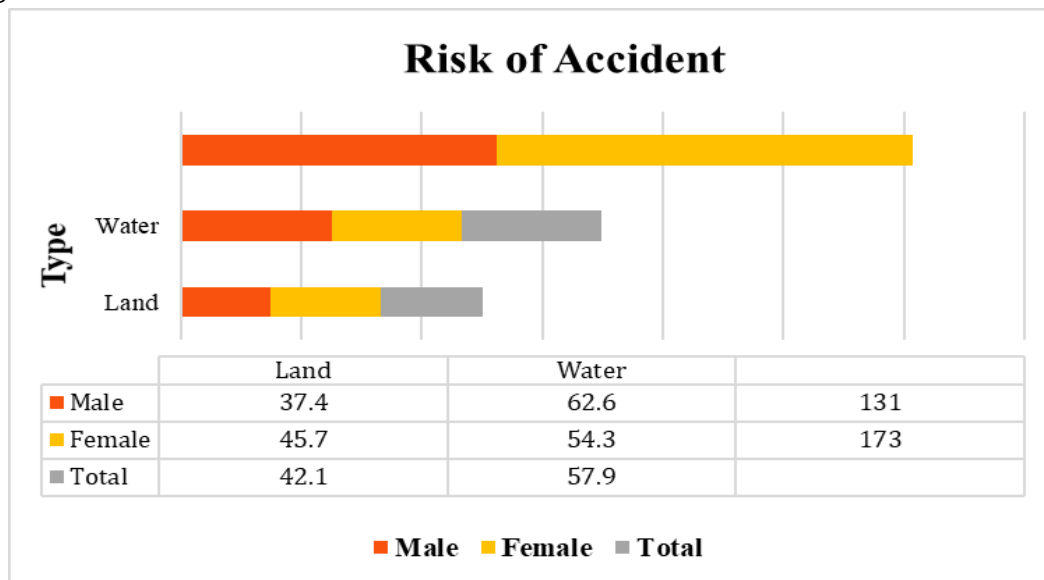


Figure 12.8: Type and frequency of respondents' accidents. **Source:** Fieldwork, 2023

Mobility concerns raised by respondents included the presence of strong winds on water bodies (16.1%) and long waiting times and delays (13.5%). Other concerns include poor road conditions (13.1%), overloading of vehicles, boats, and pontoons (9.7%), and the absence of life jackets (4.9%). Others also mentioned over speeding, reckless driving (4.9%) both on land and water and mechanical faults as a result of poor maintenance of pontoons, boats, and vehicles (4.1%). Exposure to harsh weather conditions (4.1%), the presence of tree stumps in water bodies (4.5%), price exploitation/inflation (3.7%); as well as robbery (1.1%) were also mentioned. Poor customer relations was mentioned among the factors that affected respondents' travel. On the contrary, 16.9 percent of respondents reported that they faced no challenges with their travels.

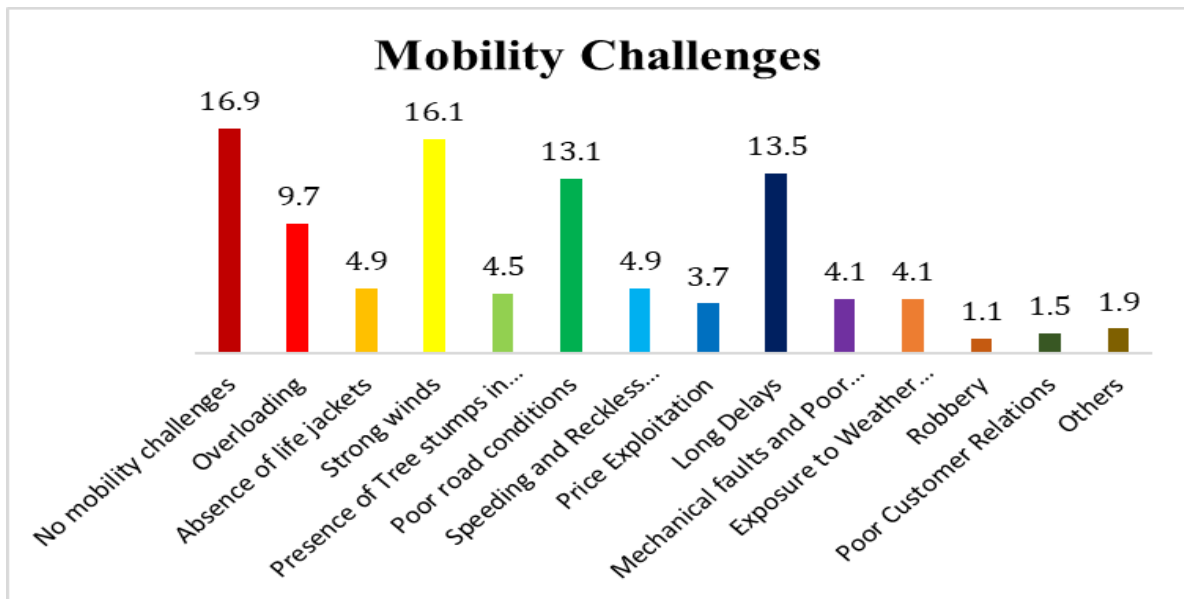


Figure 12.9: Mobility challenges experienced by respondents **Source:** Fieldwork, 2023

4.3.3 Characteristics of Inland Water Transportation in Dambai and Kete-Krachi

Inland water transportation in both communities is characterized by local boat operations by community members and pontoon operations by the Volta Lake Transport Company (VLTC). The VLTC's main operations in Dambai covers operations between Dambai and Dodikope while in Kate Krachi, it covers the route between Kete-Krachi and Kojokrom. The local boat operators have a more flexible routine, commuting between various neighbouring communities and the over 100 islands spread around the Volta Lake. Most of these communities like Dambai and Kate Krachi are also mainly involved in fishing, farming, and trading.

4.3.4 Characteristics of Boat and Pontoon Operations

The local boats can be characterized into two; the bigger boats and the smaller boats. The bigger boats carry as many as 60 to 70 passengers while the smaller boat takes up to 20 to 30 passengers per trip. The boats transport both freight and passengers. Freight transported often includes farm produce which traders come to sell during market days as well as motorcycles. Passengers transported include farmers, teachers, students, and traders. The boats often operate along neighbouring communities such as Tinkudja, Njare, Patsu, Yeji, Awusakope, Kpando, Abotoase, and Vion among others. Passengers pay between 5 cedis to 150 cedis depending on their destination and the volume of cargo to be transported. The boats often operate between the hours of 6:00 am and 6:30 pm but also operates outside the timeframe if there is an emergency. Their operations are closely monitored by the Ghana Navy which sets the guidelines for boat operations. A boat operator had this to say about their operations;

"There are time limits to our operations. The Navy has directed that we close at 6:30 pm, however, there are extreme situations that often require that we work beyond the stipulated time. For instance, you may have a director getting stranded after the close of work to travel or missing the ferry. Similarly, we can get calls to go and convey a sick person to the hospital. Because of such emergencies, we have engaged the navy to allow us to operate beyond 6:30 pm. The tree stumps have been removed from the river, so it is now safe to operate in the night, so, yes, we move during emergencies and operate in the evenings" **25 years old boat operator.**

The pontoon operated by the Volta Lake Transport Company Limited carries both passengers and freight. The freight often includes farm produce, especially yams, vehicles, motorcycles, and general cargoes.

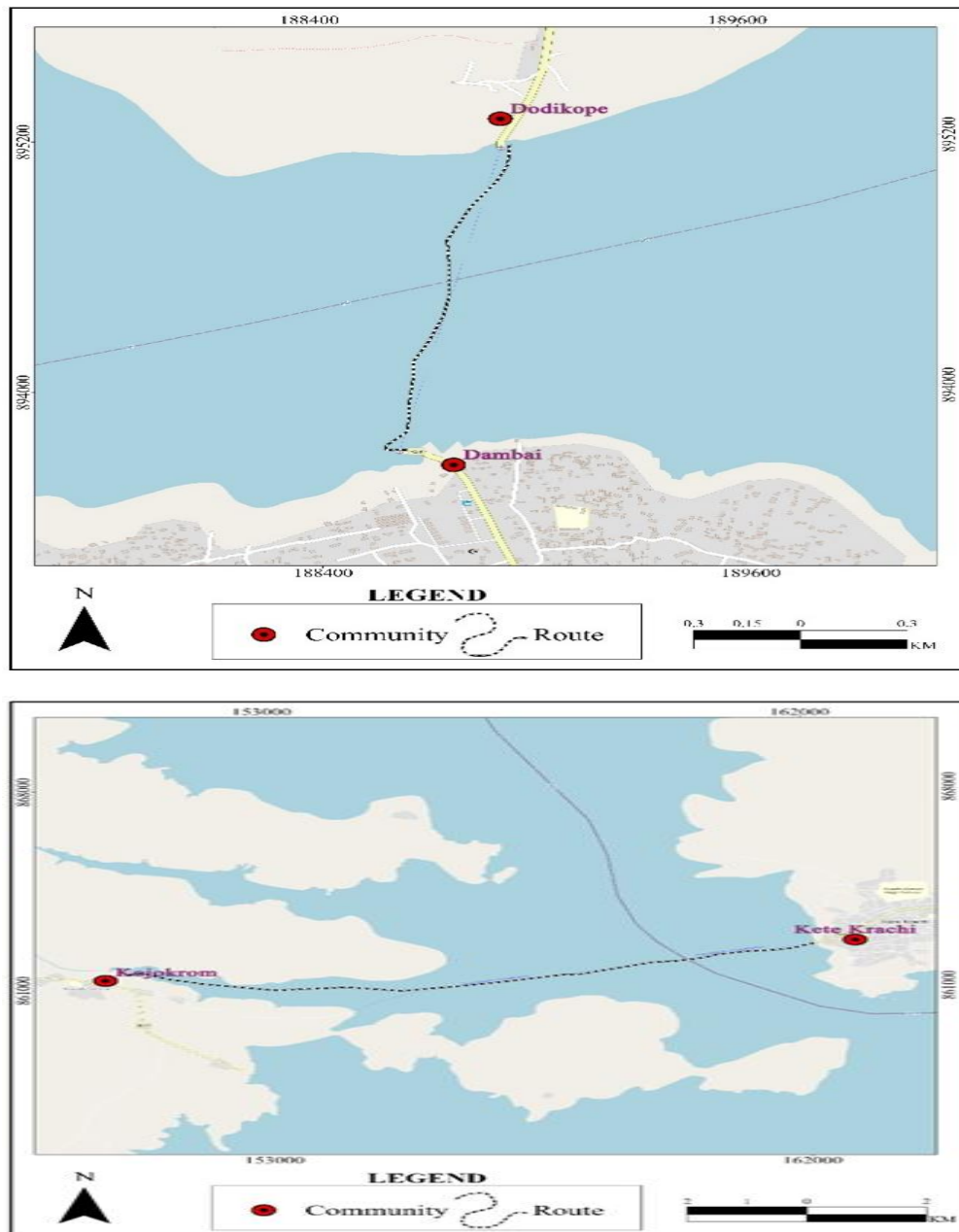


Figure 12.10: Maps showing operational routes of pontoon in Dambai and Dodekope

4.3.5 Challenges of Boat and Pontoon Operations

Compliance with rules governing passenger transportation is a major challenge for boat operators. Passengers often disregard safety protocols due to their familiarity with the routes and operations of the boat. Another challenge has to do with access to life jackets by boat operators. Most of the boat operators operate without life jackets for passengers which is a major concern in their operation. Boat operators complain of the high cost of life jackets as a reason why they do not have access to them. Another challenge has

to do with access to fuel for their operations. A boat operator from Dambai and Kete-Krachi share their challenges;

“Our major challenge has to do with access to fuel to operate. Secondly, some passengers give us undue pressure. The boats operate by scale, and we have our limits regarding the loads we can carry but sometimes some passengers will pressure us to send them even when we have not had enough passengers or attained the limit of load we are required to carry” (23-year-old male boat operator).

Some operators also complain of natural occurrence such as wind and tree stumps which often poses a risk to their operations.

“Yes, they don’t so we are also careful with our movements to prevent accidents and get our passengers safely to their destination. Our only enemy is the wind and tree stumps in the water also, we check the weather before moving and if we have set off already before the weather changes, we berth at a nearby community because when the wind starts blowing, it stops after an hour time so we are very careful with these issues because of the absence of life jackets”. (36 years male boat operator).

Concerning the pontoon operations, the absence of a landing station at Dambai is a major challenge faced by operators. As a result, operators are unable to control the movement of passengers and traders in and around the current landing site. Hawkers and food vendors pose a lot of challenges for the operators because they tend to sell in unsafe areas around the landing site. The absence of light for their operations at night is also a grave concern for its operators. Issues of passenger safety were a great challenge because most of the inhabitants of the communities have become used to the environment and therefore become careless while boarding the pontoon.

4.3.6 Inland Water Accidents

With regards to inland water accidents, data from the Ghana Maritime Authority shows an increase in boat accidents in the last three years leaving many victims injured and others dead. Despite the request for categorical data depicting the characteristics of victims, this was the only data made available to the team now. The data did not show the areas where these accidents occurred. This can be seen in Table 1 below.

Narratives from the focus group discussions suggest that boat accidents are very low in the study area due to the safety measures put in place to ensure passenger safety. Yet there have been other accidents in neighbouring communities and islands

Table 12.1: Inland water accidents in Ghana.

YEAR	NUMBER OF ACCIDENTS	INJURED	DEAD/MISSING
2014	3	58	54
2015	1	19	1
2016	5	135	31
2017	3	26	13
2018	2	53	11
2019	5	14	7

2020	7	42	12
2021	8	24	22
2022	4	53	18
2023 (AS AT 22/06/2023)	7	166	26

4.3.7 Causes of Inland Water Accidents

Key among the causes of inland water transport accidents is presence of tree stumps in the river and strong winds which leads to the drifting and capsizing of the local boats. The stumps in the water can also cause the boats to crack. A boat operator in Kete-Krachi had this to say concerning the causes of accidents;

“When you look at our work, our greatest enemy is the wind and tree stumps. For the tree stumps, it is the responsibility of the person sitting in front of the boat to watch out for them. Should you make a mistake and the boat hit the tree stumps, it breaks the bottom of the boat and this causes the accident. For the issue of the wind, when you notice that the weather is bad, you don’t set off, you berth until the weather is clear before you set off. Another issue is that when the weather is clear and you don’t check out for tree stumps, you might get involved in accidents”. (Boat Operator in Kete-Krachi).

Some of the accidents are as a result of the unavailability of fuel, therefore, boat operators tend to manage the little fuel they have while traveling on the water. They then end up being carried by the strong winds.

“I would say it’s the fuel that mostly causes the accidents. From the community I come from to Kete Krachi is three hours and when you have fuel you get here easily but when there is no fuel you have to manage the little fuel you have by moving slowly and this takes five hours. When you are unfortunately hit by the strong winds midway, there is nothing you can do and this causes accidents. With the issue of the tree stumps, most of the time when you move in areas where tree stumps are found and the wind suddenly comes up, it can carry your boat and hit it on these tree stumps and this can cause an accident. We are pleading with you officials (researchers) to help us with these problems to make our work easy for us”. (Boat Operator, Kete-Krachi).

While the tree stumps served as a hindrance to some boat operators, others maintain that the tree stumps are very important to them. A boat operator from Kete-Krachi narrates the importance of the tree stumps to their livelihood;

“The tree stumps are not a major problem to us because they help us a lot. It is on these tree stumps that the fishes mostly eat from. It got to a time when they were uprooting the tree stumps and it was a worry to us because they were destroying our source of livelihood, a source where we get the fish from being taken away so the fishes move away so the tree stumps are not of a problem to us but our problem is when the wind catches up with you whilst on the water, you have no control, it’s the wind that controls the boat hence leading the boat into the tree stumps”.

4.3.8 Characteristics of Road Transportation in Dambai and Kete-Krachi

The roads in Dambai and Kete-Krachi are characterized by several paratransit operations such as the trotro (mini-bus), taxis, Pragma (auto rickshaw), motorcycles, motor king (Aboboyaa),

long passenger buses, cargo trucks, bicycles, and many others. Some of them operates beyond their neighbouring communities to other cities in other regions such as Tamale, Yendi, Bimbilla, Kumasi, Atebubu, Ahiamankyene, Ntewusu, Osraman. Their operations are bedevilled by overloading beyond the seating capacities of the vehicles. For instance, some of the taxis in operation can load up to five passengers in addition to the with the driver, making it six instead of the four it was built to carry. In some extreme cases, the four-seater minibus loads fourteen passengers whereas the three-seater loads up to twelve passengers plus the driver making thirteen in all including the driver.

4.3.9 Causes of Road Traffic Accidents

During the focus group discussions, it was revealed that there are a lots of road traffic accidents in both Dambai and Kete-Krachi. Among some of the causes are reckless driving by motorists, and some unlicensed drivers on the road. The Pragma operations in the two towns are very prevalent and they cause a lot of challenges for other road users including vehicles on the road. Data from the field suggest that some of the pragma drivers are minors who have no training in driving and therefore tend to create a lot of trouble for motorists. Other causes of road traffic accidents are reckless behaviours from drivers such as over speeding and drunk driving. Below are some of the responses from focus group participants in the field.

“We have lots of accidents occurring here. Most of it is caused by motorcycles with two tires and the Pragma and Aboboyaa (also auto rickshaws for cargo). They often engage in reckless driving which causes the accidents” (Driver, Dambai).

“The assembly says there are lots of road traffic accidents, and that’s true because the unreported cases are more than the reported cases. Sometimes injure people and the vehicles are not even insured or registered. Sometimes the drivers do not even have a license. If the assembly can give us the right backing to conduct proper operations by January next year there will be some changes within the region” (Motor Traffic and Transport Department officer, Dambai)

“For me, I think the Pragma causes a lot of problems on our roads. The assembly must register the Pragma vehicles to be able to check their activities in Dambai. About 70% of the operators are from nearby communities...We need a way to check their operations in this community...They are causing a lot of problems here”. (Assemblyman, Dambai)

Commercial drivers also made mention of illegal speed rumps constructed by community members to reduce speeding on the roads to protect their livestock from being killed. Another issue has to do with the loitering of livestock such as goats on the roads which causes inconvenience for drivers on the road especially at night. This can be seen in the narratives shared by some commercial drivers in Kete-Krachi.

“The issue of illegal construction of speed rumps contributes to accidents. The board and shaft of our vehicles has constantly been destroyed by these rumps. If you count the number of rumps from the Gyengyen community here to Dambai, you are likely to get close to 70 for a journey that is supposed to last about 1 hour 20 minutes. We spend more than 2 hours on this same stretch, and we wish that something could be done about this”. (Commercial Driver, Kete-Krachi)

“Another issue has to do with goats and other animals taking major portions of the road as breeding grounds. These animals can sometimes cross a driver when driving which can easily cause an accident” (Commercial driver, Kete-Krachi)

Note: The team from UCC has requested for crash data from the Building and Road Research Institute since the assembly we visited did not have the crash data available.

4.4. Conclusion

While road traffic accidents are common in Dambai and Kete-Karachi just like any other city in Ghana. The causes of road traffic crashes are no different from what is known globally. This includes reckless driving from the motorist and poor maintenance of vehicles. While there are institutions to govern the road transport industry in Ghana, enforcement of the laws has not been effective. The emergence of Pragma also poses a new challenge to regulators given its widespread use and the challenges of managing their use.

Inland water transportation in Ghana provides an alternative sustainable mode for road transportation given the fact that it is cheap and environmentally friendly as compared to traditional road transport. Yet, inland water transport in Ghana is not well developed with a lot of operational challenges. Data on water transport accidents have not been effectively collated. Data on water accidents are very scanty. This may be because the sector has received less attention from the government of Ghana. Water transport in Ghana still faces the challenges of tree stumps in the rivers which puts the boats, canoes, and pontoons at risk.

CHAPTER 5: COMPARATIVE ANALYSIS OF THE THREE CASE STUDIES, CONCLUSIONS AND RECOMMENDATIONS

This section compares the findings of the three case studies: Lagos in Nigeria, Nairobi and Lake Victoria in Kenya, and Accra and the Ada region in Ghana. It summarises the road and water crash situations in those regions.

Lagos's situation revealed a very high rate of crashes on the road and the land. The main factors are the increasing population and urbanization. The insecurity of the north displaces the population, and the unemployment of the eastern part of the country is creating an avalanche of immigrants in the tiny geographical space. This gives the area the heaviest population and vehicular density in the country. The resultant effect is the heavy pressure on the fragile transport infrastructure. Lagos accounts for more than 40% of the 11.8 million vehicles in Nigeria. This is in spite of the fact that it is only 0.36% of the landmass, out of which about twenty-five percent is water. Another major challenge is that due to the cost, most vehicles plying the city of Lagos are “Tokunbo,” meaning used cars from abroad. Most of these vehicles are at or very close to their service years; their owners, mainly from Europe and America, are glad to dispose of the wreckage for which maintenance will become a problem for the buyers. Consequently, mechanical failures and breakdowns contribute significantly to crashes. Federal Road Safety Corp (FRSC) and Lagos State Traffic Management Authority (LASTMA) are the two agencies of regulation and enforcement on the road, whereas on the part of the federal government, Nigeria Inland Waterway (NIWA) and Nigeria Maritime and Safety Administration (NIMASA) are its agencies managing the inland and international waters respectively.

Our findings regarding the road crash situation in Nairobi and water crashes in Lake Victoria, Kenya, indicated challenges like those of Lagos. Its status as the country's capital poses its own set of difficulties. However, unlike Lagos, only one agency exists for each mode: The National Transport and Safety Authority manages the road transport system in the city. In contrast, the Maritime Authority manages the waterways. These institutions are making strenuous efforts to ensure safe roads and waters for the country. However, despite their efforts, the challenges are not abating. The increasing population presents a situation whereby the investment in transport infrastructure is lagging behind the demand. Like Lagos, artisanal boat operators in Lake Victoria do not always play by the rules, and the problem in properly regulating them creates a lacuna whereby risky journeys are undertaken without safe jackets, resulting in high fatalities whenever there is a commonplace accident. It is advised that this laxity be addressed to stop unnecessary waste of lives and property.

The study in the Ada region came up with equally depressing findings of poor infrastructure, bad roads, waterways that are not marked dotted by tree stumps, and sunk wrecks that regularly capsize the boats. On the roads, the potholes and minimal signages create blind spots, leading to frequent accidents both on the road and on the water. The two regulatory agencies are the Motor Traffic and Transport Department for the road and the Ghana Maritime Authority for the water. Despite their existence, crashes remain a permanent feature of the region, as indicated in the statistics. It's advised that there should be more efforts on enlightenment and enforcement. More investment is required to build the needed infrastructure in both modes.

There is more similarity between the institutional framework of Ghana and Kenya, which is one agency for road and one for water. This is a reflection of the governance structure of the countries. The Lagos State government duplicates the federal government agencies except NIMASA, which is a regulator of international waters. It is unclear whether this is an advantage or disadvantage because the outlook is still the same for the three countries. However, it is on record that there are occasional role conflicts between federal and state agencies. For instance, NIWA and LASWA still have their court issues concerning each authority's jurisdiction. The case has not been resolved even when the same political party is in power at both the state and the federal level. Indeed, the current president of the country was a former governor of Lagos State who also contended with the legal issues regarding the boundary of control by the two authorities on the inland waters. Since the national rivers enter the sea through Lagos territory, it is both technical and constitutional. It is also about who can collect what levies and resource mining on the rivers. So, Ghana and Kenya are not having any issues along this line.

In all three case studies, the main culprit is the human factor. These manifest through reckless driving, drug and alcohol abuse, inadequate training, over speeding, taking telephone calls on the wheel, and other violations of traffic rules. The desire to make as much money as possible to meet the target of the vehicle and boat owners is also a factor. In the majority of the cases, the operators are not the owners and, therefore, have to meet definite financial targets or else they will be thrown out of the job. Consequently, they overload their vehicles beyond their standard capacity on land or water. Overcrowding and overloading should be controlled, especially during rush hour.

Most of the vehicles in the three regions under investigation are fairly used, popularly called Tokunbo in Nigeria and Ghana. They are usually at the very tail end of their service years. Thus, mechanical failures, breakdowns, and blow-outs are regular features causing accidents. There should be, therefore, greater attention to vehicle inspection processes to ensure roadworthiness and advocacy for using life jackets and other safety measures in water transport. The other major causal factor for the water is the seasonal high tides that cease the control of the boats from the boat operators who have no access to or care for weather forecasts. There is, therefore, the need for a Weather reporting system and enlightenment. In the case of Lagos, there is an additional factor of kidnapping on the roads and water. This adds to the insecurity in the industry. This does not seem to be an occurrence in Ghana and Kenya.

The quays/jetties should be modernized and made safe for all water transport users day and night. To boost security, watchtowers, and regular and reliable coastguards should be installed. The study recommends sensitizing all stakeholders and the community to safety and search-and-rescue drills.

Vehicle safety standards and compliance should be developed and implemented. Regulations that align vehicle safety and environmental standards with global best practices, such as procedures to manage the importation of second-hand vehicles, establishing compliance regimes that ensure vehicle inspection and certification at the point of entry to the country, and assessing options and procedures for retiring older vehicles;

Post-crash services should be provided in the context of emergency response, such as crash scene injury diagnosis and stabilization, fast ambulance transport to hospitals or treatment centres, effective emergency and trauma care, and longer-term rehabilitation. The focus should

be on reducing crash response times and improving victim recovery and rehabilitation services in designated high-risk corridors.

In the three countries, there should be an independent accident investigation body in addition to the regulators. It would be unwise to allow the regulators to conduct the investigation in instances where they are implicated because they will do all that is possible to cover their tracks.

There are yawning gaps in data collection and analysis. This study has identified the pressing need for improved data collection and analysis to understand better the causes and trends of traffic crashes, which is vital for designing targeted interventions: comprehensive road safety database, monitoring, evaluation, and learning systems. There is a need to improve the safety data collection and analysis system to enhance its functionality and accessibility, starting with improved recording and input of crash data as reported by police, accurate geo-referencing of crash locations, and enhanced diagnostic tools. Attention should be given to monitoring and evaluating road safety performance in designated high-risk corridors.

Interventions and recommendations have been proposed for each region to combat and address these challenges. The key focus of these measures is to enhance staff training; strengthening enforcement and compliance. Despite the active efforts of the regulating agencies in the regions to manage traffic safety, persistent challenges remain regarding consistent enforcement, public compliance with regulations, and insufficient infrastructure. By implementing these necessary steps, there is expected to be a drastic reduction in the occurrence of accidents and a decrease in their associated impacts. These proposed solutions should be implemented promptly and effectively to save lives. Both road and water traffic crashes result in significant loss of life and injuries, placing a heavy burden on the healthcare system and leading to substantial economic costs due to medical expenses, loss of productivity, and property damage. Collaboration among government agencies, transport unions, and private sector stakeholders is recommended.

All three regions face similar road and water traffic accident challenges. However, the degree of enforcement, the quality of infrastructure, and public awareness differ across time and space. To reduce the level of crashes and their costs, it is critical to strengthen regulatory templates, invest more in infrastructure, and embark on continuous public enlightenment and education on safety. Only by determined and joint efforts can we witness safer road and water transport situations in the regions of our study. Each region is advised to pay the required attention to the safety and well-being of its citizens, lives and property lost in delayed action could thus be saved.

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