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PASSENGER SAFETY AND SECURITY IN ROAD TRAVEL: AN
ASSESSMENT OF PREVAILING SITUATION AND INTERVENTIONS IN
GHANA

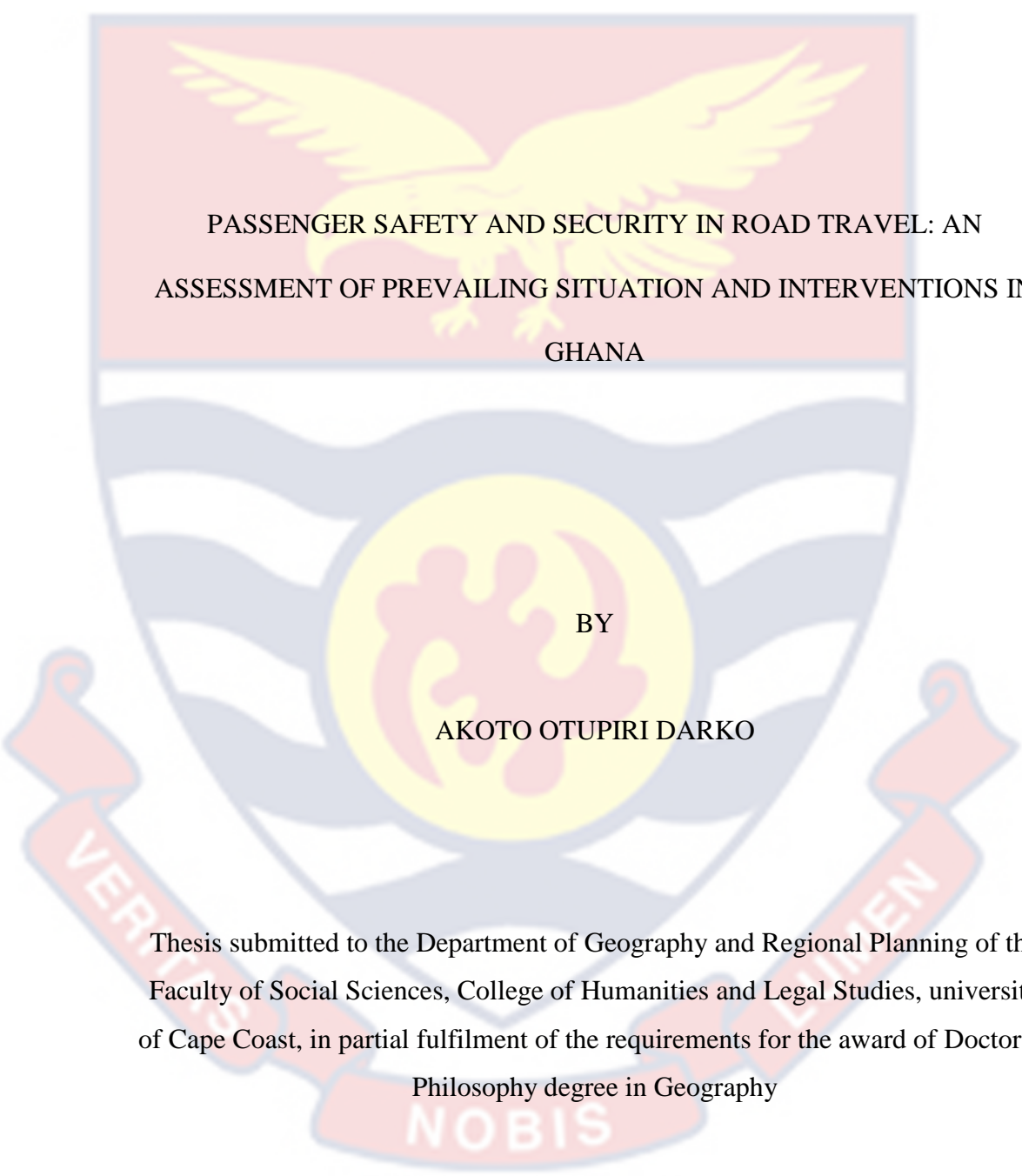
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PASSENGER SAFETY AND SECURITY IN ROAD TRAVEL: AN
ASSESSMENT OF PREVAILING SITUATION AND INTERVENTIONS IN
GHANA

BY

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Thesis submitted to the Department of Geography and Regional Planning of the
Faculty of Social Sciences, College of Humanities and Legal Studies, university
of Cape Coast, in partial fulfilment of the requirements for the award of Doctor of
Philosophy degree in Geography

OCTOBER 2022

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature.....Date.....

Name:.....

Supervisor's Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature.....Date.....

Name:

Co-Supervisor's Signature.....Date.....

Name:

ABSTRACT

Road crashes have become a public health problem with about 1.35 million people dying every year on the roads across the globe, and up to 50 million people sustaining various degrees of injuries, some of which lead to permanent disability. Ghana over the past three decades lost 50,311 people through road crash fatalities, and 362,203 others sustained various degrees of injuries within the same period. Moreover, highway robbery has become a serious insecurity in Ghana's road transport sector. This study therefore sought to assess passenger safety and security in road travel and the interventions that are in place. Adopting the pragmatist research philosophy, and guided by the accident/incident theory and the routine activities theory, the explanatory sequential mixed method was used for data collection. A multistage sampling method was used to select six transport organisations, 372 passengers for a survey, and 40 participants for a follow-up in-depth interviews and a focus group discussion. Additionally, some observations, as well as a desktop review were also carried out. The results indicate that safety and security in road travel are in poor state. Further, the road safety problem in Ghana is mainly attitudinal on the part of both road users and regulators, and that security is not incorporated in the road transport regulation. The study recommends the development of effective strategies to influence attitudinal change with road users and regulators as well. Further, there is the need for strict enforcement of road traffic regulations, and intensification of some existing security interventions. There is also the need for the Ministry of Transport, in collaboration with the Police to develop a standardised road transport security intervention for implementation by the public transport organisations in Ghana.

KEY WORDS

Assessment

Interventions

Passenger

Public transport

Road travel

Safety

Security



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DEDICATION

To my son Anuonyamba



TABLE OF CONTENTS

	Page
DECLARATION	ii
ABSTRACT	iii
KEY WORDS	iv
ACKNOWLEDGEMENTS	v
DEDICATION	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	xv
LIST OF FIGURES	xvii
LIST OF ACRONYMS	xix
CHAPTER ONE: INTRODUCTION	
Background to the Study	1
Statement of the Problem	9
Objectives	13
Significance of Study	13
Delimitation	14
Limitations	15
Definition of Terms	15
Organisation of the Study	17
CHAPTER TWO: CONCEPTUAL AND THEORETICAL ISSUES	
Introduction	20
Concepts in Transport	20
Transport product	20

Service quality	22
The systems concept	22
The concept of safety and its importance in transport	23
Security and transport	24
A Brief History of Accident and Crime Causation	26
History of accidents	26
History of crime	28
Theories on Accident and Crime Causation	30
Accident theories and their application in transport	31
Theories of crime causation	45
Adapting the Behaviour Change Communication (BCC) as an Intervention to Improve Transport Safety and Security.	50
Conceptual Framework for the Study	54
Summary	59
CHAPTER THREE:REVIEW OF EMPIRICAL LITERATURE	
Introduction	61
The Burden of Road Traffic Fatalities and Injuries	61
Passengers' Assessment of Personal Safety on Public Transport in Ghana	63
Factors that Contribute to Accident Causation in Road Transport	65
Human factors in road crashes	66
Technological factors (vehicle factors)	84
Environmental factors that affect road safety	85
Other factors that affect accident severity	87

Road Transport Safety Interventions	89
Attitudinal change as a road safety intervention	90
A shift from private car onto public transport as an intervention	91
Point record mechanism	92
Road safety intervention messages	93
The systems approach to road safety	93
Cost/benefit of road safety interventions	94
Traffic policing and technology	95
Measurement of road safety	97
Emergency Management	98
Road Transport Security	99
Nature of crime on public transport	101
Public transport security interventions	104
Summary	107
CHAPTER FOUR: METHODOLOGY	
Introduction	108
Research Setting	108
City of Accra	109
Research Philosophy	113
Research Approach and Design	115
Population	117
Sample size and sampling procedure	118
Data Collection Instruments	122

Pre-testing	124
Data Collection Procedures	125
COVID-19 protocols	128
Data Processing and Analysis	128
Field Experience and Challenges	131
Ethical Considerations	133
Limitation of Study	134
Chapter Summary	135
CHAPTER FIVE: STATE OF PASSENGER SAFETY AND SECURITY IN GHANA	
Introduction	136
Trends in Road Crashes in Ghana from 1991 to 2020	136
Trends in fatalities from road crashes in Ghana from 1991 to 2020	141
Trends in casualties from road crashes in Ghana from 1991 to 2020	144
Trends in crashes involving public transport vehicles	149
Crash trend by vehicle type from 1991 to 2020	150
Road crash indices for 2012 to 2020	156
Causes of Road Traffic Crashes in Ghana	158
Crime Associated with Public Transport from 2010 to 2020	160
Projection of Crash Trend and Crime on Public Transport for 2021 to 2030	162
Discussion	164
Summary	167

CHAPTER SIX: PERCEIVED STATE OF SAFETY AND SECURITY IN
ROAD TRAVEL

Introduction 168

Background of Organisations and Participants Involved in the Qualitative
Study 168

Demographic Characteristics of Respondents 170

Travel Frequency and Accident Records of Respondents 172

Respondents' Knowledge and Perceptions of Road Safety 174

Respondents' Assessment of State of Road Safety in Ghana 179

Constraints Identified 187

Perceptions on the State of Security of Public Transport 189

Assessment of Road Transport Security 190

Assessment of security using qualitative data 192

Discussion 194

Chapter Summary 198

CHAPTER SEVEN: EXISTING INTERVENTIONS AND THEIR
IMPACT ON ROAD SAFETY AND SECURITY IN GHANA

Introduction 199

Knowledge of Existing Road Safety Interventions and Their Effectiveness 199

Participants' Assessment of Road Safety Interventions 209

Regulatory and Other Forms of Intervention 214

Regulation on establishing a road transport organisation 215

Regulation on licensing of drivers 217

Regulation on passenger carrying vehicles	218
Regulations on speeding	220
Road traffic offences that attract spot fines	221
Passengers' reaction to reckless driving	222
Respondents Awareness of Security Interventions and their Effectiveness	223
Assessment of security interventions	224
Outcome of observation conducted	229
Discussion	231
Summary	237
CHAPTER EIGHT: PASSENGER SAFETY AND SECURITY IN ROAD TRAVEL: A LOOK INTO THE FUTURE	
Introduction	238
Suggestions from Passenger Survey	238
In-Depth Explanation and Further Suggestions on Public Transport Safety and Security	241
Suggested road safety interventions	241
Suggested interventions to improve security	255
Other suggestions	261
Discussion	262
Summary	269
CHAPTER NINE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	
Introduction	270

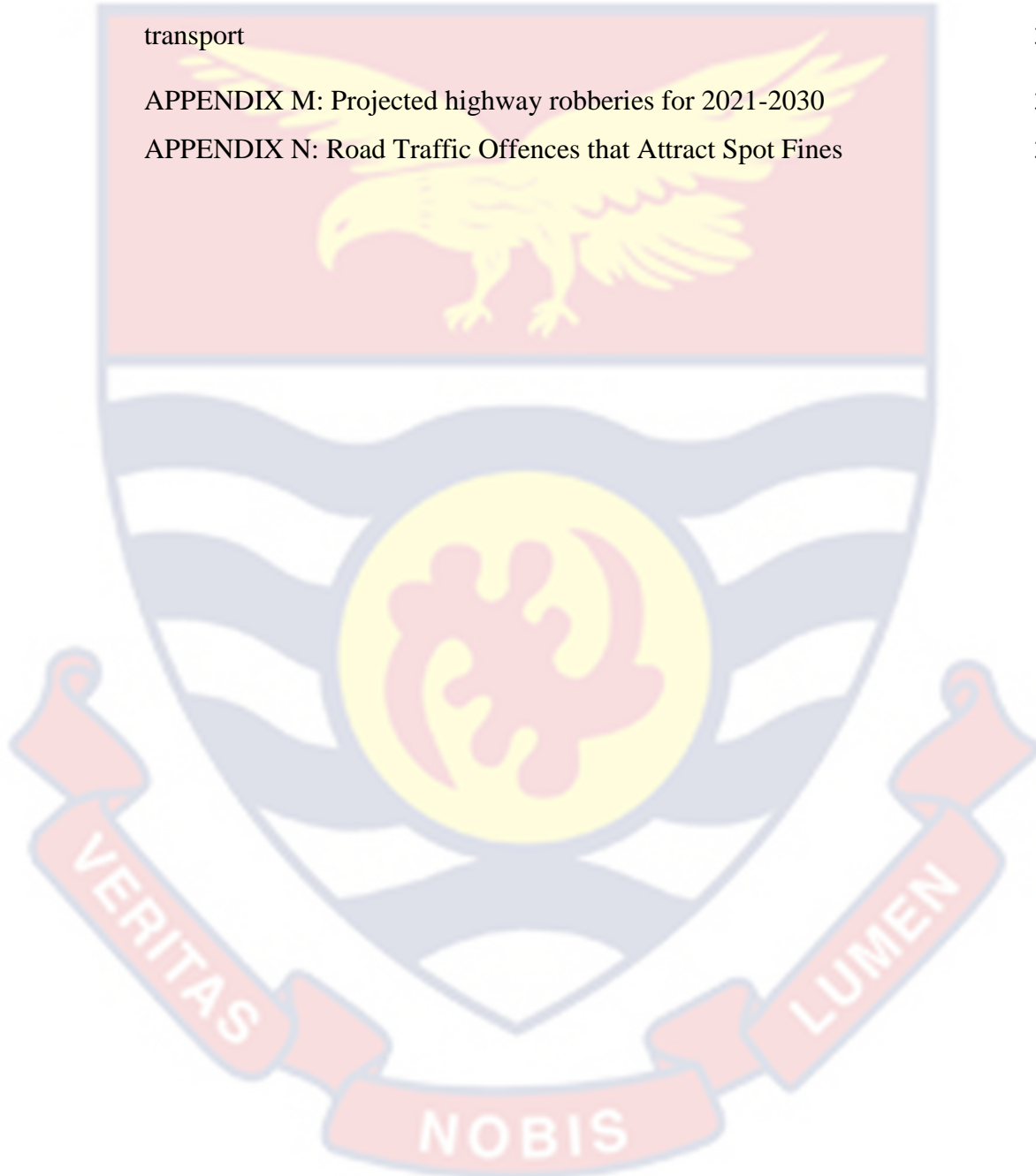
Summary	270
State of road safety and security in Ghana	272
Existing road safety and security interventions and their impact in Ghana	275
Participants' suggestions for improving road safety and security in Ghana	277
Conclusion	281
Recommendations	283
Contribution to knowledge	287
Implication for policy and practice	293
Avenues for future research	294
REFERENCES	295
APPENDICES	319
APPENDIX A: Formal request to institutions for secondary data	319
APPENDIX B: Questionnaire for passengers	321
APPENDIX C: Survey data collection checklist	329
APPENDIX D: Interview guide for PhD thesis data collection	330
APPENDIX E: Discussion guide for focus group discussion with drivers	334
APPENDIX F: Observation guide for PhD thesis data collection	335
APPENDIX G: Multiple comparisons (Tukey HSD) of crash-type trend	336
APPENDIX H: Multiple comparisons (Tukey HSD) on trend of casualties	339
APPENDIX I: Multiple comparisons (Tukey HSD) of mean number of public vehicle accidents across six-year groups	342
APPENDIX J: Projected crashes by vehicle type for 2021-2030	343

APPENDIX K: Projected total casualties and casualties involving public transport for 2021-2030 344

APPENDIX L: Projected total fatalities and fatalities involving public transport 345

APPENDIX M: Projected highway robberies for 2021-2030 346

APPENDIX N: Road Traffic Offences that Attract Spot Fines 347



LIST OF TABLES

Table		Page
1	Sample size for survey	119
2	Sample size for in-depth interviews	122
3	ANOVA test for mean number of crash-type across six-year groups	139
4	ANOVA test for mean number of casualties across six-year groups	146
5	Spearman's rank order correlation of relationships between the total number of road crashes, casualties, population and registered vehicles	148
6	Distribution of average number of public vehicle accidents across six-year groups	149
7	ANOVA test for mean number of crashes involving public transport vehicles across six-year groups	150
8	Road crash indices for the period 2021 to 2020	157
9	Crash indices involving public transport vehicles from 2012 to 2020	158
10	Causes of road traffic crashes in Ghana as of 2020	159
11	Police records of reported robberies in Ghana from 2010 to 2020	160
12	Police reported highway robberies for 2020	161
13	Calculated highway robberies from 2010 to 2019 based on 2020 figures	161
14	Passengers' demographic information	171
15	Respondents' Travel Records and Mostly used Means of Long Distance Journeys	172
16	Accident Records of Respondents and their Relatives/Friends	173

17	Frequency and medium of hearing about crashes	174
18	Passengers' perception of causes of road crashes	175
19	Respondents' views of most affected victims of road crashes in terms of sex, age and road user categories	179
20	General assessment of state of road safety	180
21	Assessment of safety of public transport vehicles	181
22	Personal feeling of safety on public transport vehicles by religion	181
23	Personal encounter with any incident of insecurity on public transport by sex	190
24	Assessment of the state of security of the public transport system	191
25	Personal feeling of security on the public transport system	191
26	Passengers' knowledge of road safety interventions in place	200
27	Passengers' view of who is responsible for road safety on in Ghana	201
28	Passengers' assessment of general effectiveness of road safety interventions	209
29	Passengers' knowledge of existing road transport security interventions	223
30	Passengers' views of who is responsible for ensuring security on public transport	224
31	Passengers' assessment of effectiveness of existing security interventions	227

LIST OF FIGURES

Figure	Page
1 Three factor behavioural model	39
2 Conceptual framework (Transport safety and security intervening model)	54
3 Map of study area (Accra)	112
4 Trend in number of road crashes recorded in Ghana from 1991 to 2020	137
5 Trends in forms of road crashes recorded in Ghana from 1991 to 2020	138
6 Trends in forms of road crashes recorded in Ghana by year groups	139
7 Trends in fatalities from road accidents in Ghana recorded from 1991 to 2020	141
8 Trends in fatalities from accidents in Ghana by road environment	142
9 Trends in fatalities recorded in road accidents in Ghana by age groups	143
10 Trends in number of fatalities recorded in Ghana disaggregated by sex	144
11 Trends in number of casualties from road accidents in Ghana recorded from 1991 to 2020	144
12 Trends in casualties by form of casualty recorded in Ghana from 1991 to 2020	145
13 Accidents involving public transport (bus/minibus)	149
14 Trend of crashes by vehicle type from 1991 to 2020	151
15 Fatalities recorded through crashes involving public transport vehicles from 1991 to 2020	152

16	Comparison of total crashes and public transport crashes from 1991 to 2020	153
17	Percentage of public transport crashes to total crashes by year group	153
18	Comparison between total casualties and public transport casualties from 1991 to 2020	154
19	Percentage of public transport casualties to total casualties by year groups	154
20	Comparison between public transport fatalities and total fatalities from 1991 to 2020	155
21	Percentage of public transport fatalities to total fatality rate by six-year groups	155
22	Projected crash trend for 2021 to 2030	163
23	Projected highway robberies for 2021 to 2030	163
24	A word cloud of suggested safety interventions	239
25	A word cloud of suggested security interventions	240
26	A schematic diagram of proposed architecture of Traffitech GH Integration and process flow by police using Traffitech GH for traffic enforcement	290
27	A schematic diagram of existing structure of stakeholders in road safety management in Ghana	291
28	A schematic diagram of proposed structure for stakeholders involved in road safety management in Ghana	292

LIST OF ACRONYMS

ACADDAE	Assessment, Communication Analysis, Action and Evaluation
BAC	Blood Alcohol Concentration
BCC	Behaviour Change Communication
BrAC	Breath Alcohol Concentration
CCTV	Close Circuit Television
CDC	Centers for Disease Control and Prevention
CID	Criminal Investigation Department
CILT	Chartered Institute of Logistics and Transport
COAT	Concentration, Observation, Anticipation, Tolerance
DDACTS	Data-driven Approach to Crime and Traffic Safety
DIF	Drift Into Failure
DUIC	Driving Under the Influence of Cannabis
DVLA	Driver and Vehicle Licensing Authority
GIS	Geographic Information Systems
GPRTU	Ghana Private Road Transport Union
GPS	Global Positioning Systems
GSM	Global System for Mobile Communications
IRTAD	International Traffic Safety, Data and Analysis Group
ITF	International Transport Forum
MMT	Metro Mass Transit
MTTD	Motor Transport and Traffic Department

NAS National Ambulance Service

NDA National Drivers Academy

NIA National Identification Authority

NIC National Insurance Commission

NITA National Information Technology Agency

NRSA National Road Safety Authority

NRSC National Road Safety Commission

PPE Personal Protective Equipment

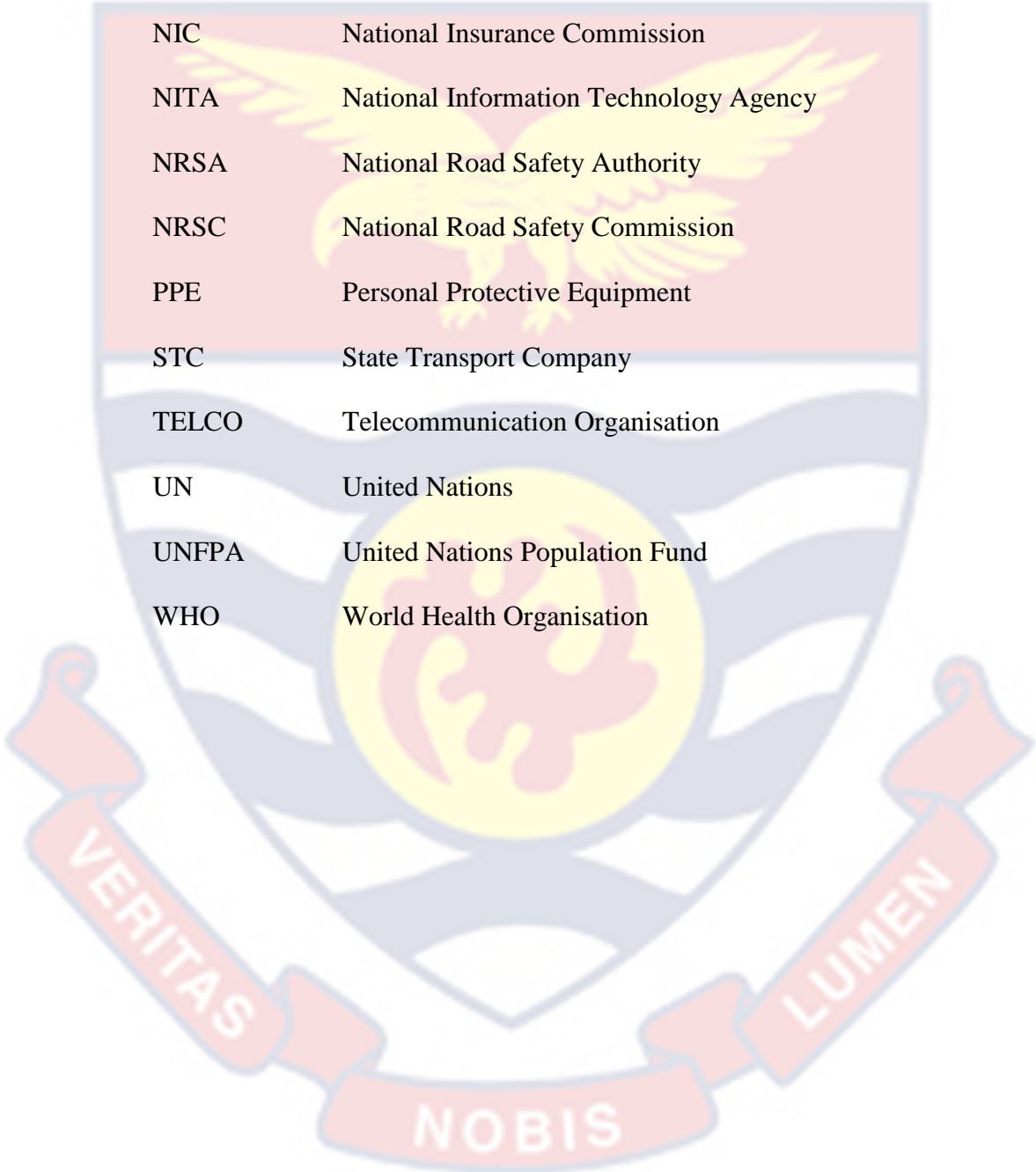
STC State Transport Company

TELCO Telecommunication Organisation

UN United Nations

UNFPA United Nations Population Fund

WHO World Health Organisation



CHAPTER ONE

INTRODUCTION

Background to the Study

The importance of transport to society has been extensively documented (Gubbins, 2003; Hoyle & Knowles, 1992; Rodrigue, Comtois & Slack, 2006; 2013). A careful contemplation about how people move from one place to the other to fulfil their needs, or how they are provided with their goods and services will point to the obvious importance of transport to society (Gubbins, 2003). Principally, transport plays the role of providing access between locations that are spatially separated for both the business and household sectors, covering the movement of both freight (goods) and people (New Zealand Ministry of Transport, 2014). Regarding the business sector, transport involves connections between businesses and their input sources, between one business entity and other businesses, and between businesses and their markets. For the household sector on the other hand, transport provides people with access to workplaces such as education facilities, shops, and social, recreational, community and medical facilities. Gubbins (2003) has also classified the importance of transport to society under four main categories which are (1) trade (2) the link with the marketplace (3) social interaction and (4) national cohesion. Transport is a political issue because it affects everybody; and whether by the lack of provision, the lateness of arrival, the poor service, or the road congestions caused by an overload system, transport issues are discussed at the national, local and individual levels.

Thus, no matter the spatial location, race, or political affiliation of the individual, he/she is affected by transport. As emphasised by Hoyle and Knowles (1992), one cannot escape from transport. Transport and communication are activities that ensure effective spatial interaction. With the advancement of technology, especially Information and Communication Technology (ICT), people within two or more different spatial locations can interact effectively. In the present technological age, business transactions are easily carried out via the internet and other networks. However, the physical movement of people and goods is only possible using transport services. Rodrigue, Comtois and Slack (2006; 2013) assert that, the differences in spatial locations, and the fact that some locations are endowed with more resources than others, or that different locations have variety of resources, necessitate the need for trade. For resources to be able to move from where they are in abundance to where they are in demand, there is the need for transport.

Transport as a service is characterised by four Vs, namely, (1) it is vital, (2) it is visible, (3) it is volatile, and (4) it is vulnerable (Gubbins, 2003; Shaw, 1993). Transport is vital because it is part of everyday life and therefore affects everybody. It is visible because transport vehicles and the service can be seen by people within the environment in which they are operated. It is volatile because the transport service cannot be stored. The volatility nature of transport service is related to its instant perishability (Cole, 2005), in that, unlike a manufactured product that can be stored during the lean season and resold when the market is at its peak, a seat or space not sold for a particular journey cannot be stored for the same journey at

another time. Transport is vulnerable because it is exposed to the weather and terrain, and these have effects (either positive or negative) on the service. The vulnerability characteristic of transport is what is of paramount interest to this study.

Although transport is said to be very vital in people's lives, and the economies of nations, it is not sought for its own sake but rather, to facilitate the achievement of other desires. For this reason, transport is said to be a derived demand because transport is sought to satisfy other desires. It follows then, that, if the desire for which transport is sought is removed, the need for transport will cease to exist.

Moving people and goods effectively, which transportation primarily seeks to accomplish, is performed better by ever increasing speeds (Evans, 2003). Hence, technological innovation and advancement in the transport sector over the years has been focused on increasing transportation speeds, from animal-powered vehicles to sophisticated and faster vehicles that can cover longer distances within a few hours, and in general, increasing the speed of movement comes with increased risk (Evans, 2003). Faulks (1990) had earlier asserted that the movement of people from where they are to where they prefer to be and goods to where their relative value will be greater is the function of transport. It follows that the object or the end product of transport is the arrival. Obviously, this arrival must be safe; that is passengers and goods must be taken to their destination in safety and without damage. Faulks (1990) further uses the analogy that, just as the product of a tailor or seamstress is a well-fitting suit, so is safe arrival the product of transport.

If the customers' expectation is the arrival, then service quality, which embodies reliability, punctuality, safety, convenience, comfort and security, should be the first responsibility of a transport organisation to its customers (Iles, 2005). Safety and security of passengers and goods alike are therefore very paramount in transport operations. Unfortunately, this expectation of safe arrival is sometimes marred by accidents of various nature and insecurity of both passengers and goods on the transport system. These accidents and insecurity affect all forms and modes of transport. Transport is therefore said to be dangerous because it involves the movement of vehicles around, and this has the potential of causing harm to people and damage to property (Abane, 2012; Gubbins, 2003). The World Health Organisation status report on road safety (WHO, 2018) indicates that, as of 2016, the estimated number of deaths through road crashes stood at 1.35 million per year. The report also indicates that, whereas road traffic injuries are the eighth leading cause of death for all ages, they are now the leading cause of death for children and young adults between the ages of 5-29 years. Furthermore, it is estimated that, between 75 and 85 percent of fatalities in road accidents occur in developing countries, despite the low levels of car ownership (Iles, 2005). Iles' claim is confirmed by WHO (2018), which indicates that, Africa's rate of road traffic deaths is 26.6 per 100,000 population as compared with the global rate which is 18.2 per 100,000 population. The developed regions like the Americas and Europe have a regional rate of 15.6 and 9.3 deaths per 100,000 population respectively, which is lower than the global rate. Iles (2005) further asserts that while the number of road accident fatalities has been reducing in developed countries during the past two to

three decades, it has been increasing in developing countries, where a significant proportion of road accidents involve public transport vehicles. Public transport safety does not only impact on its users: other road users may also be involved in accidents with public transport vehicles, while every accident has external costs which affect the economy generally. As a result of the risks associated with transport operation, all modes of transport are regulated by international regulatory organisations and individual governments as well, to ensure maximum safety. Regulation of transport operations focuses on three elements namely the operator, the driver and the vehicle. In most jurisdictions, various institutions are established with the mandate to ensure that these regulations are adhered to. The effectiveness of the work of these institutions is what promotes safety in transport operations in a country.

Since transport is associated with risk, it is important to put in measures that will reduce the number of crashes or reduce harm in the event of any crash. Such measures could be in the form of crashworthiness or crash prevention. Crashworthiness associates itself with engineering features aimed at reducing losses, in the event of a specific crash occurring. For example, protection of occupants could be improved by making the structure close to the occupant less likely to crush, and also the use of devices such as collapsible steering columns. Another example of crashworthiness is reducing the risk of post-crash fires (Evans, 2003). Crash prevention on the other hand is associated with measures that are aimed at preventing the crash from occurring. Such measures may be either of an engineering nature (making vehicles more visible, improved braking system, radar)

or of behavioural nature (how drivers are selected, how they are trained, their motivation and licensing, enforcement of traffic regulations). Fundamentally, the distinction that can be made between crashworthiness and crash prevention is that when a crash is prevented, all harm is eliminated totally. On the other hand, although improved crashworthiness does reduce the level of harm in a severe crash, it rarely eliminates harm (Evans, 2003).

The risky nature of transport operations also requires the establishment of standards and the need for strong enforcement of those standards. Safety in transport is not only concerned with the design and maintenance of vehicles but includes the infrastructure, the organisation, the law and the people. It has to do with processes, both physical and social (Gubbins, 2003). Safety in transport is usually treated in terms of the three Es: enforcement, education and engineering. Enforcement involves the setting of standards, both technical and behavioural, backing these standards by a system of penalties if they are breached, and providing some form of enforcement agency to apply the sanctions to those who break or defy those standards. Education and training are vital and well recognised in the matter of transport safety. Education must have far wider implications than simply teaching to attain competence. It must include alerting everybody involved in transport operations to the risks inherent in poor procedures and in deviating from the safe forms of operation. Engineering in safety relates to the design and construction of both vehicles and infrastructure. Engineering plays a key role in safety because a lot of safety regulation revolves around outcomes that emanate from engineering analysis (Gubbins, 2003).

Although transport in general has experienced security threats like piracy, hijacking and terrorism in the past, transport security was not a topical issue until the aftermath of the September 11, 2001 incident, popularly known as 9/11, when a transport device was used to commit terrorist attack on the World Trade Centre in New York City (Edwards & Goodrich, 2013; Bragdon, 2008). Following the 9/11 incident, the United States Department of Homeland Security was formed and mandated to ensure safety and security in all forms and modes of transport. The Department of Homeland Security for instance, ensures transportation safety and security by conducting risk assessment to identify potential hazards that could affect either the transport vehicle or infrastructure, and takes steps to reduce or eliminate these hazards. In the context of transport, security seeks to prevent acts of unlawful interference against passengers, freight or the transport infrastructure. Security aims at giving users confidence that they can use transport (European Commission, 2012). Although it may be acknowledged that there cannot be perfect transport security especially regarding land transport which is more susceptible because of its open nature of operations, transport security policy primarily is proactive in seeking to prevent incident from happening (European Union).

According to Edwards and Goodrich (2013), transportation risks in the road sector can be categorised into natural, technological and human causes. Natural risks relate to those occurrences that emanate because of changes in the natural environment like floods or landslides for example. Technological risks refer to issues that relate to defects that may occur in manufacturing the transport vehicle, or any other equipment that may potentially fail. A poorly designed bridge that

leads to its collapse while in use is also an example of technological risk. Human related risks refer to errors caused by the operational and maintenance crew of the transport vehicle or any deliberate attack on the transport system that may result in death, injury or damage to property. Edwards and Goodrich (2013) indicate that the development of any security plan begins with a threat analysis. The World Bank (2002) has categorised crime in public transport into:

- 1) Theft by stealth, which is largely a function of crowding on public transport vehicles, but which may also involve the unattended parking of bicycles and other vehicles;
- 2) Theft by force which can occur in crowded places, but it is more likely to occur in situations where the victim is relatively isolated. Theft by force includes vandalism and violent physical attack;
- 3) Sexual harassment, which with different degrees of violence can occur in either crowded or isolated situations; and
- 4) Political and social violence, which may have some transport significance (such as attacks on commuters travelling by rail, bus, or minibus) or for which the transport vehicle may simply be an opportune location.

From the literature, although crimes like fare invasion, pickpocketing, sexual harassment, other physical attacks and vandalism have been cited, terrorism seems to be the major security concern facing the developed countries especially in recent times.

On the African continent, countries like Kenya, Mali and Nigeria have experienced some form of terrorist attacks in recent times. However, the transport

system in particular has not been so much the target of these terrorist attacks in those countries. Although some of the security threats mentioned in the previous paragraph may be present in the transport sector on the African continent, the major security concern, especially in the road transport sector is highway robbery which includes attacks on public transport, assault and stealing of luggage or cargo (Oyinloye et al., 2022; Ugwuoke et al., 2021). Highway robbery attacks on public transport vehicles for instance is the biggest security threat in the road transport sector in Ghana (Sam & Abane, 2017). To deal with this threat, the highway patrol by the Ghana Police service has been introduced, coupled with the erection of barriers at some identified hotspots on some of the major roads. Some of the transport operators have also resorted to the use of armed policemen in plain cloths as escort on some of their long distance vehicles.

Statement of the Problem

A lot of the travelling public in Ghana depend on public transport to meet their daily transport demands (Ministry of Transport, 2008; Republic of Ghana, 2010). However, public transport is marred by safety and security threats. Road accidents or crashes for instance have become a daily concern of many Ghanaians (Abane, 2012) as travel has become part of people's daily activities (Hoyle & Knowles, 1992). Statistics from the National Road Safety Authority [formerly National Road Safety Commission {NRSC}] (NRSA, 2021) show that between 1991 and 2020, 302,711 road crashes, involving 477,609 vehicles were recorded in Ghana, out of which 18 percent involved public transport vehicles (buses and minibuses). The total casualty rate for the period was 412,514, out of which 50,311

people died, 154,629 sustained serious injuries and 207,574 minor injuries. Public transport alone contributed 34.15 percent to the total casualty rate and 19 percent to the total fatality rate. Of major concern is the fact that, most of those who die or are maimed through road crashes fall within the working age group and this has negative impact on the nation's economy.

Although several road safety interventions have been put in place over the years by the National Road Safety Authority (NRSA) and other stakeholders, road crashes and their attendant casualties continue to increase or fluctuate (NRSA, 2021). A lot of studies have also been done on road crashes locally (for example Abane, Akyea-Darkwa & Amenumey, 2010; Abane, 2012; Afukaar, 2001, 2003; Jorgensen & Abane, 1999) and suggestions have been made towards reducing these crashes and their effect on the country, but this has yielded little result. Abane (2012) for instance found that over 80 percent of road crashes in Ghana is because of human error. The data from the NRSA (2021) probably suggest that the interventions that have been put in place may not be effective or executed to the letter to curb the rising occurrence of road crashes. This assertion was previously emphasised by Abane (2004; 2012). Some sections of the public have blamed the continuous rise in road crashes to poor enforcement of road traffic regulations, which give room for recalcitrant drivers to misbehave on the roads in Ghana. This suggestion could relate to a systems failure as suggested by Petersen's (1975) accident/incident theory.

Another area of concern in road travel is the security of passengers and their luggage whiles trying to access the terminal, at the terminal and also in transit.

Highway robbery on public transport vehicles, for instance, has become a major concern as almost every week, there is a report of highway robbery attack on travellers on public transport in the media (Citi Newsroom, 2020; Ghanamma, 2020; Ghanaweb, 2019; Kojo, 2021). This situation may affect public transport use because, for various economic and social reasons, people would have to move from one place to another, and most of the time, the means of getting to these places is by public transport. Since, the product of transport service which the operator sells to the public is the arrival (Gubbins, 2003), all travellers expect to reach their destinations safely without harm or injury. It follows then that the public transport operator has the responsibility to ensure the safety and security of passengers and their luggage if they aim to sustain their businesses. The responsibility of providing safe and secure public transport however, cannot be left with the providers of public transport alone, but the government, as well as other institutions mandated with regulation and enforcement.

Lack of safety and security therefore influences public transport patronage, as people travel with the intent of feeling safe and secure on whatever means of transport that they choose, so they can get to their destinations. Most of the studies done locally (including Jorgensen & Abane, 1999; Abane, 2012; Afukaar, 2001, 2003;) focused mainly on road crashes. In recent times however, some studies have been on both safety and security on public transport (Sam & Abane, 2017; Sam et. al., 2018; Sam et. al., 2019). Sam and Abane (2017), for instance, focused on the safety and security interventions adopted by some public transport operators, in which they (public transport operators) enumerated several safety and security

interventions that they have put in place. However, 58.2 percent of passenger respondents believed public transport is unsafe. Further, 64.1% of the respondents expressed insecurity on public transport, while 67.8 percent felt unsafe using public transport. Notwithstanding their findings, some gaps were identified with the study. In the first place, Sam and Abane (2017) focused only on the safety and security interventions that had been put in place by the transport organisations themselves. Secondly, majority of the passenger respondents that were surveyed involved people who had attained tertiary education. This was probably based on a suggestion by Poku-Boansi and Adarkwa (2013) that people with formal education are usually engaged in activities that may generate increased number of trips. It is argued that of course, people with higher education may be considered very analytical and critical, who could paint a picture that would be close to reality. On the contrary, it is argued that people with less education may be less critical and analytical with issues, and may paint a picture that is different from what Sam and Abane (2017) found. Besides, the data collected on the perspectives of the respondents were not compared with any available secondary data on road crashes or security to ascertain whether the two reflect each other. Finally, it appears Sam and Abane (2017) focused on security at the transport terminals and in transit, but did not include security while accessing the transport terminal or station. Newton (2004) identifies three situations in which passengers could be attacked, namely; (1) while accessing the transport terminal, (2) at the terminal, and (3) in transit. This study therefore attempted to fill the gaps identified by assessing safety and security in road travel by trying to answer the following questions:

1. What is the state of road safety and security in Ghana?
2. How do operators, regulators and passengers perceive the state of safety and security in road travel?
3. How effective are the existing safety and security interventions?
4. What other interventions could be put in place to improve safety and security in road travel?

Objectives

The general objective of this study was to assess safety and security in road travel in Ghana. Specifically, the study sought to:

1. Examine the state of safety and security in road travel;
2. Assess the perceptions of operators, regulators and passengers on the state of safety and security in road travel;
3. Assess the effectiveness of the existing safety and security interventions; and
4. Explore other interventions that could be put in place to improve safety and security in road travel.

Significance of Study

This study is not only a response to current challenges but also a proactive effort to build a resilient and future-ready transportation system that prioritises the well-being and confidence of all stakeholders involved in road travel. In the first place, the study's comprehensive approach will ensure a holistic understanding of the complex issues surrounding passenger safety and security. This knowledge can empower decision-makers with nuanced insights, enabling them to formulate

policies and interventions that address the root causes of challenges. Additionally, by assessing the perceptions of operators, regulators, emergency service providers, and passengers, the study facilitates improved collaboration among stakeholders.

Understanding diverse perspectives fosters a cooperative approach, ensuring that interventions are not only effective but also well-received and supported by those directly impacted. Further, a thorough evaluation of existing interventions and the exploration of new strategies contribute to creating a safer and more secure road travel environment. This, in turn, enhances public confidence in the transportation system, encouraging more people to utilise road travel as a safe and reliable means of transportation. Last but not least, the exploration of novel intervention ensures that the study remains forward-thinking and adaptable to emerging challenges. This approach encourages the adoption of innovative solutions, leveraging technology and community involvement to stay ahead of evolving safety and security threats.

Delimitation

The study focused on public transport (transport service provided for a fee and open to all) in the road sector. Both private and state-owned transport organisations were considered for the study. Although the study was done in Accra, the capital of Ghana, the focus was on routes, rather than destinations or locations. This was because, some of the routes in Ghana are prone to road crashes as well as highway robbery attacks. The survey was therefore carried out at terminals that operated on those routes that were considered to be crash/robbery prone. The selected routes for the study were all long-distance routes that were beyond 200km. The major issues that were looked at included data on current road crash and

security situation in the country. The perceptions of operators, regulatory organisations, emergency service providers and the general travelling public were also sought, and these were compared with existing data to see if there was some form of correlation. Anything that was outside the issues listed was beyond the scope of the study.

Limitations

The major limitation to this study is the sampling method used in selecting respondents for the survey. Although this stage of the study was quantitative in nature, convenience sampling method was used in selecting passenger respondents for the survey. As has been expounded in the research literature, convenience sampling is not a probability sampling technique and this may affect the generalisability of the findings. Notwithstanding, this sampling method has been used in other transport studies across the globe, the results which have been generalised. Besides, the secondary data on road crashes for this study was purely quantitative which results is generalizable. On the contrary, data available on crime on the public road transport system was scanty and could not be subjected to any rigorous statistical analysis.

Definition of Terms

For this study, some of the terms used may differ in meaning from their everyday use. This section therefore tries to define some of the terms used in context of the study.

Safety, in the context in which it has been used refers to the absence of injury or harm to both passengers and their luggage and involves occurrences that could lead

to accidents (road crashes) arising from the movement of transport vehicles which results in injury or death to an occupant of the vehicle or any other road user and also damage to property. These occurrences, though they may arise mostly from human actions or inactions are not deliberate in nature. Safety is therefore a transport problem.

Security, on the other hand refers to any deliberate attempt by an offender to attack the transport infrastructure or occupants of transport vehicles. The intent is always to cause harm or accrue some personal benefit, and this may stem from political, economic or social misunderstanding, which compels offenders to commit crimes like terrorism or vandalism. It may also be for personal gains as in assault, pickpocketing, baggage theft, highway robbery and fare invasion.

Road travel has been used to mean travels by public transport (transport services provided by a third party and open to everybody who is prepared to use the service for a fee) and comprises activities that are undertaken from the point of access to the transport terminal, activities at the terminal and in transit.

Passengers connote people who have the intent of using a transport service for a fee, and are in the process of accessing the service, or are on-board a transport vehicle in transit.

Interventions refer to actual activities or programmes put in place by all stakeholders (central and local government, regulators, operators and passengers) to ensure that the use of public transport is safe and secure.

Operators refer to transport service providers who have the obligation to move passengers from one point to another with the view to generating revenue. They comprise both state assisted transport organisations as well as private ones.

Regulatory agencies refer to governmental organisations who are mandated to develop transport policies and ensure its implementation and strict adherence. They include the Ministry of Transport, the Driver and Vehicle Licensing Authority (DVLA), the National Road Safety Authority (NRSA) and the Motor Transport and Traffic Department (MTTD) of the Ghana Police Service. Emergency Service Providers are those institutions that provide post-crash services like rescue and treatment of accident victims. They include the Ghana Ambulance Service, Saint John Ambulance Service, Ghana Red Cross, and Ghana Health Services.

Organisation of the Study

The study is organized into nine chapters. Chapter one focused on the background to the study, statement of the research problem, objectives, research questions, significance of the study, delimitation, limitations, and definition of terms. Following the present chapter is chapter two which reviews literature on some conceptual and theoretical issues in transport, especially those regarding accident causation and transport security. Some of the issues discussed in this chapter include the systems concept, the concept of transport product and quality of service. Others are the domino theory, the human factors theory, the epidemiological theory, the risk compensation theory, the three-factor behavioural model, the accident/incident theory and the routine activities theory.

Chapter three, which is an extension of the literature review outlines some of the empirical reviews on some concepts in road transport accident causation and security. Among the issues discussed are causes of road crashes and their motivating factors, the effects of road crashes and some of the interventions that have been put in place to reduce the effects. The chapter also looks at some of the security threats that have been experienced in the transport sector in general, as well as specific threats in the road transport sector in particular. The chapter finally discusses some of the security interventions that have been adopted in some countries at both national and local levels.

Chapter four discusses the methodology adopted for the study. It starts by explaining the research design used and the philosophies that underpin the study. Other issues discussed include the study area, population, sampling methods and sample size used for the study and how it was arrived at, data collection procedures and instruments used. Other issues include data processing and analyses techniques, and how ethical issues were dealt with.

Chapters five to eight discuss the results of the study based on the research objectives. Chapter five looks at the state of safety and security in the public road transport sector by analysing available data from the National Road Safety Authority and the Ghana Police Service. Chapter six analyses the perceptions of public transport operators, regulators and passengers on the state of safety and security in Ghana. Chapter seven focuses on the impact of existing interventions in reducing road crashes and its attendant fatalities as well as ensuring passenger security on the public road transport system. Chapter eight explores other

interventions that could be put in place to reduce road crashes and improve security on public transport.

Chapter nine covers the summary, conclusion and recommendations of the study.

It also covers the contribution of the study to knowledge and explores avenues for further research on the topic or other related topics.



CHAPTER TWO

CONCEPTUAL AND THEORETICAL ISSUES

Introduction

This study aims at assessing road crashes and passenger security in the road transport sector in Ghana. This chapter is devoted to some of the conceptual and theoretical issues in transport operations, with special emphasis on safety and security. The chapter is structured into four sections: the first section discusses some basic concepts in transport that are relevant to the study topic. The next section focuses on a brief history of accidents and crime, whereas the third section discusses some of the theories that have been propounded to explain accident and crime causation, stressing the justification for selecting two of the theories for the study. The fourth section is devoted to a discussion of the conceptual framework that underpins the study.

Concepts in Transport

This section examines some concepts that are widely used in the transport business, and their relevance to this particular study. Some of the concepts that are discussed are the transport product, quality of the transport service, the systems concept, the concept of safety and the concept of security.

Transport product

The product of the transport service can be looked at from two perspectives: the production point of view; and the consumption point of view. The transport product, unlike a manufacturing product is intangible. As alluded to in chapter one,

transport is a derived demand in the sense that it is not sought for its own sake, but in order to fulfil another desire.

From the production point of view, which is the operator's perspective, the product that is sold to the customer is a seat for the passenger or space for the freight forwarder (Gubbins, 2003). Similarly, looking at the transport product from the point of consumption or the customer's perspective, what comes to mind first is a seat for the passenger and space for the freight forwarder. But the question that should be asked is why does the passenger need a seat, or the freight forwarder a space? The answer is, the passenger needs a seat because he/she wants to get to a place rather than where he/she presently is. The same applies to the freight forwarder who needs a space because he/she wants his/her goods to move from their current location to another location where the economic value will be higher. It follows then that the arrival of the passenger or goods is the product of transport, and this must be done safely without injury to the passenger or harm to the goods.

Faulks (1990) compares the product of transport service to a well-fitting suit, which is the end product of a tailor. Gubbins (2003) also agrees with Faulks that the product of a transport service is the arrival, but he further adds that the customer wishes to get to the final destination safely and within a specific time frame. This argument means that, as much as the customer wants his/her or their goods to get to the final destination safely, they do not want to stay in transit forever. Therefore, both safety and timeliness must be considered together when discussing the transport product, and that, one should not be sacrificed for the other. From the foregoing, it can be argued that the operator's knowledge and understanding of the

customer's expectations is what would propel the operator to provide quality service to the public.

Service quality

One of the factors that determine the demand for transport is the quality of service that is provided by the operator. Quality of service is a concept that embodies several sub-factors. Whereas Cole (2005) lists frequency and standard of service to comprise comfort, reliability and safety as indicators of quality of service, Gubbins (2003) adds speed to the list. Gubbins talks about safety separately because in his view, it is very paramount and strongly connected to the arrival, which is the product of the transport service. Iles (2005) also defines service quality as comprising reliability, punctuality, safety, convenience, comfort and security; and indicates that this should be the prime responsibility of a transport organisation to its customers. In a publication by Gromule, Yatskiv and Pepulis (2017) which assesses the safety and security of transport terminals, safety, security and reliability were placed at the base of a pyramid to indicate their fundamental importance to transport service. Other factors listed at the apex of the pyramid are experience, comfort, convenience and speed.

The systems concept

A system consists of a whole and not individual components or elements (subsystems) of a phenomenon. The concept is widely used in many organisations and disciplines. The concept postulates that the whole, or totality of a system is better than the sum of its parts (Gubbins, 2003). The concept looks at the synergy, or collective effort that an organisation or system can achieve as compared to the

individual efforts of the subsystems. According to proponents of the concept, a system has parts, with an interrelatedness and interdependence between the parts (Shaw, 1993). This means that a change in one of the component parts affects the other parts. The parts in a system are therefore held together in an organised way, and each part plays a role in the system in a hierarchical manner. If one part fails to function effectively, we can talk about sub-optimality in the performance of the whole system. It follows then that there should be no conflicting objectives within a system, but rather, all the component parts in a system must have a common objective.

The application of the systems concept to transport operations first looks at transport as a system comprising the vehicle, the way and the terminal. All these three components must be present for the transport system to operate effectively. Secondly, the systems concept looks at the transport organisation as being an interconnectedness of various departments that must equally function for the organisation to succeed. Thirdly, the transport vehicle itself is also a system comprising various parts that come together for the vehicle to function. Finally, the concept applies in other aspects of the transport business including safety regulation and provision of security. Regulation focuses on three elements, as well as three thematic areas that must be given equal attention at any point in time. In the same way, security also has various components that must be considered systemically.

The concept of safety and its importance in transport

Safety is an issue that is discussed in every field of endeavour including the home. Whenever the issue of safety is discussed, what comes to mind is accident;

and accident connotes injury or death to humans, as well as damage to property. Booth and Lee (1995) assert that safety aims at intervening in the accident causation process by trying to break the causation chain. This assertion implies that safety management involves the identification and assessment of risks, monitoring and controlling of hazards, but of utmost importance is the detection and prevention of latent and active failures in the work process.

The concept of safety from the traditional safety management viewpoint is more reactive than being proactive (Booth & Lee, 1995; Herrero, Saldana, Del Campo & Ritzel, 2002). This is because the traditional method of safety management focuses on investigating and analysing accidents that have already occurred and putting in measures to ensure that such accidents do not reoccur. In view of this, the concept of safety is now moving from the traditional method of management to what is termed “total quality management”. The concept of safety can therefore be described (especially in terms of transport) as the absence of injury or death to humans, as well as damage to property and other resources. The same explanation could apply to safety in both the home and the workplace.

Security and transport

The concept of security is interpreted differently by various schools of thought. Some define the concept from the military perspective, indicating that the security of a nation depends on the strength of its military power (Baldwin, 1997; Moller, 2000; Soltani & Yusoff, 2012). Moller especially asserts that security has a military connotation. Both Moller (2000) and Soltani and Yusoff (2012) quote Wolfers (1952) as the only one who defined security in terms of the absence of

threats and fear. However, this definition has been explained differently from the perspective of rationalism, reflectivism and constructivism (Soltani & Yusoff, 2012).

Rationalism is based on positivism and the argument that facts and values are not the same but rather different things (Soltani & Yusoff, 2012). Accordingly, empirical validation and falsification can be used to unearth the regularities of social phenomena. However, there are two perspectives of rationalism which are realism and liberalism. The difference between the two, according to Soltani and Yusoff (2012) is that, whereas realists believe in the fact that states cannot trust other but themselves in terms of security issues, the liberalists support the relationship among states and argue that it has the potential for progress and purposive change.

Reflectivism sees the realist approach to explaining security as problematic because in its view, there is no single fact to be discovered. Constructivism on the other hand believes that internal norms of states are determined by practice. Therefore, terms like territoriality, security, enemy and threat are constructed by the practices of agents (Soltani & Yusoff, 2012). Consequently, constructivism believes that realities that can be understood through observation cannot be ignored as suggested by rationalism and reflectivism.

Arguing from Wolfers' contention on the specifications of security, Baldwin (1997) contends that the issue could be dealt with by taking into consideration the actor, the values in question, the degree and kind of threats, means of coping, cost involved, and the time frame. Based on this argument, Baldwin

(1997) asserts that the concept of security has now been expanded from its focus on military connotation to embrace economic security, environmental security, identity security, social security, food security, and many others including transport. Regarding transport security, the European Commission (2012) emphasises any unlawful and deliberate attack on the transport infrastructure, the vehicle or its occupants. Attacks on transport come in various forms, one of which is terrorist attacks that could be targeted at the transport infrastructure or the vehicle (Edwards & Goodrich, 2013). Another form of attack is vandalism to the transport vehicle, especially, the spraying of graffiti on windows and slashing of seats which has been identified in the developed countries (Newton, 2014). Other security threats that have been identified in other jurisdictions are robbery attacks on both passengers and goods, as well as baggage theft and assault (Oyinloye et al., 2022)

A Brief History of Accident and Crime Causation

This section briefly reviews the history of accident and crime causation and how they have evolved over time. The discussion links the historical background of accident and crime to present day understanding of safety and security generally, and specifically to the transport industry.

History of accidents

The history of accidents cannot be specifically traced to a particular period of time. However, Loimer, Driur and Guarnieri (1996) argue that the word accident itself has a biblical interpretation which is referred to as an 'act of God'. This explanation of accidents means that, they are occurrences that cannot be predicted, but most writers refute this claim and argue that accidents occur because of human

errors. Loimer et al. (1996) cite an example of two professionals in the field of injury prevention (William Haddon and Donald Robinson) who imposed a fine on the use of the word accident by their followers, and rejected its use outright.

Loimer et al. (1996) also trace the use of the word accident to Aristotle, who they claim to have used it to define nonessentials or extrinsic characteristics. The authors indicate that the Greek, Roman, and medieval philosophers applied Aristotle's definition of accident to questions of law and causation. At the peak of Norman influence around the 14th century, Loimer et al. explain that the English began to use the word accident in a different perspective to explain occurrences which happen by chance, a misfortune, and an unexpected happening which cannot be foreseen.

During the industrial revolution, accidents were much attributed to human errors and negligence, and not an act of God (Loimer et al., 1996). The use of the word accident in the legal fraternity has also been debated for long, and it is said that no definite legal interpretation has been given to the term. The consensus reached by the legal fraternity is that, an accident can only qualify to be an act of God if the cause is due to natural occurrences without human intervention. The modern use of the phrase act of God to represent accident (according to Loimer et al.) is attributed to a biblical translation of Exodus 21: 12-13 (especially verse 13 in the Living Bible published in 1971) which used accident to mean an unintentional committing of murder by a person. Loimer et al. assert that the translation in the Living Bible is a paraphrase of the Old Testament sources and that, it (translation) did not exist in the bible until the mid-1960s. The argument is

that God cannot be blamed for occurrences that arise from human errors and negligence.

Loimer et al. (1996) conclude that the use of the phrase 'act of God' to mean accident in the medieval world was understandable because there were no scientific tools to investigate causation. This conclusion may mean that the existence of several scientific tools in the modern world to investigate causation negates the attribution of occurrences to God; therefore, the use of the term accident may not be appropriate. It is not surprising that investigators of safety issues in the transport sector (especially the road transport sector) over the past few decades are moving away from the use of accidents to crashes. Perhaps, due to such uncertainty in the definition, and the fact that the presence of human factors dominates in most vehicular accidents, the WHO in 2004 decided on the word crash rather than accident.

History of crime

Crime is something that probably has been with humans since they inhabited this earth. Although it is common knowledge that humans inhabited the earth before the Bible was written, the first record of crime may be traced to Genesis when Cain is purported to have clubbed down his brother Abel to death out of jealousy. Glaser (1979) asserts that ancient and medieval societies attributed the cause of crime to demonic influence, but other societies have also had the belief that some humans are inclined to engage in illegal activities in which they will incur some profit or pleasure unless they are aware and afraid of the consequences of such activities which are in the form of punishment.

Sharpe (1982) tried to look at the history of crime in late medieval and modern England by reviewing what other crime historians have written. One of the difficulties the author identified is the problem of defining crime. According to Sharpe, the term 'crime' has different meanings to different historians, and that the use of the word in its modern understanding was not familiar throughout the period. He asserts that the term 'crime' in present-day England connotes activities which are as disparate as careless driving and rape. He further explains that this problem of explanation to crime also existed in past centuries. Another difficulty that Sharpe identifies is the distinction between crime and sin. To buttress this argument, the author adopts what is termed 'institutional' definition which looks at crime as any act or behaviour that is illegal which attracts certain penalties imposed by the law courts if the act is detected and prosecuted based on a criminal charge. The question that arises is whether the definition means that illegal activities that are not detected and prosecuted before a law court cease to be classified as crime.

Sharpe (1982) in his review indicates that in the 1600s, the parish courts considered acts such as treason and felonies as well as sexual immorality as crime punishable by law. The level of punishment however depended on the gravity of offence as was decided by the parish courts which were mainly presided over by people who were not professionals in the legal system. Another issue identified by Sharpe is the segregation of the communities in the medieval ages into the elite and rich as against the poor in the society. He asserts that whereas the rich were considered noble and respectable, the poor were labelled as lawbreakers in the society. Those who were selected to be parish officers to enforce the law were

selected from the rich and elite. This led to selective application of the law in that the law enforcers had the discretion to decide which individual went to court and why they should do so. The dependence on the population at large (especially the rich and elite but who were not professionals) to serve as officers and prosecutors of the law enforcement system was problematic.

Sharpe (1982) concludes that the definition of crime has not changed much. On the contrary, he argues that enforcement of the law can be said to have seen a change between the medieval ages and modern times. This assertion is based on the fact that in the medieval ages, law enforcement was decentralized and left in the hands of the local communities. In modern times however, law enforcement is left in the hands of public agencies and the state who use the police and the prison system to enforce the law. Additionally, law enforcers in modern times are trained professionals who are well abreast with the law and the judicial system. In the twentieth century in particular, a lot of theories have been propounded in the bid to understand why people commit crime and what motivates them. Some of these theories would be discussed in the next section.

Theories on Accident and Crime Causation

The previous sections covered some basic concepts that are relevant to this study and also the history behind accident and crime causation. This section discusses theories intended to explain accident and crime causation. Among the theories discussed are the domino theory, human factors theory, accident/incident theory, systems theory, epidemiologic theory, the three-factor behavioural model, risk compensation theory, and risk homeostasis theory. The rest of the section looks

at theories of crime causation including the deterrent theory, rational choice theory and the routine activities theory. The behavioural change communication model which does not belong to any of the two theories of causations is also discussed based on its usefulness to the study. The section ends with an outline of the justification for selecting two out of the many theories discussed as frameworks for the study.

Accident theories and their application in transport

The domino theory

The domino theory, propounded by Heinrich in the year 1932 is one of the early scientific theories used to explain accident causation (DeCamp & Herskovitz, 2015). Heinrich used the analogy of dominoes falling over each other, resulting in a chain of events. According to Heinrich, when dominoes are connected and one domino happens to fall over, it tips the next domino, and the sequence continues until all the dominoes fall over. Should any of the dominoes be successfully removed, the entire process is likely to cease. Five stages of accident causation were identified by Heinrich. The first stage is the social environment and ancestry which entails anything that may result in producing undesirable traits in people, for example alcoholism. The second stage in the process is faults of a person, which relates to personal characteristics that could lead to accidents, such as bad temper, recklessness, disregard for safety precautions, and ignorance. Unsafe act or condition is the third stage, and this marks the beginning of a specific incident. This stage relates to some actions or inactions of the individual that can lead to an accident, for example, performing a task without the necessary personal protective

equipment (PPE) or failing to carry out required maintenance and repairs which could result in an accident. The fourth stage is where the actual accident occurs, which may lead to injury or damage to property. The final stage is injury, which is the unfortunate outcome of some, but not all accidents. Some accidents may not result in injury or damage, but whatever the outcome, an accident has taken place.

Heinrich asserts that a personal injury occurs only as a result of an accident, which is the result of a personal or mechanical hazard. Personal and mechanical hazards stem from carelessness of people, or poorly designed and unmaintained equipment. Further, personal faults are inherited or acquired because of the environment or ancestry; the environment being where and how a person is raised and educated. In the view of Heinrich, the point of intervention in the process should be the accident itself. Some corrective measures that have been suggested to minimise the incident include: (a) engineering, which emphasizes control of hazards through product design; (b) education, which focuses on training workers in all aspects of safety, and also drawing the attention of management to the benefits of ensuring safety in their organisations; and (c) enforcement, which relates to ensuring that internal and external rules, regulations and standard operating procedures are strictly adhered to by both employees and management (Cleveland State University, n.d.).

Human factors theory

In contrast to the domino theory which looks at accident causation in a linear manner, the human factors theory which is attributed to Ferrel incorporates several causes which are specific. According to this theory, accidents occur because of

errors caused by individuals (Cleveland State University, n.d.). In view of this, Ferrell explains his theory by assuming that accidents are caused by one person. The causes identified by the human factors theory as leading to accidents have been put under three general categories: overload, incompatibility, and improper activity (DeCamp & Herskovitz, 2015).

Incompatibility involves both an incorrect answer to a circumstance by a person and subtle environmental features such as inappropriately sized workstations. Overload is a situation where the task assigned to an individual is beyond his/her capability, and this includes physical and psychological factors which are also influenced by environmental, internal, and situational factors. Physical factors include fitness, training and genetics; psychological factors include motivation and agitation, whereas environmental factors include difficulty of task, noise, distraction, etc. Situational factors include exposure to drugs and pollutants as well as job-related pressures and stresses. Improper activity involves two things the person responsible for the task may lack knowledge of; or the person may know but will deliberately take the risk.

Accident/incident theory

The accident-incident theory was proposed by Petersen (1975) as an extension of the human factors theory, which seeks to explain industrial accident causation and prevention. Petersen agrees with Ferrell on the issue of overload which is caused by the capacity, state or load in the system. Notwithstanding, Petersen introduces some changes or modifications to the human factors theory. In the first place, Petersen talks about ergonomic traps (workstation design and display

and control) which he conceptualizes as environmental aspect of incompatibility. Secondly, Petersen separates decision to err from the overload factor. With the decision to err, Petersen gives reasons such as logical decision that arises from a particular situation like that arising from financial cost and temporal deadlines. Another reason that he alludes to, is an unconscious desire to err which arises from psychological failings and downplaying the probability of an accident occurring. Petersen further asserts that, downplaying the probability of an accident occurring can include the natural human inclination to disregard personal mortality, and the notion that actual instances of accidents are extremely unlikely to occur. Petersen explains that human error in accident causation is only a part of a bigger model. The final component that Petersen adds to the human factors theory is labelled systems failures. This, he explains is the inability of an organisation to correct errors, which may act as a possible mediator between errors and accidents. These failures in the system may arise from possible occurrences such as failure of management to detect mistakes and correct them. Lack of adequate training for personnel, and poor organizational policies that aim at correcting human errors could also lead to systems failure which could eventually result in accidents. This study uses the accident/incident theory (especially the decision to err and the systems breakdown aspects) to explain the crash situation in Ghana. This is because Ghana's crash situation is perceived to be characterised by lack of enforcement, which leads to total disregard of road traffic regulations.

The systems theory

Whereas the theories discussed so far focus on human errors and flaws in the environment that can cause accidents to occur, the systems theory takes a different approach towards the relationship between humans and their environment (DeCamp & Herskovitz, 2015). The theory focuses on the harmony between man, machine, and environment. It assumes that the chances of accidents occurring are low under normal circumstances, until some disruption is caused to the harmony. This disruption could be by changing a component or changing the relationship between the three components. This situation could greatly increase the probability of an accident occurring. Risk taking is also an aspect of the systems model. Every task that is performed by the individual has some form of risk attached to it. In taking a decision to perform or not to perform a task, there is always a comparison between the associated risks and the benefits that the individual will accrue. If the benefits far outweigh the risks, one may go ahead to perform the task. In the view of Firenze (as indicated by DeCamp & Herskovitz, 2015), five calculated risks and benefits should be considered in deciding to perform a particular task:

1. Job requirements
2. The capabilities and limitations of the worker in relationship to his/her job
3. The potential gain upon succeeding
4. The potential consequences upon failure
5. The potential loss of not attempting the task.

After an initial attempt to a particular task, some additional information may be gained through feedback. This implies that, a task that has been done over and over again would have more and well-known information about the risks and benefits

associated with the task. Information on risks and benefits to a new task on the other hand is likely to be more unknown (Cleveland State University, n.d.). The advantages of the systems model of safety management is that it does not look at the individual components of accident causation in isolation, but looks at the components holistically. In a systems safety analysis (example the use of fault tree analysis), the focus is on eliminating and controlling hazards by considering the interactions among components and not just components failures, and also the inclusion of non-technical aspects of systems. Road accidents for instance are seen as failures of the interaction between vehicle, driver, and the road infrastructure rather than the failure of the driver. The major disadvantage of the systems approach to safety management is that highly reliable systems may be unsafe whereas safe systems may not be reliable.

Epidemiologic theory

The epidemiologic theory of accident is attributed to Gordon (1949) who considered accidents as an ecologic problem. Just like the disease ecology, the causative factors of accidents are said to arise from the interaction between an agent, a host, and the environment. In the disease ecology, a satisfactory equilibrium adjustment between the host and the environment leads to health or wellness (Gordon, 1949). On the contrary, if this equilibrium is significantly disturbed, it leads to disease or injury. A disturbance of the equilibrium may arise because of some principal action of the agent, some characteristics of the host, or environmental conditions. However, a disturbance is most caused by a combination of the three factors stated above, and these constitute the fundamental factors of

causation. In finding a remedy therefore, Gordon (1949) suggests that it must be suited to the whole of the cause as it lies in the host, agent, and environment.

Some of the host factors in accident as identified by Gordon (1949) are age, sex, race, genetic inherent susceptibility. Just like diseases, the agent factors that underlie accidents are physical, chemical and biological in nature. According to Gordon (1949) the relevance of the many classes is greater in some types of accident than in others and the kind of agent within a class is potentially great. Due to the inability to separate mechanism from the real agent, knowledge about the agent is not too satisfying. The mechanism of accident creation is the process by which the three components interact to create a consequence, the accident, it is not the cause of the accident. In classifying accidents by types, the knowledge of kinds of mechanisms has the advantage of enhancing the ease of classification. For example, a particular event may be attributed to cutting or piercing, collision, or crushing, but the agent in all three scenarios could be a glass panelled door. A fall on the other hand, could be related to such different agents as a defective staircase, a playful dog, or a misplaced handbag.

Environment consists of three key components, the physical, the biological and the socioeconomic (Gordon, 1949). The physical environment has to do with matters of climate and weather issues, seasonal and topographical issues, with soil and landscape, and other physical structures of the earth where human beings reside. It is possible to take the biological aspect of the environment to include the universe of living things surrounding man, everything other than man himself. The outcomes that arise because of interactions and association with fellow humans

constitute the socioeconomic aspect of the environment. Environment, so considered, sometimes exerts an effect on disease through direct action on host or agent, and sometimes on the processes that bind together or determine interaction between host and agent. This theory may have influenced that proposed by Meade et al. (1988) as they have virtually same characteristics. Like the systems model, the epidemiological theory also provides the advantage of assessing the causation of accidents through the interaction between the various components rather than dealing with the components individually. The only disadvantage in applying the epidemiological theory to assessing road accidents causation may be the identification of factors that relate to agent and host in the disease ecology. This has however been successfully tested by Jorgensen and Abane (1999) in their modified framework known as the three-factor behavioural model.

Three factor behavioural model

The three-factor behavioural model was adapted by Jorgensen and Abane (1999) based on Meade, Florin and Gesler's (1988) three-factor typology for disease causation namely population inhabiting an area, behaviour of the population, and the habitat (environment where the population dwell). The interaction between and among the three component factors, which is depicted in the form of triangle (Figure 1), determines how a particular disease spreads in the community. This model is similar to the epidemiologic triad which is also used to explain the spread of communicable diseases among a particular population. The component factors of the epidemiologic triad however are the agent of disease causation, a host who is susceptible, and the environmental factors that make it

conducive for the disease to spread (Centers for Disease Control and Prevention [CDC], 2006).

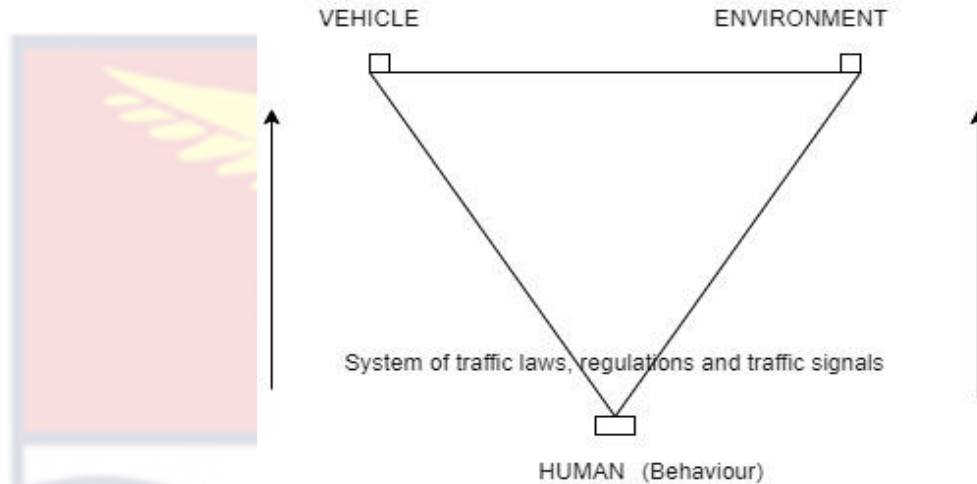


Figure 1: Three Factor Behavioural Model
Source: Jorgensen and Abane (1999)

Jorgensen and Abane (1999) adapted Meade et al.'s (1988) model to explain the factors that contribute to road traffic crashes. The adjustment made by Jorgensen and Abane include the vehicle which corresponds to the vector in disease ecology, the environment representing the road system and wider physical and built-up environment, and the behaviour of the population representing the socio-demographic characteristics of the population including attitudes, perceptions and behaviour displayed on the road. Abane (2012) further explains that the categorisation makes it possible to isolate key variables for the purposes of planning and policy. Further, the model indicates how the factors generally interact, allowing us to understand that most of the crashes are a combination of various circumstances.

Human attitudes and behaviour are known globally to contribute between 80-90 percent of all road crashes (Abane, 2012). There are three fundamental

components of attitude namely perception (emotional impression), cognition (thought) and behaviour. Perception is largely an enduring predisposition towards a specific service or an environment. Attitude influences behaviour and so actions arising from people's attitude are likely to have either positive or negative implications for what one is doing, including of course driving. Some of the behaviours identified are driving under the influence of alcohol and other abusive substances, speeding, disregard to road traffic regulations, fatigue driving and the use of mobile phones while driving. In order to control negative behaviours by road users, a system of traffic laws, regulations, and signals are developed and enforced.

Risk compensation hypothesis

The risk compensation theory (otherwise referred to as Peltzman's hypothesis) was proposed by Dr. Sam Peltzman of University of Chicago in 1975. His hypothesis was used to assess accident rates and casualties for the period 1947-1965 before and 1966-1972 after the mandatory installation of accident protective devices in motor vehicles in the United States. Based on time-series and cross-sectional accident data, he hypothesised that the installation of protective devices such as seat belts, energy absorbing steering columns, padded instrument panels, penetration-resistant windshields, and dual braking systems did not reduce accident rates or occupant deaths as suggested by the regulatory bodies. Rather, the mandatory installation of protective devices influenced drivers to take more risk in the form of increased driving intensity, which resulted in increased road crashes and a shift from occupant to non-occupant deaths, for example, pedestrians and property damage (Peltzman, 1975).

The risk compensation theory has been strongly criticised by researchers who applied the theory to bicycle riding and the wearing of helmet (for example Thompson, Rivara & Thompson, 2000). Most of the studies disputed the fact that the mandatory wearing of helmet influenced any behaviour change of riders, therefore the hypothesis could not hold. Notwithstanding, other researchers who also applied the theory in the same field of study as those who disputed it, found some evidence of behaviour change in the experiments they conducted. Phillips, Fyhri and Sagberg (2012) conducted an experimental study with bicyclists and found some evidence of risk compensation, especially with those cyclists who were regular wearers of helmet. Another experimental study was conducted by Streff and Geller in 1988 which involved between-subject versus within-subject. The study used 56 undergraduate psychology students from a large south-eastern university who were randomly assigned to four groups. The research found no risk compensation effect between-subject, but with the within-subject on the other hand, some evidence of risk compensation was detected. Sam (2012) also used this theory to study the determinants of road traffic crashes on the Accra-Cape Coast highway in Ghana. The study found that demographic factors such as age and gender affect driver speed choice and risk taking behaviour. Other factors that were identified are driving experience and the model of vehicle, including safety gadgets installed in it and the trust that those gadgets will work effectively in the event of a crash.

The risk homeostasis theory

Wilde (1982) propounded the risk homeostasis theory as a hypothesis of the dynamics of how humans conduct themselves in the face of risk. It posits that a

person, while driving an automobile behaves in a way that may be interpreted as a self-regulation process that is homeostatically controlled. The theory further asserts that allowing people to take risk in one way will encourage them to take more in another. The theory explains that when people are faced with a particular risk, their perception of the risk (which may be high or low) and their target level of risk (risk the individual is prepared to take) come into play, and the difference between the two will cause the individual to take action towards the risk. The theory further states that whether the individual will take action is dependent on the ability to be safe and the willingness to be safe. The ability to be safe are the skills set that the driver possesses to control the vehicle into safety in the face of a risk, whereas the willingness to be safe is the driver's decision to take the risk or avoid it.

According to Wilde (1982), a number of factors influence the quality of information that is taken in, the level of anticipations, verifications, estimations of risk, comparison with the target level, decision taken and action executed upon the vehicle controls. Wilde also categorised these factors into cognitive states and motivational states, and indicates that they correspond with the distinction between the driver's ability to be safe and his willingness to be safe. He further indicates that both categories are characterised by long-term variations between drivers, as well as by trip-specific and temporary variations between and within individuals.

Three types of skills have been identified by Wilde (1982) that influence the behaviour of a driver. The degree to which the subjective risk relates to the objective risk is defined by perceptual skills. The ability of the driver to make prompt decision on the action needed to bring out the desired outcome is referred

to as decisional skills, while vehicle handling skills determine whether the driver is capable of effectively carrying out the required action to achieve the purpose. Wilde then asserts that the ability to execute all the three types of skill may be improved by driver education, by the standards of licensing, or by an ergonomically designed environment, including road geometry, signalisation, and controls and displays in vehicle design. He however cautions that such improvements are not likely to have a lasting effect upon the accident rate.

Regarding driver behaviour, three initial responses to the introduction of an intervention that is non-motivational are likely to occur (1) if anticipation is correct, behaviour will change, but no measurable change in accident rate will occur; (2) if anticipation results in overestimation of the intrinsic safety benefits, an increase in accident rate may follow; and (3) if the intrinsic safety benefits are underestimated, accident rates will drop.

Wilde (1982) identifies two types of accident countermeasures which are non-motivational and motivational. Non-motivational countermeasures include the improvement in the crashworthiness of the vehicle, designing a better highway, or improving the vehicle control skills. He argues that these non-motivational countermeasures may not reduce accident rates but rather encourage drivers to drive at higher speeds, which could result in the occurrence of the same accident rates that the countermeasures seek to reduce. On the other hand, motivational accident countermeasures which seek to reduce the target level of risk and increase people's desire to be safe can lead to enhanced safety. In general, Wilde suggests four ways in which the target level of risk may be lowered, namely:

- 1) Reduce the expected benefit of risky behaviour;
- 2) Reduce expected cost of cautious behaviour;
- 3) Raise the expected benefit of cautious behaviour; and
- 4) Raise the expected cost of risky behaviour.

In summary, the theory of risk homeostasis shows that in order to obtain a lasting effect of accident reduction interventions (per time unit of exposure or per capita), road users should not be provided with measures that give them more opportunity to be safe, rather, measures that increase people's desire to be safe should be put in place in order to achieve enhanced safety.

The risk homeostasis theory has received several criticisms from some researchers for various reasons (see Brindle, 1986; Evans, 1985, 1986; Joubert, 1985; Lund & Zador, 1984; McKenna, 1985a, 1985b; Shannon, 1986). In a rebuttal to some of these critiques, Wilde (1988) remarks that the risk homeostasis theory was propounded with the view to offer an explanatory model of accident causation rate per kilometre driven, per hour of exposure to road traffic and per capita, as well as of the relationship between these different rates.

It has been observed by DeCamp and Herskovitz (2015) as well as the Cleveland State University (n.d.) that not all accidents can be explained by a single accident causation theory. They assert that each theory tries to explain some part of accident causation. In view of this, two or more theories may be combined to explain a particular type of accident depending on what one seeks to explain.

Theories of crime causation

Deterrence theory

The deterrence theory was proposed by Ceasar Beccaria in 1764. The theory assumes that humans are rational beings capable of thinking through issues critically before taking a particular action (DeCamp, 2015). This rationality of humans is referred to in modern criminological studies as 'hedonistic calculus'. For example, if someone decides to steal a particular item, he/she is likely to weigh the pleasure of owning that item as against the displeasure of not owning it. Secondly, the person may weigh the displeasure of parting away with money to own the thing as against the consequences that will be suffered by acquiring the item through foul means. In this case, stealing may be the best option of acquiring the item, as the offender will be punished only if he/she is apprehended. In effect, the offender may choose the pleasure of owning the item over the consequences that will be suffered if he/she is caught.

To deter an offender from engaging in a crime therefore, the punishment to a particular offence must far outweigh the pleasure that would be inured from the offence. The punishment must have three elements:

1. Severity-which means the extent of punishment should be in line with the offence committed. Beccaria suggests that when the punishment goes beyond a certain level, people may not relate it to the offence committed, and as a result it may not deter them from committing similar offence
2. Celerity-which relates to the swiftness of dealing with criminal cases. The swifter the case is dealt with, the more people relate the punishment to the offence

3. Certainty-this means the likelihood of punishment being meted to an offender. If people know that they will be severely punished for committing an offence once they are caught, they are likely to think twice before attempting to commit such offences.

The deterrence theory has been divided into general deterrence and specific deterrence (DeCamp, 2015). The general deterrence focuses on the willingness of the public to commit crimes after they have heard or witnessed the punishment of an already existing criminal. Specific deterrence on the other hand focuses on the individual being punished. The proposition of the specific deterrence is that if an individual commits an offence, and the offender is caught and punished, it will deter that individual from committing a similar offence in the future. However, it utilises much of the same concepts as the general deterrence theory. Some of the variables of interest in the theory include context variables, present conditions of life and situational variables. Situational variables are of most concern because they may be affected by a person outside the personal life of the potential offender. The simplicity of the deterrence theory limits its explanation of the elements of crime and criminality.

Rational choice theory

The rational choice theory proposed by Clarke and Cornish (1985), is an improvement or upgrade of the deterrence theory. Unlike the deterrence theory, the rational choice theory moves further in explaining the elements of crime (DeCamp, 2015). The theory assumes that every crime has a purpose behind it; this purpose usually benefits the offender. The theory further assumes that the offender lacks the

ability to properly analyse all the benefits, as well as the risks involved in committing a particular crime. The inability of the potential offender to perform a proper analysis of the benefits and risks associated with a crime does not arise from a mental deficiency that the offender may have, but because it is impossible for the individual to comprehend all possible benefits and risks as well (DeCamp, 2015). This situation, according to the theory, can lead to high possibility of potential offenders to make wrong decisions regarding the actions they take. The rational choice model has three components: (i) initiative, which leads to the first offence; (ii) habitation, which means continued offending; and (iii) desistance, that is either becoming a non-criminal at a point, or moving to a different crime. The rational choice theory is said to have been in existence in many forms in the study of crime in the last few decades. Notwithstanding, it is perceived to be a relatively simple model that often fails to explain all the elements of crime and criminality.

The routine activities theory

The routine activity theory was propounded by Lawrence E. Cohen and Marcus Felson in 1979 to explain the crime rate trends in post-World War II United States. Prior to the propagation of this theory, most existing theories that explained why crimes are committed focused on the characteristics of offenders. Instead of following the norm, Cohen and Felson (1979) decided to shift their focus from the characteristics of offenders to the circumstances in which predatory criminal acts are committed. They contend that most criminal acts require the convergence in time and space of motivated offenders, suitable targets and the absence of capable guardians against crime. They explain that the lack of any of these components is

sufficient to prevent an effective direct-contact predatory crime from occurring. In addition, they claim that the convergence of suitable targets and the absence of capable guardians in time and space can lead to significant increases in crime rates without any rise in the structural factors that motivate people to engage in crime. The key hypothesis of their theory was that the dispersion of activities away from households and families increases the risk of crime and thereby produces higher rates of crime.

The proponents of the theory believed that the nature of routine activities influences the prospect of criminal activities, which consequently affects trends in a class of crimes they refer to as “direct predatory violations”. Their explanation of predatory violations is unlawful actions in which an individual or property of another is certainly and deliberately taken or abused. In addition, their review was limited to those predatory violations involving direct physical contact between at least one individual or object that the perpetrator is attempting to take or destroy.

In the view of Cohen and Felson (1979), the effort to reduce predatory violations must involve critical control of activities. In effect, a decrease in controls through routine activities is likely to cause an increase in illegal predatory activities. This assertion suggests that if controls through routine activities is strengthened, illegal predatory activities are likely to decrease. The theory further argues that some factors such as value of an object, physical visibility, access and inertia are likely to reflect target suitability. Further, the theory argues that advancement in technology can aid an offender to commit crime easily, but can also help the capable guardian to effectively protect the suitable target. Cohen and Felson (1979) assert

that a capable guardian may be a person, a structure (for example a wall or fence), or technological devices that are used for surveillance.

The findings from the research of Cohen and Felson (1979) indicated that routine activities may indeed provide the opportunity for many illegal activities to occur. They describe routine activities as any recurrent and prevalent activities that regardless of their biological or cultural origins, provide for the basic population and individual needs. These involve formalized work, regular food, accommodation, sexual outlet, leisure, social interaction, learning and child-bearing provision. These activities may go far beyond the minimum thresholds required to avoid the extinction of a population, as long as their prevalence and recurrence makes them a part of daily life. Routine activities, according to Cohen and Felson (1979), can take place at home, in jobs that are sited away from home, and in other activities away from home. Cohen and Felson argued that since World War II, there has been a major shift of routine activities from home-based to job and other activities from home, and this shift increases the probability of motivated offenders and suitable targets converging in time and space without the presence of a capable guardian. This situation could lead to a significant increase in direct-contact predatory crime. The routine activities theory is used to explain security in travel in Ghana in this study. This is because transport is considered a routine activity that takes people away from their capable guardians, which may expose them to criminal attacks.

Adapting the Behaviour Change Communication (BCC) as an Intervention to Improve Transport Safety and Security.

It has been observed that close to 90 percent of road crashes are caused by human factors. Most transport safety interventions therefore are geared towards reducing the human factors, and one such intervention is education which aims at providing the requisite knowledge to road users and also influence their behaviour. One of the strategies that could be adapted to influence the behaviour of road users is the behaviour change communication framework. Behaviour change communication (BCC) is neither a concept nor a theory, but rather an intervention strategy developed by the United Nations Population Fund (UNFPA) to address population and reproductive health issues. The United Nations Population Fund (2002) defines BCC as a phase of some involvement in the development of communication strategies with individuals, communities and/or societies to encourage healthy behaviours relevant to their settings. Chen (2006) also describes BCC as a series of structured communication interventions and processes aimed at influencing social and community norms and fostering a better quality of life through individual behavioural improvement or positive behaviour maintenance.

Behaviour change communication has shown to be an educational intervention that has a near interface with education and communication. The interpretation of a desired improvement in behaviour of the target group is a strategic and group-oriented mode of communication. It offers a welcoming atmosphere that helps individuals to initiate and retain meaningful and beneficial behaviour outcomes. It is important for success to be able to formulate the correct

messages tailored to particular audiences using the most suitable medium. An effective behaviour change communication needs a lot of research and careful preparation on the subject's information material and target group's behaviour / attitude pattern. In the context of transport safety, BCC is critical to addressing among others, responsible risk reduction behaviours, preventive behaviours and knowledge on road crashes and associated hazards.

Behaviour change communication has its roots from and draws on over seventy theories and models of behaviour change, some of which are health belief model, theory of reasoned action, and stages of change theory. A sequential steps of assessment, communication analysis, action and evaluation, a process popularly referred to as ACADAE is associated with an effective BCC intervention (Chen, 2006).

Assessment of individual and societal behaviours that impact on road crashes is very critical. Prior to developing any programme, there is the need to conduct an assessment and analysis of the situation at hand. An assessment should be based on evidence drawn from empirical and qualitative data. Data for assessment can either be from primary or secondary sources. Chen (2006) asserts that assessment must identify the immediate, underlying and root causes of the problem, as the solution to a problem begins with an in-depth analysis of the causes and effects created by the problem. A problem can be due to behavioural or non-behavioural causes. BCC focuses on reorganising behavioural conditions that can be influenced and changed by communication. A problem can arise from one or more immediate causes that may or may not be linked to behaviour. Each of these

causes can be due to many underlying causes that in turn are due to certain fundamental, systemic, or root causes that form a cause and effect result-chain.

After identifying the problem behaviours, Chen (2006) indicates that a BCC intervention requires that a thorough analysis is done to identify the context in which the problem behaviours exist and an in-depth analysis of the people to communicate with. In analysing the problem, the causes and effects of the problem are critically identified. One of the effective tools for analysing causes and effects of a problem is the cause/effect problem tree. The problem analysis may begin by asking what the intended audience did that resulted in the situation. The conduct of a behaviour review to determine obstacles to desired behaviours and causes that promote those behaviours is another critical step in the assessment phase of the ACADAE process. A problem tree analysis reveals the cause and effect result-chain while a behaviour analysis seeks answers to the reason why people behave the way they do (Chen, 2006).

Communication analysis, according to Chen (2006) is done to identify communication networks within a particular community and selecting those channels that would be more appropriate for dissemination of the intervention. It also identifies the audience in question and crafts the message to suit their understanding. Other stakeholders who are relevant in carrying out the intervention effectively are also identified.

Design and development put all the information gathered from the assessment and communication analysis to develop an appropriate communication strategy. A communication strategy document should have stated outcomes,

outputs and activities together with their corresponding indicators for measuring results (Chen, 2006). A vocabulary of a message, tone and appeal play an important role in it being readily embraced or rejected by the intended audience. The appeal and tone of a message can be positive or negative, menacing or motivating, logical or emotional, appealing to individuals or to the masses. Chen (2006) suggests that research and practice have shown that it is more productive to communicate social signals by using a positive plea rather than a negative plea. An example is cited from a vaccine campaign poster in India during the 1980s that showed that a healthy baby playing happily with her parents was more successful than posters showing a child on crutches and emacipated legs with the caption “polio can cause disability and death, immunise your child against polio”. To get the necessary behaviour improvement, a negative message can be counterproductive.

Having designed the appropriate communication strategy, the next thing is to put into action what has been designed. This requires the use of people with requisite training, knowledge and skills to lead the implementation of the plan.

Evaluation is an important and critical component of any intervention programme. It is imperative to find out at the end of the programme or project whether the desired results have been achieved or not, after setting the behavioural outcomes, outputs and their related indicators as well as the behaviour modification techniques for how to accomplish them. Monitoring should be part and parcel of the implementation process to ensure that all the activities in the plan are being followed and where they are not, corrective actions are taken immediately. The discussion of BCC in this section is based on the assumption that, it has the potential

to enhance education and attitudinal change with regard to road safety and security of passengers on the public transport system.

Conceptual Framework for the Study

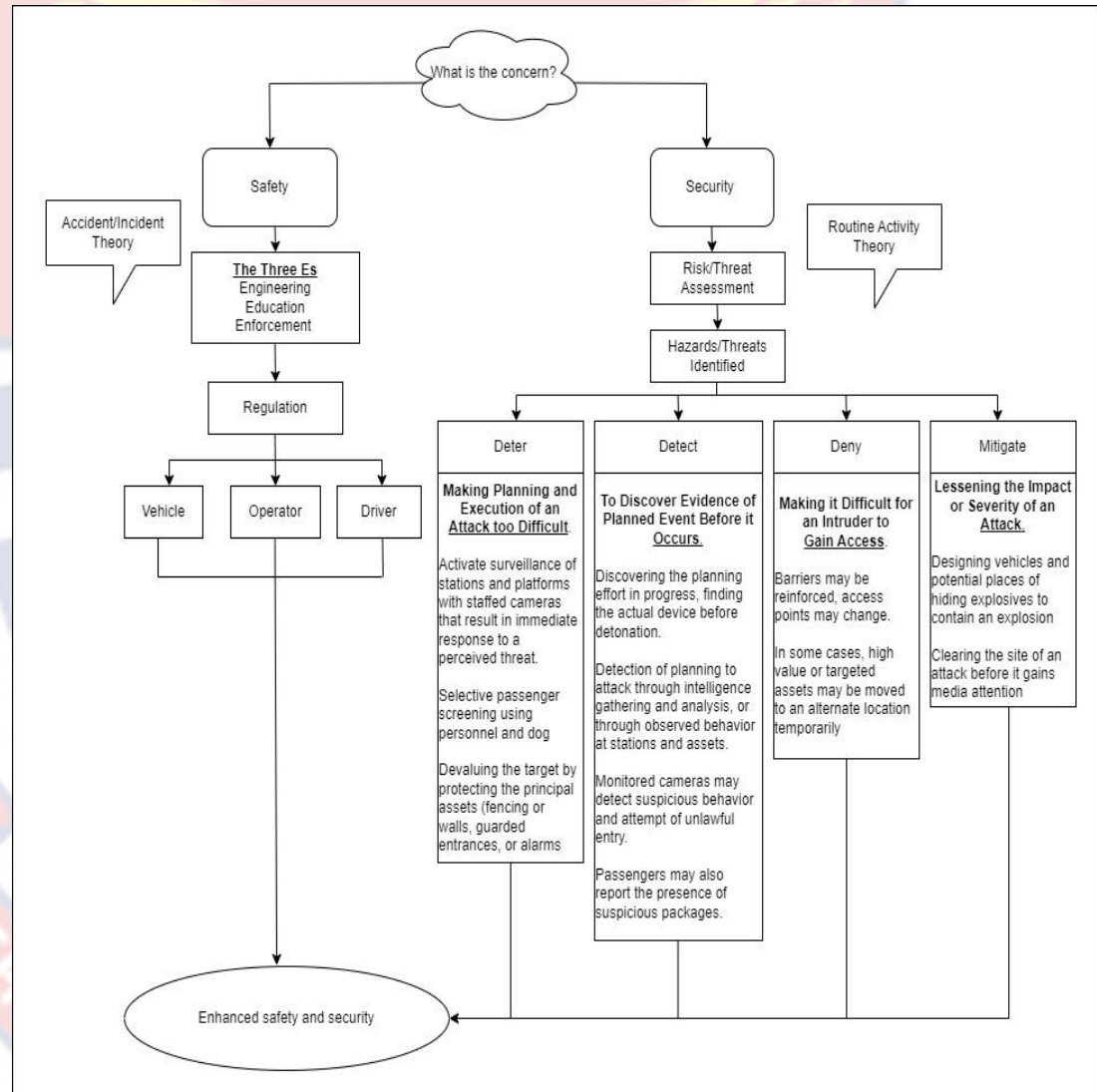


Fig. 2: Conceptual Framework (Transport Safety and Security Intervening Model)
 Source: Construct based on Edwards & Goodrich (2013); Gubbins (2003)

Figure 2 shows the conceptual framework that guided the study. The framework has been labelled ‘transport safety and security intervening model’ and was constructed based on the narratives of Edwards and Goodrich (2013) and

Gubbins (2003). The model begins by identifying the problem or concern; whether it is about safety, or whether it is about security, or whether the concern is about both safety and security. Having identified the problem or concern, the model suggests two interventions; (1) regulation in the case of safety and (2) risk/threat assessment to identify hazards/ threats and deal with them in the case of security.

Regulation seeks to make transport operations as safe as possible, and ensure that transport operation is done within the confines of the law. Safety in transport is however treated in terms of the three Es namely enforcement, education and engineering. Enforcement involves the setting of acceptable standards (technical and behavioural) and backing it with a suitable system of penalties to be meted to offenders. It also involves setting up institutions responsible for enforcing these standards and ensuring that these institutions perform their mandate effectively and efficiently. Education seeks to ensure the competence of operators and their staff, but according to Gubbins (2003) education is not only about competence. It also seeks to inform or alert all stakeholders in transport operations to the risks inherent in poor procedures and deviation from safe forms of operation. Engineering focuses on ensuring that construction of both vehicle and infrastructure for transport operation is safe. Gubbins (2003) asserts that engineers hold the key to transport because much of safety regulation is as a result of engineering analysis. The model suggests that a well-regulated transport system will lead to an enhanced safety. This however requires a systemic or holistic approach to all the component parts in dealing with safety regulation.

Regulation in transport deals with three elements which are the operator, the driver and the vehicle. In the first place, the operator must prove that he/she is fit legally to operate a transport business. Fitness involves proving that he/she has previously not violated any of the laws governing transportation in the country of operation and has not been sanctioned as such. Secondly, the operator must also prove that he/she has the requisite knowledge of the industry, or he/she will employ somebody with the requisite knowledge to manage the business. The third requirement is that the operator must prove he/she has adequate financial resources to run the business effectively and efficiently. Finally, the operator must prove that he/she has facilities to maintain the fleet of vehicles or otherwise has outsourced the maintenance to a third party. An operator's license will only be issued after all the above conditions have been satisfied.

The driver needs to prove that the requisite skills and knowledge has been acquired to handle a particular vehicle and has been so licensed by the appropriate regulatory authority. The driver also needs to have knowledge about the number of hours that drivers are supposed to work within a particular day and must be so empowered to keep records of hours worked so the authorities can verify for compliance. The vehicle that is used for transport operation, on the other hand, must be subject to internationally accepted rules of construction, and this must be approved by the appropriate regulatory authority and the vehicle so licensed. Additionally, regulation regarding adequate maintenance must also be certified, and there should be proof that the vehicle will be used in a safe manner by both operators and staff. In using this model to assess the level of safety of a transport

organisation or country, indicators like number of accidents and its attendant casualties (fatality and injuries) recorded within a certain period must be collected and compared with acceptable standards (the World Health Organisation for instance expresses fatalities and injuries per a 100,000 population and crashes per 10,000 vehicles). In addition to the crash records, the causes of the crashes must also be identified and analysed to ascertain the effectiveness of the regulation in place. It is through the identification of the causes of crashes and why they are occurring that corrective measures can be taken to ensure that the transport system is operated safely.

With the issue of security, the model starts by also asking what the concern is. If it is about security, the model recommends risk assessment to start with. According to Edwards and Goodrich (2013), risk assessment involves a systematic analysis of all potential sources of threats and hazards to the transport system and ensuring that adequate protection or mitigation measures are instituted to prevent or reduce the impact of such hazards. Edwards and Goodrich (2013) further assert that for a risk assessment to be effective, it is important to understand the classification of threats or hazards that exist into natural causes, technological causes, or human-caused. Understanding of the classification will help in determining the likelihood of a hazard or threat occurring and defining the elements within the transport system that are vulnerable to the hazard or threat. It also helps in evaluating the consequences of such hazards or threats occurring. Having identified the hazards, Edwards and Goodrich, based on the objectives of the United

States Transportation Research Board, suggest four interventions namely deter, detect, deny, and mitigate.

To deter activities that would possibly threaten the transport system, two strategies have been suggested by Edwards and Goodrich (2013). The first is to make the planning and execution of an attack too difficult for the adversary to carry out. This could be done by providing active surveillance of stations and platform with staffed cameras that result in immediate response to a perceived threat, or by making selective screening of passengers and their luggage. The second is finding a way to devalue the target by protecting the principal asset by fencing or walls, guarded entrances, or alarms. In the case of passengers, the provision of a capable guardian in transit is recommended.

Detect aims at discovering evidence of a planned event before it occurs. This may be by either discovering the planning effort in progress or finding the actual device that may have been planted before it detonates. Detection of planning for an attack on transport infrastructure may be prospective, accomplished through intelligence gathering and analysis, or through observed behaviour at stations and assets. Close circuit cameras (CCTV) may detect suspicious behaviour on a platform or attempt to enter restricted spaces by unauthorised persons. Passengers may also report the presence of suspicious packages.

The third intervention is to deny access to the target by reinforcing barriers, or changing access points. In some cases, high value or targeted assets may be moved to alternative places temporarily to ensure their safety. The last intervention is to mitigate or lessen the impact or severity of an attack. It has been suggested

that vehicles, as well as other places that explosives could be hidden are designed to contain explosion; that is using materials that will cause less destruction should an explosion occur. Another suggested intervention, which is more reactive is to clear the scene of an incident before it attracts media attention. From the interventions outlined, the model suggests that when they are effectively executed, it will lead to an enhanced security. Just like the case of safety, the state of security of a transport organisation can be assessed by comparing its interventions in place with those outlined in the model and ascertaining how effective those interventions are and the level of enforcement to achieve the desired result. If lapses are identified in the organisation's security measures, then there is the need to revise the measures to conform with interventions outlined in the model with the view to ensuring effective security of passengers and their luggage.

Summary

This chapter focused on some conceptual and theoretical issues that are of interest to the study. The concepts discussed include the product of the transport service, what constitute quality of the transport service and the systems concept. It emerged that the product of the transport service is the arrival, and this must be done safely. It was also realised that the quality of a transport service comprises issues like comfort, reliability, timeliness, and of course safety and security which is at the core. The concepts of safety (which is the absence of injury to people and damage to goods) and security (which is absence of deliberate attack on the transport vehicle, people/goods, and the infrastructure) are also discussed together with a brief history of accident and crime causation. Several theories of accident

and crime causation have been reviewed and two out of the lot were selected for the study; the accident/incident theory and the routine activity theory. Finally, the conceptual framework (transport safety and security intervening model) was constructed based on the narratives from Edward and Goodrich (2013) and Gubbins (2003).



CHAPTER THREE

REVIEW OF EMPIRICAL LITERATURE

Introduction

This chapter reviews empirical literature on road safety and road transport security. The chapter is structured into six sections: first is the burden of road traffic fatalities globally, regionally and nationally. Section two covers passengers' assessment of personal safety in Ghana, whereas section three focuses on factors of road accident causation, which is divided into human, technological, and environmental factors. The fourth section discusses some safety interventions while the fifth throws the searchlight on emergency management. The final section (six) focuses on road transport security by looking at the larger security problem, the nature of the road transport security, and the interventions that have been put in place across the globe including Ghana.

The Burden of Road Traffic Fatalities and Injuries

Globally, it is estimated that about 1.35 million people die through road crashes every year, and up to 50 million others sustain various degrees of injury which lead to permanent disability and economic cost to nations (ITF, 2020; World Health Organisation, 2018). The World Health Organisation (WHO) asserts that although low-income countries (including African) own only one percent of the vehicles in the world, they contribute about 13 percent of all road crash fatalities. The fatality rate of Africa, as indicated in the report is estimated at 26.6 deaths per 100,000 population, compared to the Americas and Europe which have 15.6 and 9.3 deaths per 100,000 population, respectively. Furtherance to the assertion above,

Adeloye et al. (2016) conducted a review of publications on the burden of road traffic injuries on the African continent with the view to generate a continent-wide estimate of road traffic injuries and deaths for all road users and by road user type.

The study found that the burden of road traffic injuries in Africa is high (65.2 per 100,000 population) and that there is an underestimation of road traffic fatalities (16.6 per 100,000). The authors therefore suggested that improved road traffic injury surveillance across African countries may be useful in identifying relevant data gaps and in developing contextually feasible prevention strategies in these settings.

On the local front, statistics from the National Road Safety Authority (NRSA, 2021) indicates that from 1991 to 2020, a total of 302,711 crashes involving 477,609 vehicles were recorded in Ghana. The total crashes casualty rate for the period was 412,514 out of which 50,311 died, 154,629 sustained serious injuries, and 207,574 sustained minor injuries. The data further indicates that within a three-year period (from 2018 to 2020), 33,132 crashes were recorded, which resulted in 45,751 casualties and 6,621 fatalities. Out of this figure, 2020 alone recorded a total of 12,484 crashes with 16,820 casualties and 2,528 fatalities. The 2020 figures are said to be the highest ever recorded in the history of road crashes in Ghana. Studies conducted between 2000 and 2012 also emphasised the burden of road crashes in Ghana. In the early 2000s for instance, Afukaar, Antwi, and Ofosu-Amaah (2003) analysed data on police reported road crashes in Ghana for the period 1994 to 1998 to highlight the magnitude of the road traffic safety problem, the pattern of distribution of road traffic injuries, and the policies and

strategies needed for prevention and control of road traffic injuries. The study found that the burden of road traffic injuries and fatalities was high (65.3% increase within the period), and that pedestrians were the most victims. Afukaar et al. also underscored the longer disability times of traffic related injuries in Ghana, and the associated high medical cost and economic impact on the affected families and the national economy. In a similar study, Coleman (2014) used available data to highlight the increasing problem of road traffic crashes related morbidity and mortality in Ghana, and the public health measures needed to control the problem. This study also concluded that road traffic accident related fatalities and injuries continue to be an important morbidity and mortality problem, as well as a health finance problem in Ghana, which requires urgent attention and containment. The study emphasised that over 65 percent of pedestrians killed through road crashes were between the ages of 1-40 years old. Abane (2012) emphasised that Ghana was losing the fight against road crashes, having analysed crash data from 2001 to 2010. All these studies emphasise the fact that the burden of road crashes continues to be rife in Ghana.

Passengers' Assessment of Personal Safety on Public Transport in Ghana

Several studies done on determinants of transport demand, or specifically passengers' choice of a particular transport service indicate that factors such as on-board experience, service delivery, waiting conditions, customer service, cost, quality of transfer, and image are broadly the factors that influence passengers decision in making a choice for a transport service (Agu, Ikenna & Ben, 2017; Andaleab, Hag & Ahmed, 2007; Poku-Boansi & Adarkwa, 2013; Tyrinopoulos &

Antoniou, 2012; Lierop, Badami & El-Geneidy, 2017; Pakdil & Kurtulmusoglu, 2014). Embedded in the on-board experience, for instance, is safety which is the focus of this study. As indicated in chapter two, the product of a transport service is the arrival, which must be done in a safe and secure manner, and also within an expected timeframe. In relation to safety, it is believed that passengers consider issues bordering on their personal safety very important in making a choice of which transport service to use especially for their long-distance travels. One of the few studies sighted in the literature, and which focused on passengers' assessment of their personal safety on public transport in Ghana is next discussed.

A study done by Sam and Abane (2017) found that passengers considered their safety and security important factors that influence their choice of transport service to patronise for their long distance travels. Sam, Brijs, Daniels, Brijs, and Wets (2018) adopted a phenomenological qualitative approach to identify what could be considered as relevant conceptual dimensions and underlying items that needed to be included in a scale for the assessment of personal public transport safety. The study found that participants focused their safety assessment of public transport on four conceptual dimensions; the driver, the vehicle, transport operator, and other considerations (nature of bus operation). Three main criteria, namely vehicle condition, driver's marital status, and transport operator's safety records were used by participants to assess bus safety. In a follow-up study, Sam et al. (2019) focused on developing and validating a public bus passenger scale using two separate studies involving university students who used public transport frequently. The study concluded that public bus passenger safety is a three-dimensional

concept made up of driver-related, transport operator-related and vehicle-related safety indicators. A further study by Sam et al. (2020) attempted to develop a scale for public bus passenger safety attitude in the case of predicting future intention to use public bus/minibus for long-distance trips and subjected this scale to predictive validity. The study found that driver-related safety beliefs are the most important public transport safety-related beliefs. However, the beliefs related to the driver's ability to handle the vehicle, how well the transport company is organised and the condition of the vehicles exterior weighed more in the prediction of the driver, transport operator and vehicles attitudes respectively. Personal safety as a passenger was found to be important in the decision to use public bus/minibus in the future for long-distance trips.

Factors that Contribute to Accident Causation in Road Transport

Generally, the factors that contribute to accidents in the transport industry have been grouped into three categories; human related factors, technological (engineering) related factors, and environmental related factors (Abane, 2012; Edward & Goodrich, 2013). The human factors especially, have been attributed to attitudes of humans which mostly results in errors, actions or inactions that lead to road crashes. The human factors in the causation of road accidents (crashes) is therefore said to be attitudinal which Rudin-Brown and Jamson (2013) claim influences behavioural adaptation to road safety programmes, with some effect on safety benefits. The technological factors refer to technological failures that could lead to an accident, and in the road transport sector, this may strongly relate to engineering factors, which may be related to road construction and facilities like

bridges and tunnels, or it may relate to the construction of the transport vehicle. The environmental factors include the terrain in which the transport operation is done, weather conditions, time of the day. In some situations, the already constructed roads and their surroundings are considered under environmental factors.

Human factors in road crashes

Research has identified that between 80 and 90 percent of road crashes are caused by human error. Generally, human error in road traffic crashes is attributed to the driver. However, as far back as the beginning of the 21st century, Dekker (2002) reviewed past investigation of accident in the quest to assess the ability to reconstruct past human performance and demonstrate its role in accidents. The conclusion of the study indicated that the systematic investigation of human contributions to accidents is not yet a very well-established practice with common methods or assumptions. Investigators are often forced to rely almost exclusively on domain knowledge and common sense, but this exposes them to the mechanism of hindsight. The study further indicated that human performance evidence can get disembodied from flow of events that accompanied it and brought it forth; and conclusions about the human contribution easily become counterfactual and judgemental – stressing what people should have done to avoid accident, but failed to do. None of these explain what really happened or why. There may be a need for stronger appreciation among investigators of the methodical challenges and pitfalls associated with retrospective analyses of human performance. Even clearer is the need for further development of ways in which investigators can systematically reconstruct the human contribution to accidents and avoid the biases of hindsight.

Notwithstanding Dekker's (2002) findings, various other studies have identified human factors that contribute to road crashes. In a study conducted by Rolison, Regev, Moutari and Feeney (2018) into the main causes of accidents in the United Kingdom for example, the authors compared the expert views of police officers and the lay views of the driving public with available accident data. The study identified six main factors (drug or alcohol, excessive speed, inexperience, medical condition, and eyesight) as the most generated causes by participants, although there were some discrepancies between the factors generated by participants and those recorded in the accident data. Zou and Vu (2019) also analysed a total of 20,720 published articles and reviews on road safety and identified some topics in co-citation analysis including effects of driving psychology and behaviour on road safety, causation, frequency and injury severity analysis of road crashes, epidemiology, assessment and prevention of road traffic injury, and effects of driver risk factors on driver performance and road safety.

Other researchers identified a relationship between age and gender on risk taking behaviours of drivers. Pakgohar, Tabrizi, Khalili, and Esmaeili (2011) used data mining methods like logistic regression and classification and regression tree to investigate the role human factors play in incidence and severity of road crashes in Iran. Using data on 347,285 road crashes that occurred in 2006 for their analysis, the authors identified possession of driving license, use of seatbelt, age and gender as attributes of the human factor that impacts crash severity in Iran. The authors observed that people who did not possess any license at all, or those who possessed provisional license had a higher rate of injuries and deaths than those who possessed

certified form of license. They also found that age had an influence on the wearing of seatbelt and the use of seatbelt could prevent injury by 95 percent.

Sarma, Carey, Kervick, and Bimpeh (2013) also presented the results of a study that sought to examine predictors of risky, reckless and cautious driving in a national sample of drivers in the Republic of Ireland using 1638 drivers made up of 902 males and 735 females who held valid driving licenses and were 17 years or older. The study concluded that those under the age of 25 engage more frequently in behaviours that are considered more dangerous than those aged 25 or older. It was also observed that male drivers engage more frequently in dangerous driving and are less cautious than females.

Hordofa, Assegid, Girma, and Weldemariam (2018) focused their study on assessing the magnitude of fatality and associated factors of road traffic accidents in Burayu Town, Ethiopia. The authors used a retrospective cross sectional study design to analyse data on 462 victims in all accidents that occurred between 2010 and 2015. The variables used in their data included demographic characteristics, driving experience of victims and drivers, drivers' behaviour related factors and vehicle related factors. The study found that about three quarters of accidents were caused by young drivers aged 18 to 30 years. One of the factors identified as likely to cause fatal accidents was failure to give priority to other road users. The non-wearing of seatbelts was also identified as having 4.25 times odds of causing fatalities, with fire after accident recording as much as six times likelihood of causing fatalities.

Speeding

Different categories of roads are built to take specific maximum speeds. Engineers explain that, the type of road (single carriage, dual, or multiple carriage) and the material used for surfacing the road determine the maximum speed that a particular type of road can accommodate (Hu, 2011). Further, portions within a particular stretch of road although they may be of the same surface or type can be intentionally marked to take a particular maximum speed as a result of activities within that stretch. Driving beyond the maximum permissible speed on a particular stretch of road is considered as speeding (Amegashie, 2002). Some countries (example Ghana) refer to the breach of the maximum permissible speed on a particular stretch of road as 'over speeding', but 'speeding' is what is globally recognised by the literature.

The United Nation in its document on the Decade of Action on Road Safety (UN, 2011) identified speeding as one of the major contributors to road crashes, and formulated interventions to reduce speeding by all member states. In other related studies, Aarts and Schagen (2006) for example, performed an analysis of some publications on road safety based on a self-reported and case control in relation to the methods used, and concluded that there is a relationship between speed and the risk of a crash. On individual vehicle level and at road section level, the study showed that on a particular road, the crash rate increases in relation to increase in speed. Further, crash rate rises exponentially for individual vehicles that increase their speed, and also crash rate increases faster within particular increase in speed on minor/urban roads than major/rural roads. One recent study that attempted to develop an ecological model of road traffic fatalities, in Indian states

as areal units concluded that the speed of a particular vehicle has a direct relationship with the risk of accident deaths (Goel, 2018).

Elvik, Vadeby, Hels, and Van Schagen (2019) conducted a meta-analysis to some selected publications on the relationship between speed of traffic and the risk of road crash. The focus of the study was to ascertain whether some two mathematical models (the power model or the exponential model) that had been used for estimating the relationship between speed and road crashes prior to the year 2000 were still effective for studies that were conducted after year 2000. The studies that were included in their analysis were therefore those published after the year 2000 which also contained data that were collected after the year 2000. The study found that the two models mentioned above both estimate the relationship between speed and road safety with great precision. A strong relationship between the mean speed of traffic and road safety, stated as the number of fatalities and the number of injury accidents was also found. Further, it was observed that the relationship between speed and road safety in studies after the year 2000 was no different from those done before 2000. Finally, it was found that the relationship between a driver's speed and his or her involvement in crashes has the same shape as the relationship between the speed of traffic and road safety.

The relationship between speeding and crash is not confined to studies done in the developed countries. Some of the studies done locally also found some relationship between speed and crash. For example, Afukaar (2003) conducted a study to ascertain the effect of speed calmers on road crashes in Ghana by examining crash data before (1995 to 1999) and after (2000 to 2001) when rumble

strips were constructed at an accident blackspot. The study found that excessive speed increases the probability of a crash and its attendant fatalities and injuries. Consequently, putting in measures to control speeding offers one pragmatic way of stemming the road traffic injuries and deaths in developing countries. The author suggested that speed control must be done in such a way that it becomes acceptable to most drivers through proper road design, appropriate speed limits and legal sanctions, as well as public education and information. Another study conducted four years after Afukaar's study measured vehicular speed at two locations where the 50km/h speed restriction sign was posted on a selected trunk road in Ghana. The aim of the study was to establish the mean speed and speed variability in terms of the standard deviation in built environments (Derry, Afukaar, Donkor, & Mock 2007). The study concluded that drivers in Ghana do not adhere to the speed limit of 50km/h in built environment and this increases the frequency and severity of crashes in such environment. The measured mean speed was 87km/h whereas the modal speed was in the range of 80km/h and 89km/h. Abane (2012) also emphasised speed as a major cause of road traffic fatalities. Further, Abane's study identified other factors like drink driving and the use of other substances that could eventually lead to speeding.

Drink driving

Drink driving is one of the major causes of road crashes and this is clearly stated in the United Nations Decade of Action on Road Safety document (UN, 2011). It has been observed that, the youth mostly engage in drink driving which is causing a lot of crashes with its attendant casualties. Several studies conducted into

drink driving used driving simulator experiments, and all these studies observed that alcohol consumption impair the judgement of drivers and this leads to road crashes. Christoforou, Karlaftis and Yannis (2012) used a driving simulator experiment to explore how young drivers behave when driving under the influence of alcohol and concluded that significant differentiation exists among individuals on breath alcohol concentration levels in regard to driving performance while intoxicated. Individual drinking, driving and driving-after-drinking behavioural patterns significantly affect actual performance. Reaction time and speeding seem to be the most robust alcohol impairment indicators, for they affect directly driver choices. Christoforou, Karlaftis and Yannis (2013) further extended their first study by exploring the reaction times of young drivers under the influence of alcohol once again through a driving simulator experiment. The findings of this study indicated that higher Breath Alcohol Content (BrAC) levels are related to slower reaction times (a 10% increase in BrAC levels result in two percent increase in reaction time). Further, variations in BrAC levels have a stronger effect on reaction times compared to baseline driving skills.

In a more recent study, Yadav and Velaga (2020) conducted an experiment to examine the effects of different levels of Blood Alcohol Concentration on the mean speeds of drivers, model the probability of the occurrence of a crash in case of sudden braking events while driving under different BAC levels, and investigate the differences in alcohol-impaired driving performance in rural and urban driving environments. Eighty-two volunteer drivers made up of 62 male and 20 female were made to drive at four different BAC levels (0%, 0.03%, 0.05% and 0.08%)

and in two different environmental conditions (urban and rural). The results of the model generated showed that age, gender and all the three (0.03, 0.05, and 0.08%) BAC levels were significant factors that affect the mean speed of drivers in both driving environments. It was realised that comparing drivers speed in the sober condition to all the three BAC levels in the rural driving environment, drivers drove faster by 3.5km/h, 5.76km/h, and 8.78km/h at 0.03 percent, 0.05percent and 0.08 percent respectively, and this increment was 3.6km/h, 3.69km/h and 4.13km/h in the urban driving environment. Additionally, male drivers were found to drive at a faster speed of 10.5km/h than their female counterparts in the rural driving environment and 3.8km/h faster in the urban environment. Further, crash probability model in the study revealed that 0.03 percent, 0.05 percent and 0.08 percent BAC levels increased the crash probability by 1.9 times, 2 times and 3 times respectively in the case of rural driving environment and 2 times, 2.3 times and 3.5 times in the urban driving environment. The findings give some indication that under different alcohol impaired state, the probability of a crash occurring is higher in the urban environment than the rural environment.

Studies conducted in Ghana (using different methodologies) also found a relationship between alcohol consumption and driving impairment. Abane (2012) in his observational studies found alcohol consumption as one of the factors that cause road crashes. In a related study, Damsere-Derry, Afukaar, Palk and King (2014) used a cross-sectional methodology with the help of multivariable and bivariate logistic regression to establish the association between drink-driving and road traffic crashes in a real world driving environment. Out of a total of 2,736

drivers whose breath alcohol concentration were measured, 8.7 percent tested positive with 5.5 percent exceeding the legal Blood Alcohol Concentration (BAC) level of 0.08%. The study found that truck drivers and two-wheeler riders had a higher probability of engaging in drink-driving as compared to car and commercial bus drivers. Additionally, car drivers were found to have a higher propensity to engage in drink driving than commercial bus drivers. Another finding was that those who had higher education had a low probability of engaging in drink-driving as compared to those with little or no education

Drug driving

Apart from drinking, another phenomenon that is contributing to road crashes is the use of drugs in driving. Drugs that influence people's attitude could be prescribed or un-prescribed. Some of the prescribed drugs cause drowsiness, therefore, people are always advised not to drive when they are on those drugs. Other illicit drugs like marijuana, cocaine, crack etc. are intentionally taken by some people to stimulate their ego before they drive. One other drug that is gaining popularity in some parts of the world is the abuse of tramadol. In some parts of Africa, drivers use snuff as a stimulant to aid their driving. However, contrary to the believe by such persons that drugs act as stimulants to aid driving performance, drugs rather act as depressants which result in driving impairment. A study conducted by Bergeron and Paquette (2014) used a driving simulator experiment to investigate the relationship between reckless driving and frequency of driving under the influence of cannabis (DUIC) among young cannabis users, by means of self-reported measures and direct observation. The study found that self-reported

DUIC is associated with a risky driving style including a broad range of reckless on-road behaviours. These results suggest that attempts to address DUIC faces significant challenges, particularly using non-deterrent-based strategies. Since cannabis usage and DUIC appear to be related to an overall reckless style of driving, it is proposed that public safety policies should be more holistic, simultaneously targeting multiple on-road behaviours for intervention.

Distraction

Driving is an activity that requires a lot of concentration, observation, anticipation, and tolerance (COAT). Every driver, whether private or commercial, needs to put on this metaphorical garment anytime they sit behind the steering wheel. Notwithstanding, it has been observed that a lot of activities cause distraction to drivers and other road users on daily basis. Distraction in driving comes in many forms (eating, tuning radio and other internal controls, talking to passengers, focusing on other activities around the road environment), but major amongst them is the use of mobile phone while driving. Some use the mobile phone to text, call, watch movies, and play games while driving, and these could lead to road crashes.

Choudhary and Velaga (2017a) have conducted various studies using a driving simulator approach to ascertain the impact of various forms of distraction on road safety. One of such studies was a statistical modelling of the impact of distraction due to both conversation and texting on mean speed and accident involvement probability by replicating the Indian rural driving environment. Five different conditions were used for the simulation (i.e. normal without phone, simple

conversation, complex conversation, simple texting, and complex texting). The findings showed that contrary to the view that the use of mobile phone while driving compensates for speed, it has the potential risk of involving in road traffic crashes.

In another study, Choudhary & Velaga (2017b) investigated the distraction effects due to mobile phone use for Indian driving conditions, where the driving conditions and driver behaviour are completely different from others. The authors examined both cognitive and visual distraction effects with different levels of complexity on driver reaction time to two events; pedestrian crossing, and road crossing event by parked vehicles. The study concluded that any form of mobile phone distraction results in the impairment in driver's behaviour. The presence of simple conversation, complex conversation, simple texting and complex texting caused 40, 95, 137, and 204 percent increment of reaction times of drivers in the case of pedestrian crossing event; and similarly, caused 48, 65, 121, and 171 percent increment of reaction times in the case of road crossing event by parked vehicle respectively.

Another study conducted by Choudhary and Valega (2018) identified the predictors of the accident probability associated with sudden events in terms of the real-time driving behavioural characteristics and distraction conditions. Participants in this study undertook four drives (baseline, phone conversation, texting, and music player) with two activities for music player (visual and audio) carried out on a single drive. Two scenarios of traffic situations were created for the driving activities (a pedestrians crossing at a point and sudden braking). The results indicated that all the secondary activities that were performed during the

driving resulted in increased reaction time compared to baseline. Twenty-seven accidents were recorded in the pedestrian crossing scenario, whereas 20 accidents were recorded in the sudden braking scenario. It was observed that the reaction of higher speed driving was less than that of lower speed driving. Additionally, the probability of accident occurring increased for texting and operating the music player during driving. Further, conversation increased the reaction time by 42 percent, texting increased reaction time by 113 percent, whereas music player operating increased by two percent.

To determine the effect of music player task and compare that with the effects of phone tasks on drivers' stop/cross decisions, Choudhary and Velaga (2019a) conducted another study using driving simulator. The study also examined the effects of intersection configurations and driver demographics on drivers' stop/cross decisions, and investigated the particular situations (i.e. potential combinations of different factors) which alter drivers' stop/cross decisions. The simulation was done in three driving conditions; baseline, music player tasks and phone conversation tasks in an urban environment with four signalised and two unsignalised intersections. The study concluded that distraction caused by music player and phone conversation led to reduced crossing probability. However, the authors explained that the lower crossing might be a result of sudden braking which is a major contributor to the rear-end accidents at signalised intersections.

Choudhary and Velaga (2019b) further analysed the risky behaviour associated with eating, drinking and texting at uncontrolled intersection in Indian driving conditions. A driving simulator was used in this study and participants were

asked to perform two manoeuvres (going straight, and turning right at the intersection) while eating, drinking, and texting. The study found that reaction distance increased for the eating and drinking tasks compared to baseline. On the other hand, a decrease in reaction distance was observed when participants were involved in texting. Those who approached the intersection with higher speeds were more likely to meet with an accident while crossing. The authors assert that almost 80 percent of drivers engage in either eating or drinking in the real world driving conditions.

Tarkowski and Rybicka (2020) on the other hand performed an experiment in the real world traffic conditions with the aim of trying to record and measure the reaction time of professional drivers when they are distracted from the main track. Twelve drivers aged between 18 and 30 years, with driving experiences of between one to eleven years were asked to react to a stimulus from a light, and depending on where the light came from (left or right) manoeuvre in the opposite direction. Participants were also asked to perform additional manoeuvres (avoidance, evasion) and hold safely in motion because the test site was not separated from the traffic. The test was carried out at a speed of 40km/h and the lapse in reaction time was recorded and analysed with a computer programme. The outcome showed that the total manoeuvring times ranged from less than a second to a little above three seconds. The size of the discrepancy between the first response and the maximum steering angle was influenced among other things by the steering angle at the time of the driver's response, and that the more the steering wheel was turned in the opposite direction to the desired reaction, the higher the value of the time.

Other forms of distractions in the Ghanaian environment that have been observed but not well documented in the road safety literature is the situation where public transport drivers tend to count or change money for either their conductors or passengers while driving. There are road crashes that have been attributed to this form of distraction. Another form of distraction is the sale of herbal medications and other drugs on public buses by hawkers, or preaching the gospel by self-styled pastors and preachers. Although no study on these forms of distraction has been sighted, they are suspected to distract the attention of public bus drivers.

Fatigue driving

Internationally, it has been suggested that drivers should not drive continuously for more than four hours (Amegashie, 2002). This suggestion is based on studies that show that fatigue sets in after a person has driven for more than four hours continuously. The advice to drivers is to take at least 30 minutes break after every four hours, which experts believe can relieve a driver of fatigue. However, most drivers do not comply with this directive and sometimes even drive continuously for eight hours or more, which could lead to fatigue and eventually result in a road crash.

Fletcher, McCulloch, Baulk and Dawson (2005) reviewed countermeasures for non-commercial drivers that are designed to reduce the likelihood of fatigue-related crashes through education and legislation. The study found that fatigue contributes 10-40 percent of crashes and is a critical area for public health. Friswell and Williamson (2013) also compared the results of two studies carried out in Australia with the aim of trying to understand the similarities and differences

between light and heavy vehicle drivers' experiences and views on fatigue. The study found that light vehicle drivers were experiencing fatigue in similar ways as heavy vehicle drivers, however, fatigue is an under-recognised problem for light transport drivers. Another study (Zhang, Yau, Zhang, & Li, 2016) also focused on the role of fatigue driving in accident, based on available data, and contrasted the severity of such accidents based on the characteristics of the driver, the type of vehicle, road conditions, and environmental factors. The findings of the study indicate that male drivers are at a higher risk of causing fatigue related crashes than female drivers. Regarding age, young drivers with limited safety awareness are often involved in fatigue related crashes. It was also observed that truck drivers are normally at high risk of fatigue driving. Driving on express roads increase the probability of fatigue-related crashes. Another observation was that drivers spend a great deal of energy and pay strict attention when driving at night, which can thereby induce fatigue. Additionally, it was observed that higher fatigue-related crash risks were more prevalent during midnight to dawn and morning rush hours.

Wu, Yan, and Qiu (2016) conducted their study in a real world driving environment to investigate the effect of fatigue driving on car following behaviour. Using 40 licensed taxi drivers (including five females), the authors conducted a field driving test for the participants and recorded their objective and subjective fatigue level indicators. The Karolinska Sleepiness Scale was used to evaluate subjective sleeping whereas Percentage of eye Closures was used as objective measurement of fatigue level. For car following behaviour, Time Headway was

used for measurement and analysis. The study found that fatigue driving significantly affects car following performance.

Further studies also link fatigue driving with road crashes. Li, Yamamoto and Zhang (2017) for example, used a bivariate endogenous binary-ordered probit model framework to analyse 38,564 crash records spanning 2006 to 2011 in China with the view to examine the relationship between fatigue driving propensity and fatal injury propensity in a crash considering the potential endogeneity of fatigue driving. The study found that the influence of fatigue driving on injury severity is significantly underestimated if the endogeneity of fatigue driving on fatal injury propensity is ignored. Another study (Davidovic et al, 2020) conducted three forms of review of literature on previous experiences related to the impact of fatigue on road safety, using online databases involving over ten scientific journals and grey literature, with the view to define road safety performance indicators related to the fatigue of professional drivers and to show their significance. The study found that although fatigue, as a road safety indicator referring to all drivers have not been included in the group of basic indicators so far, there were rising cases of fatigue-related traffic accidents in relation to the total number of fatalities in traffic accidents. The authors recommended that fatigue-related indicators should be included in the set of basic road safety performance indicators. Some of the indicators proposed by the authors are percentage of nights of sufficient sleep quantity in the previous six months, percentage of sleeping hours during the night in relation to the total sleeping hours, percentage of mornings when drivers feel

fatigue after waking up in the last six months, daily driving time, and percentage of drivers diagnosed with sleep disorder.

Bharadwaj, Edara, and Sun (2021) also used data on 1,549 crashes and 2,705 near crashes to evaluate the relationship between sleep disorder and crash and near-crash risk, and identify the possible interaction effects of driver characteristics on the association between sleep disorder and crash and near crash. It was observed that drivers with shift work sleep disorder experienced the highest crash risk. The effect of age on shift work sleep disorder indicated that older drivers above 65 years were at more risk to crash. Drivers with sleep apnea and insomnia were 29 and 33 percent more likely, respectively, to be involved in a crash or near crash. For drivers with insomnia, factors such as age and sleep quality have the potential to elevate the associated crash risk. The study also found that older age drivers with sleep disorders are more vulnerable to safety critical events.

Reckless driving

Broadly speaking, reckless driving may encompass all traffic offences that are linked to human attitude and total disregard to traffic regulations. Some of the human factors already covered may fall under recklessness, but for this discussion, factors such as wrong overtaking, indiscriminate change of lane on dual or multiple carriages, leaving disabled vehicles on roads without advanced warning signs, and anger that may lead to aggressive driving and consequent crashes are considered. All these factors have resulted in road traffic crashes and fatalities and injuries in Ghana (Abane, 2004; 2012).

Bailey, Lennon and Watson (2016) examined the relationship between ethical ideologies (the personal system of ethics individuals use to make decisions about the morality of a behaviour), driving anger, and aggressive driving. The study used an anonymous cross-sectional self-report survey design, with driving anger and the self-reported propensity for aggressive driving, the outcome variable of interest, and incorporated a range of control variables, including age, gender, driving exposure, trait aggression, and sensation seeking tendency. A convenient sampling was used to sample a total of 280 drivers, made up of 144 males and 135 females from Queensland. The results of the study suggested that those drivers in ideological groups characterised by greater concern to avoid affecting others negatively (i.e. high I, situationists, absolutist) may be less likely to endorse aggressive driving responses, even when angry. In contrast, subjectivist (low I, high R), reported the lowest levels of driving anger yet were significantly more likely to endorse aggressive responses.

Apart from the human factors that have been identified to be the major cause of road accidents, there are other engineering and environmental conditions that also contribute to road crashes. Although these factors contribute between 10% and 12% of total road traffic crashes, they are worth discussing, since paying attention to these factors and correcting them could improve road safety in general. The following paragraphs discuss some of these engineering and environmental causes to road crashes.

Technological factors (vehicle factors)

Technological factors comprise both issues related to road design and construction, as well as those issues related to the transport vehicle, but for this discussion, technological issues are limited to vehicle related issues. The factors that relate to road design and construction will be discussed under environmental factors. As indicated by Abane (2012), vehicle manufacturers continue to come out with more sophisticated vehicles which are equipped with a lot of safety gadgets with the view to improving safety of occupants. However, the introduction of these safety gadgets rather encourage drivers especially, to take more risk, and this increases the probability of road crashes. Cafiso, Di Graziano and Pappalardo (2013) evaluated the knowledge and perception of 26 bus managers with respect to safety issues and the potential effectiveness of various technologies in achieving higher standards of safety in Italy. Participants of the study indicated that start inhibition, automatic door-opening, and bus material and internal architecture were the top items for bus passenger safety. Bus driver inattention/fatigue was considered to be the major cause of crashes. Brake assistance was generally considered the most effective driver assistance active safety system.

Issues of vehicle maintenance is not well articulated in the western literature on road safety, probably because maintenance schedules are strictly followed in the developed countries. In developing countries however, proper maintenance of road transport vehicles is a matter of concern. Abane (2012), for instance, observed the contribution of mechanics to road crashes in Ghana. He used 12 continuous years to observe the activities of mechanics at Siwdu, an enclave in Cape Coast that

houses a lot of motor repair garages. His observation indicated that mechanics engaged in fraudulent activities by taking money from unsuspecting drivers with the guise of buying new parts to fix on vehicles, but most of the time ended up fixing old parts which contributed to frequent mechanical failures. The result of these fraudulent activities by mechanics could be crashes that result in deaths or injuries.

Environmental factors that affect road safety

The environmental factors that have effect on road transport operation and safety includes the road environment and broader physical environment. The road plays a key role in road safety, and the safe systems approach emphasises the importance of providing safer roads to ensure road safety. Chen, Saeed, Alinizzi, Lavrenz, and Labi (2019) used bivariate negative binomial framework to investigate the impact of roadway geometric features on highway safety while accounting for correlation across casualty and non-casualty accidents. Using accident data on three categories of roads (interstate, US roads and state roads), the study concluded that highway geometric factors have variable impacts on highway safety (across accident severity level and road class). Further, the study found that crash sensitivities to the design factors differed across casualty and non-casualty levels of crash severity. For interstate roads, casualty accidents compared to non-casualty accidents were determined to be more sensitive to traffic volume and average vertical grade, but less sensitive to the inside shoulder width and median width. The study shows that the type of road and design features have an impact on the severity of crashes on such roads.

In a related study, Wang and Zhang (2017) explored ways of quantifying the impacts of some key roadway and environmental factors to the traffic crash severities with the aim of recommending practices to emphasise certain roadway types under certain environmental conditions to reduce traffic fatalities and injuries. The authors used a logistic regression model to predict the severity of crashes based on data on 71,127 fatal/serious injury crashes and 869,460 other crashes that were collected from 2006 to 2012. The findings of the study showed that road function class has a significant impact on traffic crash severity. The odds and probability of a crash being fatal/serious injury crash was significantly different in different road function classes. Higher crash severity was found to be associated with rural roadways, major arterials, not at intersection locations, locations with curves, during the night-time when it is dark without street light, dry road conditions, and high speed limits.

The broader physical environment comprises the terrain in which transport service is operated, weather conditions and the time of day that a journey is embarked upon. The terrain for instance may include topological features like mountains, plains, and valleys, all of which have some effect, either positive or negative on transport operations. Changes in the weather conditions can also negatively impact transport operation and road safety. For example, a sudden rain fall could result in a flash flood at the section of a road which could wash away vehicles, resulting in accidents. In foggy areas, visibility could be so much affected if the required lightening system is not used, that the end result could be an accident. The time of the day also affects transport operation. Night driving for instance is a

bit more difficult than driving during the day (Amegashie, 2003). Visibility during the day is clearer and any obstruction on the road could be seen in time. With night driving, on the other hand, the lighting system of road vehicles must also be in good condition to enhance visibility. In some situations, the vehicle's lighting system alone is not enough to ensure adequate visibility, and so additional street lights are needed to compliment that of the vehicles. Where these are absent, it could lead to an increase in the risk of road crashes.

George, Athanasios and George (2017) also investigated road accident severity in Greece, focusing on vehicle type, with the view to identify the critical risk factors. With the use of lognormal linear regression, data on 59,316 road crashes involving 105,674 injured persons for the period 2004-2008 were analysed. Five categories of vehicle type (car, truck, bus, moped, motorcycle) were included in the study, and the analysis was based on injury type i.e. fatalities, severe injuries and slight injuries. The independent variables used included the area type (place of accident), time of accident, rain, other weather conditions, crash type, and median barrier. The study concluded that there is an association between weather conditions, crashes during the night and increased accident severity. Additionally, crash type plays an important role in examining the severity of an accident.

Other factors that affect accident severity

One of the human factors that has been mentioned in some of the literature is overloading of vehicles. Although it may be accepted that overloading, especially in the movement of freight may cause mechanical failure and consequently a crash, it is argued in this discussion that overloading may exacerbate the fatalities and

injuries in the cause of a crash, rather than causing an accident in itself. One thing that has been observed in the road passenger transport in Ghana is the use of converted vehicles which were originally manufactured for carrying goods. Most of the time, the arrangement of seats during conversion results in congestion on those vehicles (Abane, 2012). For example, a standard Mercedes Benz Sprinter bus which ideally should have four rows of seats with three passengers on a row, rather have five rows of seat and four passengers on a row. The result is that passengers have to sit in close contact to each other with little room to accommodate the legs if a passenger is a bit taller than five feet. This situation could lead to an increase in the casualty rate in the event of a crash. Another thing that has been emphasised in the United Nation's Decade of Action on Road Safety is the wearing of seatbelt (UN, 2011). It is also argued that although the wearing of seatbelt may reduce the casualty rate in the event of a crash, it does not prevent road crashes per se.

One problem that persists in Africa is the attribution of road crashes to supernatural forces and the belief that praying to these forces for protection when embarking on a journey will prevent a road crash from occurring regardless of the behaviour put up on the road (see Abane, 2012). This system of beliefs relegates the responsibility placed on the road user to the background, consequently, leading to behaviours on the road that have a higher probability of causing road crashes. The implication is that people do not make conscious effort to pay attention to road traffic regulations when they are in the road environment and this could cause the road traffic crash problem to escalate.

Road Transport Safety Interventions

Having established that close to 90 percent of road crashes is caused by human factors, it is imperative then to intervene to reduce to the barest minimum these human factors to enhance road safety. Internationally, most of the road safety interventions come in the form of regulation which targets the transport operator, the vehicle and the driver (Gubbins, 2003). Further, road safety focuses on three key issues namely education, engineering and enforcement. Education aims at informing road users of how they can use the road safely, and also the legislations regarding road transport as well as the consequences that they can suffer when these rules are violated. Engineering focuses on the design and provision of safe road infrastructure and the road vehicle as well. Enforcement, on the other, hand ensures that the regulations set by both international and national bodies are strictly adhered to, and usually, a body is set up to ensure that these regulations are enforced to the letter. The safe system approach, for instance, talks about safer roads, safer vehicles, and safer road users. Globally, a lot of interventions like the provision of good roads that are pedestrian friendly, speed regulation, fight on drunk and drug driving, the wearing of seat belts etc. have been enforced in many countries. In 2011 for instance, the United Nations declared the Decade of Action on Road Safety which laid emphasis on five key issues namely; road safety management, safer roads and mobility, safer vehicles, safer road users, and post-crash response. Ghana being a member of the UN also adopted this strategy. Prior to the adoption of the decade of action, Ghana had initiated a road safety strategy in 2001 which was reviewed in 2006. Coleman (2013) in his study suggested that the problem of

road traffic accidents containment should primarily focus on prevention by utilising a multifaceted public health approach which draws on all the relevant public health disciplines of epidemiology, statistics, environmental sciences, behavioural sciences, safety and injury prevention, health services administration and others. Additionally, emergency and advanced trauma support services must be incorporated to guide and formulate policies towards containing the scourge of road traffic accident problem confronting the country. Some of the interventions that have been put in place in some parts of the world and their effect on road safety is next discussed.

Attitudinal change as a road safety intervention

A lot of the human factors in road safety is said to arise from human attitude which affect the behaviours that are exhibited on the roads. Influencing attitudinal change from negative to positive is therefore one of the interventions used in road safety management. Most of the road safety campaigns are targeted towards attitudinal change. Hoekstra and Wegman (2011) conducted a meta-analysis of road safety campaigns that have been used by various organisations and their effect on behavioural change. The authors also examined some behavioural interventions that have been used in psychology and economics and their impact, and concluded that, if road safety campaigns are implemented in isolation, they may not yield the intended result. However, when these same campaigns are combined with legislations and enforcement, they may yield some results. Additionally, the authors indicated that, a road safety campaign that is targeted at a particular traffic problem may not be effective for solving other traffic problems. Further, using

behavioural adaptation strategies from other fields, especially social psychology and economics could facilitate the impact of road safety campaigns. Another study done by, Jovic Vranes, Bjegovic Mikanovic, Milin Lazovic, and Kosanovic (2017) analysed road traffic crashes and casualties in Serbia using data on crashes recorded from 1994 to 2014 with a focus on number of crashes within the period, casualty rate, category of road users, demographic characteristics and the frequent causes of the crashes. The findings of the study show that the implementation of a new law led to a reduction in casualty rate in Serbia, however the reduction was more pronounced in fatalities than injuries, especially light injuries. The outcome of the study points to the fact that strict enforcement of road traffic regulations can contribute significantly to a reduction of road traffic crashes.

A shift from private car onto public transport as an intervention

Effective public transport is perceived to reduce crash rate since private cars are seen to contribute more to road crashes. In the developed countries for instance, effort is always made to make public transport as effective and efficient as possible in order to encourage people to shift from their private cars onto public transport. The capacity of public transport to carry more passengers at a time as compared to private cars, and their capacity to reduce exposure to crashes facilitates their contribution to road safety. A study conducted by Truong and Currie (2019) explored the effects of commuting by public transport on safety using Melbourne, Australia as a case study. The study concluded that shifting from the use of private cars to public transport would result in substantial reduction in the number of total crashes as well as severe crashes. With all the modes used for the study, commuting

by bus had the largest safety benefits in terms of reducing both total crashes and sever crashes. Additionally, a percentage point increase in the proportion of roads with above 100km/h speed limits would increase the number of total crashes by 16.6-17 and the number of severe crashes by 4.8-7.6. The results of the study imply that improved public transport has the potential of reducing crash rate and the casualty rate as well.

Point record mechanism

The point record mechanism is a system where drivers are either awarded points for being safe or points are deducted from a predetermined score for being unsafe on the road within a particular period of time. In some situations, specific points are awarded to the driver at the beginning of each period, and the points are deducted each time the driver commits any traffic offence. When all the points awarded to a driver is exhausted, the license is either suspended for a period or completely revoked. In other situations, the driver starts with no point but accumulates points as he/she continues to be unsafe on the roads until a threshold is reached where the license is suspended or withdrawn. Castino-Manzano and Castro-Nuno (2012) conducted a meta-analysis of scientific publications from 11 countries across the globe to investigate the effectiveness of the point record mechanism on road safety. The results of the study showed a reduction of between 15 and 20 percent in the number of accidents, fatalities and injuries. Notwithstanding these findings, it was also observed that the effect of the point system wears off in less than 18 months. Those that lasted beyond 12 months lasted under two years, and these happened in countries where the system was

accompanied by major advertising campaigns. Judging from the results of this study, it appears that the point system mechanism, if implemented in isolation has only a short-term effect. On the other hand, if it is implemented together with other road safety strategies, the effect may be long-term.

Road safety intervention messages

Warner and Forward (2016) evaluated a road safety intervention programme targeted at alcohol in traffic in Sweden by looking at which of the three messages (emotional, factual, or a combination of both messages) had the largest effect on the variables included in the theory of planned behaviour. The study used three experimental groups and one control group with the experimental groups receiving one particular message intervention. The results of the study suggested that combining emotional and factual messages had the greatest effect on the variables included in the theory of planned behaviour. The most affected variable by the intervention in both scenarios in the study was attitude, and it was concluded that the focus of road safety interventions should not only be targeted at changing attitudes but also focus on perceived behavioural control and especially subjective norm.

The systems approach to road safety

The road safety literature suggests that the factors that contribute to road crashes are not isolated but mostly as a result of a combination of various factors. It is therefore suggested that the development of road safety interventions should be done in a holistic or a systemic way. Salmon, McClure and Stanton (2012), for example, made a comparison between some existing models of road safety with the

then proposed sociotechnical systems model, and also examined the postulation that under certain conditions systems can drift into failure in the context of road safety. The authors concluded that the road transport system can be classified as a complex sociotechnical system because it bears all the characteristics of a complex system and that of a sociotechnical system. The study suggested a move from the reductionist approach to road safety assessment to a systems approach which focuses on the factors that arise from the interaction between the various components in the transport system. The study therefore recommended the drift into failure (DIF) model for future road safety analysis. The findings of this study suggest that studies which focus on the individual components of the road transport system with the aim of providing interventions for each component is not yielding the desired results, therefore, there is the need for a paradigm shift in road safety research.

Cost/benefit of road safety interventions

All road safety interventions, whether targeted at education, engineering, or enforcement comes at a cost and therefore the need for cost/benefit analysis. Daniels et al. (2019) conducted a cost benefit analysis of 29 road safety measures which were divided into six categories namely: infrastructure (13); legislation (1); enforcement (6); education (4); post-crash treatment (1); and vehicle equipment (4). The findings of the study indicated that out of the 29 measures analysed, 14 (example high risk sites treatment, installation of speed humps, enforcement of seatbelt wearing for light vehicle occupants) remained cost effective in both the best and worst case scenarios, 10 measures (example 30km/h zones or traffic signal

installations) switched from being cost effective in the best case scenario to not cost effective in the worst case scenario. Two other measures (automatic barrier installation and area wide speed calming) were found not to be cost effective in both scenarios. Cost/benefit analysis of road safety interventions however should be comprehensive, and consider all fundamental issues that relate to all interventions. The ultimate in every road safety intervention is to save human lives and the economic cost that are associated with fatalities.

Traffic policing and technology

One of the major ways of enforcing road traffic regulations is by traffic policing. Under normal circumstances, it would have been expected that since human beings are rational beings, they would voluntarily comply with all road traffic regulations. On the contrary, humans are prone to committing crime and as a result, the effectiveness of traffic policing in a particular country determines to a larger extent the state of road safety. In view of this, Beenstock, Gafni, and Goldin (2001) used data on traffic offences to estimate the quantitative effect of policing on road accidents in Israel, and concluded that small doses of policing have little or no effect, whereas more concentrated doses may have large effects. The elasticity of police effect is small: if policing is increased by one percent the expected number of accidents falls by only 0.00358 percent in the short-run, and slightly more than this in the long-run. Pritchard, Culbertson, Malm, and Agrell (2009) also conducted a study in which various teams of traffic police officers in Orebo County in Sweden were asked to develop their own indicators for measuring their performance, which indicators were approved by the superiors of the officers.

The study found that the intervention led to an increase in the performance of the teams and improvement in road safety in general, although the number of personnel kept decreasing till the end of the study. The outcome of the study suggests that when performance is rewarded with remuneration it motivates team members to do more. It was realised that participants became discouraged when there was a change in the hierarchy of the police service and the new administration decided to discontinue with the intervention or reward the team members.

Some studies indicate that effective traffic policing thrives on technology, and any country that does not pursue technology in traffic policing is bound to trail behind other nations. Kuo and Lord (2019) examined the effectiveness of data-driven approach to crime and traffic safety (DDACTS) in Taiwan and compared it to DDACTS studies conducted in Texas in the United States and concluded that the DDACTS programme could be effectively used in other jurisdiction apart from the United States where it was developed. Mali (2020) also assessed the impact of the use of sensor data and GIS on traffic policing and concluded that a pattern can be obtained using sensor data and automatic collection data of the road users' behaviour and road accidents by location and time. The author claimed that this creates opportunity for traffic police to analyse the impact of the pattern on deterring and reducing traffic offences and road accidents. The authors further assert that deterrence lead to reduction in crashes as well as the casualty rate.

Notwithstanding the importance of traffic policing, one problem that affects enforcement in many jurisdictions, especially in developing countries is corruption. Oleinik (2015), used data from two Russian agencies to explore the effect of

corruption on road safety, and found a positive connection between corruption and road safety in Russia. According to the study, corruption enhances road safety in a way that undermines social and economic development. Under some circumstances, such as at the early stages of economic development, corruption contributes to enhancing road safety. The indirect effect of corruption on road safety is positive. The direct effect of corruption on road safety is negative; it works in the opposite direction. The findings of this study contradict the general view that corruption affects road safety in a negative way.

Measurement of road safety

In order to assess road safety, there is the need to develop some standard criteria for measurement. Utriainen, Pollanen and Limatainen (2018) compared the different definitions of and international data on seriously injured, combined that data with fatality data, and investigated the results and conclusions for road safety policy. The comparison was done based on data from three European countries which were collected from 2010 to 2015 with three definitions; killed, seriously injured, and maximum abbreviated injury scale as the focus. The study found that road safety has been analysed traditionally based on the number of fatalities, and that the definition of a serious injury has a major influence on the amount of seriously injured and the share of casualties in different road user groups. It was also found that the best definition for international comparison is the maximum abbreviated injury scale which is recommended by the European Union, and is widely used. The results further indicated that using killed and seriously injured includes a higher number of casualties in comparison to looking at fatalities and

seriously injured separately. The study therefore recommended the use of killed and seriously injured as key indicators for road safety performance because they have less statistical fluctuations.

Emergency Management

Road safety interventions are mostly focused on the prevention aspect but the ultimate is to avoid deaths and reduce injuries should a crash occur. It is within this mind-set that emergency management plays a key role in road safety. As discussed previously on traffic policing, technology also plays an important role in emergency management, and this has been indicated in several studies done especially in the developed countries. For example, Mladineo, Knezic and Jajac (2011) used a combination of GIS and eCall to build a decision support system which was applied to a motorway in Croatia with the aim of enhancing the provision of emergency accident recovery response and provision of medical services. The study concluded that the introduction of the decision support systems can reduce the uncertainty caused by inaccurate information about accident location. Another study by Steenbruggen, Borzacchiello, Nijkamp, and Scholten (2013) reviewed on the use of electronic data, especially GSM data to improve the situational interface in order to aid incident response managers in a complex decision making process using the Amsterdam telecom as a case study. The study concluded that the use of telecom data has a great potential to provide new types of information services to create an accurate understandable picture of reality to improve situational awareness for daily incident management work processes.

Yet another study conducted several years after the two studies cited above focused on urban emergency management services to ascertain and cover all the demand in order to respond to all emergency calls within a reasonable time (Amorim, Ferreira & Cuto, 2017). The study concluded that as a rule of thumb to better respond to road crashes, urban emergency management services should have ambulance stations close to fast roads, double coverage when possible, and rapid response to areas with large population with no economic activity and low population density. All of these studies emphasise the role and importance of emergency management in road safety and how technology could be used to enhance the provision of emergency services.

Road Transport Security

Transport security has become a topical issue since the 9/11 incident in the United States, although some studies on transport security date back into the 1980s and 1990s (Edwards & Goodrich, 2013). For this reason, the European Commission (2012) emphasises the need for developing security policies for all forms and modes of transport in the European Union. Although the Commission acknowledges the fact that individual countries have their own security policies at the national level, it still advocates for the development of a security policy document at the regional level like the European Union.

A study conducted by Vilalta (2011) assessed the fear of crime on public transport in Mexico City using data from a survey on fear and crime conducted in 2007 by the Centre for Economic Research and Teaching. The study found that fear of crime among public transport modes (minivans, metro and buses) were not

statistically different. The author asserted that fear of crime increased with the duration of the journey, irrespective of the mode of transportation. The study further claimed that empirical evidence supports the victimisation (have been a crime victim), physical vulnerability (gender and age group), social disorder (fear of crime in the neighbourhood) and social network (opinion on local police) theories of fear of crime.

Some studies have indicated that the fear of crime on public transport deter people from using it for their journeys, and rather depend on their private cars (Currie, Delbosc & Mahmoud, 2013; Gardner, Cui & Coiacetto, 2017; Kruger & Landman, 2007; Odufuwa & Fasina, 2012). Nordfjaern et al. (2015), for instance, investigated into whether car habit strength and resistance to change and safety and security factors are associated with work/education and leisure travel mode use, and whether those psychological factors predict intention to use public transport. The study found that male reported stronger car habit than females, while females reported more emotional reaction in relation to change. Females also reported systematically higher risk on the safety and security factors. Respondents reported overall higher risk perception related to security issues in public transport. Among the habitual factors, strong car habit strength was the only factor which related to reduced intention of using public transport modes. With the security and safety factors, high probability estimates of accidents in public transport were associated with decreased intention to use public transportation modes. The same pattern was found for high risk perception of security factors in public transport. A follow-up study by Nordfjaern and Rumdmø (2018) investigated how the individual's past

experience with exposure to crime on public transport affected their subsequent decision to use such services for future travel. The study concluded that individuals who had been exposed to adverse security events in public transport the last five years perceived more risk of such events than those who had not been exposed. Individuals who had been exposed to adverse security events also reported higher probability and more worry of experiencing a personal injury in public transport than those who had not been exposed.

On the African continent, some studies sighted in the literature, all of which were conducted in Nigeria on different types of journeys found some evidence of crime against travellers. Onatere-Ubrurhe (2016), for instance, used reports published in newspaper and victim reports to produce information on the dark spots where highway robbers mostly operate and used the outcome to develop a strategic plan for policy makers and security agencies to implement in the effort of reducing crime on the highways in Nigeria. In other related studies, both Oyinloye et al. (2022) and Ugwuoke et al. (2021) also identified highway robbery as a serious insecurity on Nigerian roads. Oyinloye et al. (2022) in particular underscored how the poor nature of roads was escalating highway robbery attacks in the Kwara and Kogi states and how negatively it affected travellers.

Nature of crime on public transport

Land based transport modes are said to be very much exposed to crime because of its open nature (Edwards & Goodrich, 2013). This assertion is also emphasised by Smith and Clarke (2000) who performed a comprehensive review

of the research on crime and public transport and observed that the public transport environment is open to all and this makes it suitable for the perpetration of crime. The authors also asserted that transport is a routine activity for both offenders and targets, and that transport terminals provide a source of crime generation or crime attraction. Further, crime can be targeted against the transport system itself, employees, or passengers. Additionally, crime can be facilitated by overcrowding and by lack of supervision, and can be committed by employees, passengers, or offenders. Joewono and Kubota (2006) also explored the public perception concerning the safety and security problems in operation of public transportation. Using data from users and drivers of paratransit vehicles as well as non-users and civil servants, the study found that the user is the most important party involved in safety and security aspects. The understanding and awareness of both users and drivers of road safety and security is the most important variable in improving safety and security, which can be reached by training and education. In the case of road-based public transportation, where there is no fixed place to access and egress, the role of the user and driver is really significant for the safety aspects. The awareness of users coupled with suitable availability of police or security officers are the most important ways to overcome the security problems. Improvement agenda of three aspects, namely technology, management and institution were emphasised.

Newton (2004) conducted analysis of various environmental criminology theories and how they are applied in the crime on public transport, and concluded that crime on public transport can be categorised into static and non-static. The

author explained that crime can occur under three situations on the public transport system when using the holistic approach to public transport journeys. These include walking to or from and between stops, waiting at the stop, and travelling on a moving vehicle. From an environmental perspective, these can be described respectively as the following three different (but interlinked) situations (i) the walking environment (ii) the waiting environment (iii) the en-route environment. Newton's study indicates that the public transport environment itself has been shown to be a multifaceted arena, with a number of settings, and a range of potential offenders, victims and guardians. These settings include different modes of vehicle (including buses, trains, trams and other forms of transport), and facilities such as stations, stops and interchanges. A further study by Newton (2014) examined how crime concentrates and is potentially specialised within and around the public transport system and emphasised that crime against passengers include theft, robbery and assault. The crimes that are committed against employees include assault and robbery and that on the transport system include vandalism and graffiti, and line of route crimes which are offences along routes that cause delay or affect safety.

Another study (Yavuz & Weleh, 2009) attempted to identify specific factors and strategies which respond to female and male safety concerns by looking at whether men and women react differently to certain security practices and service attributes in the train transit environment. The study found that women perceived vulnerability tends to increase when nobody is around to provide surveillance against crime or in the presence of social incivilities. Men on the other hand tend to feel more vulnerable when they have less control over their environment or when

they are surrounded by unfamiliar people in public spaces. The study also indicated that in order to identify safety strategies that could effectively address fear of crime, it is first necessary to pay more attention to the factors that make individuals feel more vulnerable to crime in public space.

Jackiva, Savrasovs, Gromule, and Zemljankins (2016) used computer based simulation modelling to assess the state of Riga International Coach Terminal and also identify critical areas that needed to be improved to enhance passenger safety and security. The study showed that using developed analytical instrument helps to identify possible areas that needed changes during the reconstruction of the terminal towards enhancing passenger safety and security. Beecroft (2019) also attempted to establish the current security challenges that public transport networks face, the emerging security challenges looking out to 2040, and technologies that are expected to have the biggest impact on security of transport in the future. The study emphasised the establishment of principles of systematic design and evaluation of security measures for all modes of transport, and the better understanding of people's behaviour, needs and attitudes in relation to travel technology and security. Technologies with the biggest impact were grouped in two categories: vehicle (unmanned aerial vehicles, connected and autonomous vehicles, and electric vehicles) and ICT (internet of things, social media, mobile platforms, open data, big data and 3DP).

Public transport security interventions

Newton (2014) in his study on crime associated with public transport suggested that there is the need to ask some basic questions in the prevention of

crime on public transport such as: who are the potential targets and victims, and who can act as capable guardians? Who are the likely offenders, and who can act as handlers to restrain the otherwise motivated offenders? And what places and times (settings) within the public transport network create juxtapositions of offenders and victims that increase or reduce crime opportunities, and who can act as place managers for these? Newton asserts that the transport system may act as a crime generator or crime attractor; where crime generator is an area that attracts large numbers of people for reasons other than to commit crime, whereas crime attractors are places that offenders visit due to knowledge of the area's criminal opportunities. In view of this, the design, environment, and management of stations and stops can influence crime rates (Newton, 2014).

The International Road Transport Union (2006) outlines some recommended security strategies and guidelines that transport organisations can adopt in developing their own security policies. The document emphasises the need for the training of employees and management as well to ensure that they have knowledge of what to do to prevent crime, how to behave in the event of an incident of insecurity, and how to communicate to management of public transport organisations and the security agencies.

Gromule, Jackiva and Pēpulis (2017), based on European standards analysed a document regulating security and safety which was developed by Riga International Coach Terminal in Latvia. The study concluded that the development of security and safety policy documents, and its strict implementation affected positively the security and safety of the Riga International Coach Terminal.

Additionally, risk identification on the transport network and mapping of such risks is of paramount importance to identify which of the risks is critical.

Wallace, Rodriguez, White, and Levine (1999) analysed passenger reaction to measures taken by the Ann Arbor Transportation Authority to improve security on board their buses and at its two transit centres based on two surveys that were conducted in 1997 and 1998. The study indicated that security measures must be visible and noticed to influence perception of security. The results further indicated that on-board video cameras used to enhance security was the most noticed by passengers, and this proved effective in increasing feelings of security only after dark. Some interventions that have been suggested by other studies are (1) target hardening (2) access control (3) deflecting offenders (4) controlling facilitators (5) entry/exit screening (6) formal surveillance (7) surveillance by employees (8) natural surveillance (9) target removal (10) identifying property (11) reducing temptation (12) denying the benefits (13) rule setting (14) stimulating conscience (15) controlling disinhibitors (16) facilitating compliance (Smith & Clarke, 2000).

A study conducted in Ghana by Sam and Abane (2017) examined the interventions that public transport operators in Ghana had put in place within the past three years to ensure passenger safety and security. Using the accident/incident and the routine activity theories as the basis of their study, 273 passengers were surveyed and six transport organisations interviewed. The findings of the study suggested that some interventions such as the use of police escort on public transport vehicles had been put in place by the transport organisations, and these interventions proved to be effective, therefore they needed to be sustained. Further,

public transport passenger safety was improving, however, there was the need for collaboration between stakeholders to sustain the gains made. The authors also emphasised the continuous monitoring and regulation of the safety and security interventions of transport operators in the country in the face of the changing circumstances.

Summary

This chapter reviewed some empirical literature on road transport safety and security. It has been established that road crashes continue to be a burden globally and are caused by a combination of human factors, technological/vehicular factors and environmental factors, therefore a systemic approach needs to be adopted in designing preventive measures. Regarding security, it emerged that the open nature of the road transport system makes it vulnerable to crime, and that transport is a routine activity for both the passenger and the offender. Further the target of crime can be the transport system itself, the passenger, or the employee. Additionally, crime identification and mapping is of paramount importance in the prevention of crime on public transport, and this should be facilitated by the use of technology, in some cases supported by manual strategies.

CHAPTER FOUR

METHODOLOGY

Introduction

This study sought to assess the prevailing situation of passenger safety and security in road travel in Ghana. The study also explored other interventions that could be adopted to ensure that road travel by public transport is safe and secure. This chapter is devoted to the methodological approach to the study. The chapter begins with a description of the environment in which the study was conducted, the philosophical underpinning to the study, and the reason for choosing such philosophy. The chapter then discusses the research design adopted, and the population used for the study. Other issues discussed in the chapter include the sample size and the sampling techniques used to select respondents for the study, instruments used for data collection, and the data collection procedures adopted. Further issues discussed include how the data were processed and analysed, and how ethical issues related to the study were addressed. Also some limitations to the study and other problems encountered in the fieldwork are discussed.

Research Setting

Data collection was conducted in Accra, the largest and capital city of Ghana. The selection of Accra for the study was informed by the fact that the city receives and distributes a lot of passengers from all walks of life on daily basis (Otupiri Darko, 2017). Furthermore, there are a lot of public transport operators spread across the city who provide various services including intra city, rural urban, and intercity. Although data collection for the study was conducted in Accra, the

focus was more on some selected long distance routes that originate from the city and are characterised by frequent road crashes and also incidents of highway robbery. Further, Accra was considered suitable for assessing passenger security while accessing public transport terminals.

City of Accra

Accra is the largest of the coastal cities in Ghana. It covers a total land area of about 225.67km² and an estimated population of 2,052,341 as of 2019 (Ghana Statistical Services, 2019). The boundaries of the city stretch from the Nautical College at Nungua on the east to the Lafa stream at Mallam junction on the west, and the Great Hall of the University of Ghana on the north. The southern end of the city is the Gulf of Guinea.

Economically, Accra is the hub of most industrial, fishing and trading activities, and this draws people from all walks of life, most especially the rural communities of the country to settle in the city for various business and job opportunities. Accra has very large market centres like the Makola, Agboghoshie, Kaneshie and Mallam Atta that attract a lot of trading activities daily. In terms of education, Accra houses six public universities which are the University of Ghana, University for Professional Studies, Ghana Institute of Management and Public Administration, Ghana Technology University, Accra Technical University and the Regional Maritime University (Nautical College). Apart from the public universities, there are also several private universities located in the city. There are also many secondary, technical and vocational schools, both public and private that are located in Accra. In terms of health services, Accra has several hospitals and

clinics scattered across the city with the biggest being the Korlebu Teaching Hospital which is the major referral centre in the country. Accra also houses the seat of government, and this attracts a lot of political activities. Additionally, almost all the public institutions in Ghana have their headquarters situated in Accra. Accra is endowed with several monumental structures and edifices that are tourist attractions. Further, Accra is the first port of call and also the exit point for all international travellers. These various socio-economic and political activities attract a lot of travellers to and from Accra daily.

Accra is an indigenous Ga land which has over the years assumed a cosmopolitan status. The city was formed from a merger of settlements around three Forts namely James Fort (James town), Ussher Fort (Ussher town), and the Christiansburg Castle (Osu). Accra served as the capital of the British Colonial Gold Coast from 1877 till 1957 when Ghana attained independence. After 1957, the city has continued to serve as the capital.

Transport terminals within Accra

There are a lot of transport terminals (popularly known as lorry stations) spread across the various municipalities and suburbs of Accra. Most of these lorry stations provide mainly intra city services but do not provide services going outside Accra, especially long-distance travels. Notwithstanding, most of the stations that provide services for long distance travels are clustered within the Kwame Nkrumah Circle enclave and the Central Accra enclave. The Madina enclave also has lorry stations providing long distance travel services.

The stations that were visited for data collection included the Neoplan station, which belongs to the Ghana Private Road Transport Union (GPRTU), OA Travel & Tours Transport, Vision Express Transport Company, Sungtaaba VVIP Transport, Intercity STC Coaches terminals, Metro Mass Transit (MMT) stations, all within the Kwame Nkrumah Circle enclave. The other stations which were within the Accra Central enclave included the Tudu GPRTU station and Metro Mass Transit station at Opera Square. The GPRTU and MMT stations within the Central Accra enclave were visited because some of the routes identified for the study were being operated from these locations. All the terminals operated on at least one of the interested routes. The interested routes were those major highways that lead from Accra, through the middle belt to the Northern parts of the country. Other routes that were of interest were routes that go through various parts of the Volta Region, especially the Eastern corridor which passes through the Oti Region, and routes that pass through the Central Region to the Western Part of the country. Other rural/urban routes that connect with Accra which have high incidence of crash and robbery attacks were also considered for the study. Figure 3 shows the map of the study area (Accra) and the lorry terminals visited for data collection.

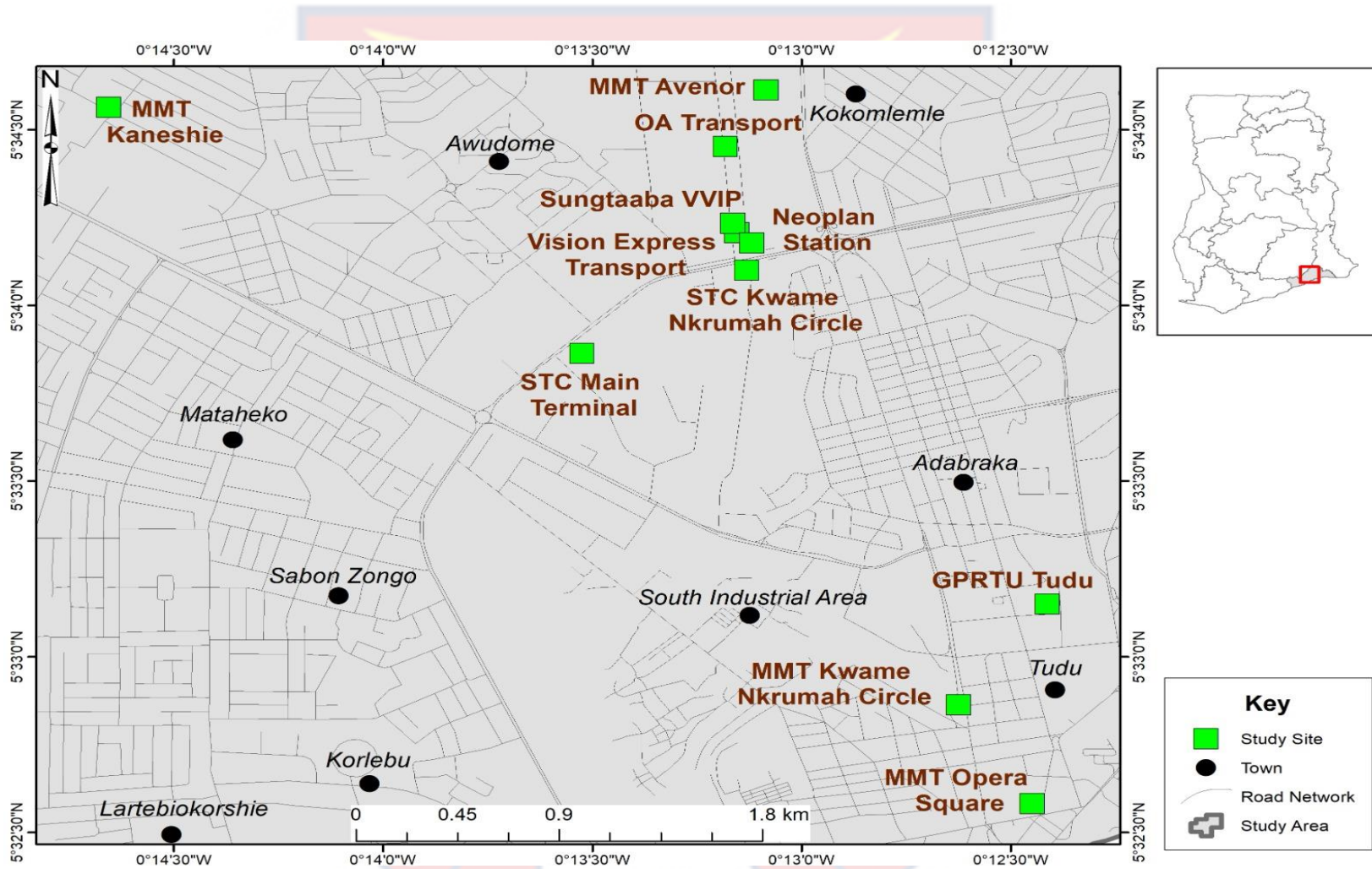


Figure 3: Map of study area (Accra)

Source: Cartography and Remote Sensing Unit, Department of Geography and Regional Planning, University of Cape Coast

Research Philosophy

The universe is endowed with so many phenomena that occur over time and space, and so much realities that people continuously strive to understand. A lot of philosophies relating to social science research have been proposed by several philosophers and social scientists over the years. The two most popular amongst the lot are the positivists and the constructivists or interpretivist approach to social research. The positivist school of thought for instance believes that reality is out there and is independent (Ruane, 2005). They believe that this reality can be ascertained through structured processes and empirical evidence. Those who belong to this school of thought tend to lean more toward the quantitative approaches to social research.

The constructivists or interpretivists school of thought, on the other hand, believe that reality is socially constructed and that subjective meaning is a critical component of knowledge building (Hesse-Biber, 2010). In other words, social reality is constructed by the individual, and that the individual alone can describe how his/her reality looks like. Those who relate more to the interpretivist school of thought try to understand phenomena and occurrences rather than know their magnitude or extent. They therefore tend to lean more towards the qualitative approaches to social research. The qualitative tradition therefore deems the subjectivity in human creation of meaning as very important. This, however does not mean an outright rejection of some notion of objectivity by the qualitative tradition (Hesse-Biber, 2010).

Another philosophical approach is what is referred to as pragmatism, which is a philosophical approach to social research that emerged in the latter part of the 19th century and the beginning of the 20th century, but which gained

popularity only after the second world war (Smith, 2009). The pragmatist philosophical approach to research emanated from the works of people like Charles Sander Pierce, William James, John Dewey, and George Hebert Mead (Leavy, 2017). Pragmatism is on the premise that if an idea achieves the desired outcome without clashing with logic or experience, then it is true. The pragmatists therefore believe that, there is no one particular approach to solving social problems. They believe in results or outcomes; in other words, they are concerned with finding solutions to social problems and not about the methods or theories that are used to arrive at the solutions (Leavy, 2017). They therefore tend to mostly combine both the positivists and interpretivists approaches to their research.

The intent of this research makes it more suitable to adopt the pragmatist approach to social research. In the first place, the research sought to know the magnitude of road crashes, as well as insecurity in the public road transport system. Secondly, the study also sought to understand why road crashes continue to increase despite the efforts that have been made by stakeholders over the years. With regard to criminal attacks on public transport, the study also sought to understand why public transport continues to be a target for criminals. Thus, adopting the positivist research paradigm to such a phenomenon will give us an idea of the magnitude as well as where they occur most often, or the cycle and pattern of occurrence. On the other hand, adopting the interpretivists approach will help us understand why accidents occur most often, or why people engage in crime, but this approach may not help in knowing the magnitude or the extent.

Research Approach and Design

Following from the philosophical underpinning to the study, the mixed method approach to research was adopted. Creswell (2014) emphasises three basic approaches of mixed methods design to social research. They are: (1) convergent parallel mixed methods design; (2) explanatory sequential mixed methods design; and (3) exploratory sequential mixed methods design.

Drawing from the three approaches to mixed methods design, the explanatory sequential mixed methods design was considered appropriate for this study. With explanatory sequential mixed methods design, quantitative data is first collected and analysed. The results of the quantitative data are then used to plan a second phase which involves the collection of qualitative data to explain in-depth the results of the quantitative data. The results of the quantitative data inform which participants to include in the qualitative phase and which questions to ask of the participants.

The reason for choosing this type of design was that, statistical (secondary) data on road crashes and crime on public transport were available for initial analysis to inform the design of a survey. The secondary data helped in deciding on which questions to ask in the primary quantitative survey data on the research problem which were collected on the field. Regarding the collection of quantitative primary data, the activity based intercept survey approach (Stopher, 1985b; Richardson, Ampt & Meyburg, 1995), which is one of the popular methods for transport surveys was adopted. The reason for adopting this method of survey was that, the characteristics of the study population required that data collections be done at the transport terminals. The results from the survey informed which individuals from the survey sample to be selected

for the follow-up in-depth interviews, and also which institutions to contact for the qualitative phase of the research. In effect, the availability of the secondary data informed the selection of the explanatory sequential mixed methods design for this study. Consequently, data collection was done in three phases.

Greene, Caracelli and Graham (1989), identified some advantages of using a mixed method research approach which are: (1) it allows triangulation of methods which enables the researcher to focus on convergence of data collected by the various methods, and this enhances the credibility of the research findings, hence making the conclusion strong and very enriching; (2) Complementarity allows the researcher to better understand the research problem and also get clarity to a given research result. It also ensures that the weaknesses of one method are mitigated by the other method and vice versa; (3) The results from one method helps to develop or inform the other method and this leads to a synergistic result. For example, statistical data from a survey can shape interview questions for the qualitative phase of the study; (4) The findings of one study may raise questions or contradictions that will require clarification, and this helps in initiating another study; and (5) Detailed findings of a study ensure the employment of different and mixed methods in the pursuit of new or modified research questions, therefore extending the breath and range of an inquiry for expansion of knowledge. On the contrary, mixed methods approach to research is expensive and time consuming to undertake, and it also requires the mastery of both quantitative and qualitative approaches by the researcher (Greene, Caracelli & Graham, 1989).

Population

The study population comprised all public transport organisations, be it state-owned or privately owned, as well as all the travellers who patronise the services of such organisations to meet their daily transport demands within Ghana. The target population, however, was all intercity or long distance public passenger transport operators within Accra (especially those covering a distance of 200km and above), and the passengers who use the services of these operators. Officials of some regulatory agencies in the road transport sector in Ghana such as the National Road Safety Authority, Driver and Vehicle Licensing Authority, the Motor Traffic and Transport Department and the Criminal Investigation Department of the Ghana Police Service were also part of the study population. Further, emergency service providers (Ghana National Fire Service and National Ambulance Service) took part in the study.

The transport organisations included in the study ranged from small individual operators to large union operators and large state assisted operators who serviced a variety of routes. Some of these operators used purposely built passenger carrying buses with capacities ranging from thirty to sixty-five, whereas others used small buses which had been converted from goods carrying to passenger carrying vehicles. Such buses had capacities ranging from fifteen to twenty-eight. The terminals for operations by the transport organisations ranged from very small and unstructured to large and well-structured with adequate waiting places for passengers.

The characteristics of the passengers who patronised the services of the transport organisations were many and varied. People from all walks of life, including foreign nationals as well as locals from various parts of the country

patronised the services of public transport operators. The ages of the passenger population ranged from children to the aged, but those who were included in the study were those who were fifteen years and above who were expected to be able to give account on their travelling experiences. The occupations of the study population also ranged from students to traders and self-employed business person as well as civil and public servants. Additionally, people with various socio economic status (low income, middle income and high income) used the services of public transport operators, especially for long distance travels.

Sample size and sampling procedure

In all, a total of 372 passenger respondents were selected for the study. The sample size was arrived at by calculating a ratio of 0.00025 or 0.025 percent (as suggested by Ruane, 2005 p.109) of estimated annual passengers carried (1,486,378) by all the six transport organisations. The estimated number of passengers was arrived at based on data collected from the transport organisations. In some of the organisations, statistics on passenger carried on the interested routes were provided, whereas in the others, estimation was based on the number of buses moved on the interested routes daily and the capacity of such buses. An average daily number of passengers carried for each transport organisation was calculated and the result was used to estimate the annual number of passengers carried. The estimated number of passengers carried by the six organisations were 327,000, 282,427, 282,400, 237,820, 193,229 and 163,502 for GPRTU, STC, MMT, OA, Vision Express, and Suntaaba VVIP respectively. The ratio used is close to that used by Abane, (2011) (i.e. 0.0003 or 0.03%) which was also replicated by Ojo (2013). Both Abane and Ruane

explained that the ratios are appropriate in situations where the estimated population is one million and above. Table 1 shows the distribution of the respondents across the transport organisations.

Table 1: Sample Size for Survey

Transport Organisation	Sample Drawn
Intercity STC Coaches Limited	70
Metro Mass Transit Limited	70
Ghana Private Road Transport Union	82
Vision Express Transport Services	50
Sungtaaba VVIP Transport Company	40
OA Travel & Tours Limited	60
Total	372

Source: Fieldwork, December 2020

Following the use of a mixed method approach to this study, a combination of probability and non-probability sampling methods were used to select participants for the study. In general, the multistage sampling method was adopted for the study. The basis for using the multistage sampling method was that each phase of the data collection required a different sampling procedure. For the selection of passenger respondents for instance, it was impractical to have a sampling frame for all patrons of public transport in the study area. The difficulty arose from the fact that, personal data of travellers that could form the bases for compiling a sampling frame was not collected by the various transport organisations.

Based on Sam and Abane's (2017) study, six transport organisations were earmarked for study. In the first place, a list of known transport organisations in Accra was compiled and was put in a strata according to the nature of the organisation (i.e. government assisted transport organisations and privately owned transport organisations). Stratification was done because the

privately owned transport organisations far outnumbered the government assisted (21 against 2). This meant that, if they were all put together, there was a high probability of missing all the two government assisted organisations in the sample. The next step was to ensure that each transport organisation listed operated at least one route that covered a distance of 200km or more. Those who did not meet this criterion were eliminated from the list. Having done this, the first stratum on the final list contained only two organisations (Intercity STC Coaches Limited and Metro Mass Transit Limited) and both were selected. The second stratum, which comprised the privately owned organisations had 21 left on the final list, and the lottery method was then used to randomly select four out of the 21. The organisations selected initially in this category were the Ghana Private Road Transport Union, VIP Jeoun Company, OA Travels & Tours Company, and Royal VVIP Transport Company. During the data collection however, VIP Jeoun Company and Royal VVIP Transport Company did not grant permission for the survey to be done with their passengers. It therefore became necessary for the two organisations to be replaced, and the lottery method was again used to select two other companies; Vision Express Transport Services and Sungtaaba VVIP Transport Company as replacement.

The next stage was the selection of the individual respondents for the administration of the questionnaire. As indicated earlier, because there was no list of the travellers, and also the fact that the questionnaires were administered at the station and not on-board the buses, the convenient sampling technique was used to select all the 372 respondents. With this method, passengers who were available at the time of the survey and who were ready to participate in the study were selected in accordance with the sample size required at a particular

terminal. The major reason for using the convenience sampling for selecting passenger respondents is that the characteristics of public road transport passengers are transient in nature, and it is difficult to keep a database on them (Otupiri Darko et al. 2021).

For the in-depth interviews, respondents were purposively selected based on the responses from the survey and the indication of their willingness to participate in the follow-up in-depth interviews, and on the part of the operators and regulatory authorities, their expertise in their various fields. Five representatives from the transport organisations, four from the regulatory authorities (NRSA, DVLA, MTTD, and National Drivers Academy), and two from the emergency service providers (Fire Service and National Ambulance Service) were interviewed. For the passenger respondents, a total of 30 people who had agreed during the survey to participate in the follow-up in-depth interview were also purposively selected. However, 21 out of the 30 respondents were interviewed in the follow-up. This was because no new themes came up after interviewing the 21 participants, and this indicated that the saturation point had been reached. One focus group discussion was held with eight drivers from one of the government assisted transport organisations to explore their perspectives on the study topic. Table 2 shows the distribution of respondents for the in-depth interviews and the focus group discussion.

Table 2: Sample Size for In-depth Interviews

Units	Sample Drawn
Transport Organisations	5
Regulatory Authorities	4
Emergency Service Providers	2
Passengers	21
1 Focus Group Discussion (Drivers)	8
Total	40

Source: Fieldwork, December 2020

Data Collection Instruments

Based on the objectives of the study, different instruments were used for the data collection. The first phase of data (secondary) was done by making a formal request in writing to the identified agencies namely NRSA, DVLA, MTTD, Fire Service, and National Ambulance Service (NAS). With the second phase of data collection which involved the survey, a questionnaire was developed which was administered to respondents. The kobo toolbox software was also used to augment the administration of the questionnaire. The third phase of the data collection focused on in-depth interviews and a focus group discussion, and interview and discussion guides were developed for that purpose. Based on the responses from the interviews, an observation was carried out to verify some of the claims made by regulatory authorities and the transport organisations. In view of this, an observation guide was developed for that purpose. Additionally, a desk-top review was carried out in relation to some of the current interventions in place both by the state and the individual transport organisations.

The questionnaire was prepared personally, but it was reviewed by both my principal and co supervisors and also a third professor from the department.

The questionnaire was structured into four sections (A to D). Section A dealt with the demographics of respondents whereas sections B, C and D dealt with objectives 2, 3 and 4 of the study, respectively. Section B which focused on respondents' view of current situation of safety and security comprised twenty-five items. Section C comprised fifteen items and focused on current interventions and their impact on passenger safety and security. Section D comprised only three items which were all open-ended questions to solicit respondents' views on additional interventions that could be put in place to help ensure safety and security of passengers. The questions in the other sections were all close ended. In all, the questionnaire was made up of forty-three items.

To ensure construct and content validity of the measures in the questionnaire, the questions were compared with some of the questions that had been asked in previous studies namely Abane, 2011 and Sam and Abane, 2017 to collect data on peoples' perspectives on road accidents and transport security. Further, both the questionnaire and the interview guide were scrutinised by my two supervisors who have expertise in transport research. Apart from my supervisors, some experts in the transport industry were also given hard copies of the questionnaire for their scrutiny and critique. The critique and suggestions from both parties helped in fine-tuning both the questionnaire and the interview guide. Additionally, the result of the pre-testing of the instruments were compared with the results of a previous study by Sam and Abane (2017), to see if they provided similar results. Having certified that the result of the pre-test was consistent with some existing studies, the instruments were endorsed by the two supervisors and two additional faculty members for the main data collection.

The reliability of the data collection instruments was ensured by pre-testing them under three different conditions, and the results compared. It was realised that the data from all the tests pointed in the same direction, and that confirmed the reliability of the instruments.

Four different interview guides were developed; one for the regulatory authorities, one for the emergency service providers, one for the transport organisations, and one for the passenger respondents. The observation guide was also prepared based on the responses from the transport organisations and the regulatory authorities. Those interventions which the respondents claimed they had put in place were documented in the observation guide and observed accordingly. The desktop review comprised the Road Traffic Regulation 2012 (L. I. 2180) and Road Traffic Act 683 of 2004, and also documented safety and security procedures by the transport organisations, where they were available.

Pre-testing

As has already been indicated a study of this magnitude needed to meet, as much as possible, all the requirements that have been established by the scientific community. In view of this, the data collection instrument (questionnaire) was pre-tested under three different conditions and the interview guide under two conditions and within separate periods and locations. The questionnaire was the first to be tested, and it was done with three separate samples; one with respondents contacted on two different social media platforms (Telegram [a platform of transport professionals, CILT] and WhatsApp [contacts who were conveniently sampled]), and the other in Cape Coast. No sample size was determined for the test on telegram since it was a group platform. For the other two tests, a sample of 30 respondents identified

from social media (WhatsApp) and 30 passenger respondents from two transport terminals were selected for the administration of the questionnaire. The pre-tests helped in refining some of the questions, for example it was suggested that some of the question which were single select, be changed to multiple select. Some typographical errors were also identified by some respondents, and these were corrected. The testing of the interview guide which was developed after the second phase of the main data collection, was also tested with two transport organisations in Cape Coast and the Central Regional office of the National Road Safety Authority.

Pre-testing on social media was done between 25th October and 10th November 2020, whereas the one in Cape Coast was done from 15th to 20th November 2020. The Metro Mass Transit Limited and the GPRTU (Tantri Branch) were the transport organisations used for the pre-testing in Cape Coast. Fifteen passenger respondents were selected from each station for the exercise.

Data Collection Procedures

Data collection was done in three phases. The first phase comprised the collection of secondary data on road crash records and other security occurrences (especially, highway robbery) from the National Road Safety Authority and the Criminal Investigation Department through the Directorate of Public Affairs of the Ghana Police Service respectively. These regulatory agencies, were formally written to, with an attachment of a letter of introduction from the Department of Geography and Regional Planning to request for the secondary data as well as permission to conduct a follow-up in-depth interview at a later date. The data from the National Road Safety Authority was sent in soft copy through WhatsApp after six weeks of consideration. The request for

the follow-up in-depth interview was also granted. On the other hand, the data from the police was given after over eleven months from the day of the request. This data was in hard copy and it was collected personally at the National Police Headquarters in Accra.

The second phase involved the survey of passengers at 11 lorry stations (terminals) belonging to the six transport organisations, all in Accra. Prior to the data collection, the management of the transport organisations involved were formally written to for permission to carry out the study at their stations. Permission was formally granted by all the transport organisations, and different dates were agreed on for the data collection. Request for a follow-up in-depth interview with the management of the various transport organisations was also granted. On the agreed dates for the survey data collection, the various stations were visited, at which time a formal introduction was made by the management of the various transport organisations. The purpose of the study was then explained to the passenger respondents, and after they had consented to take part in the study, data collection commenced. For the follow-up in-depth interviews, passenger respondents were asked during the survey to indicate if they would like to participate by giving out their contact numbers. Four research assistants who had previously been trained and used for the testing of the data collection instruments were used for the actual data collection.

Administering of the questionnaire was done through a combination of one-on-one personal interview and self-administering. The combination of the two procedures was done on the basis that whereas some of the respondents could complete the questionnaire on their own, others could not. In view of this, those who could complete the questionnaire on their own were given the hard

copy to complete which were collected on the spot and later keyed into the kobo tool kit. On the other hand, the questionnaire was imported into the kobo tool kit for responses to be keyed in directly by field assistants who conducted the survey. To ensure that the required number of respondents were surveyed with each transport organisation, a checklist was developed for the fields assistants which they ticked after each interview.

The third phase comprised the in-depth interview with the selected passenger respondents drawn from the survey sample, and management of the transport organisations as well as the regulatory authorities and emergency service providers. Most of the interviews for the passenger respondents were done via the telephone, with a few at locations identified by the respondents. With the interview done on phone, the device that was used for the calls was put on automatic voice recording to record the responses. This was done after permission had been sought from respondents to record their responses. The interviews with the representatives of the transport organisations and the regulatory authorities, as well as the emergency service providers were done at their individual premises. The purpose of the study which was explained in the request for permission was re-emphasised to the respondents for their informed consent before each interview. As a requirement, each respondent (those who participated in the face-to-face interviews) was made to sign an informed consent form to prove their acceptance to participate in the study. On the average, the interviews lasted for about sixty minutes. The focus group discussion that was held with some selected drivers from one of the government assisted organisations took place at the company's premises. Both the face-to-face interviews and the focus group discussion were audio recorded with the

permission of participants. Data collection for all the three phases were done between July 2020 and January 2022.

COVID-19 protocols

Data collection was done at a time that some of the COVID-19 protocols were still in force. In view of this, it was ensured that all the research assistants adhered strictly to the protocol by wearing their nose masks and also sanitising their hands regularly. To ensure this, each field assistant was given enough disposable nose masks to last for the period of data collection. They were also given 500ml volume of hand sanitiser each and medicated wipe for cleaning their hands and possibly the hands of the respondents. Ensuring social distance with respondents was a bit problematic because those who could not complete the questionnaire on their own had to be interviewed. This notwithstanding, it was ensured that at least some physical distance was maintained between the field assistants and such respondents.

Data Processing and Analysis

The secondary data that were collected were analysed by using SPSS versions 23 and Microsoft Excel. All the data were re-entered into the SPSS software or Excel sheet and a trend analysis was conducted to ascertain the trend of road crashes in general, and some transport related security threats, especially highway robbery. Again, a specific trend analysis of road crashes involving public transport vehicles was conducted. An intended Hot Spot analysis could not be conducted to identify the places that accidents as well as highway robberies occurred most because the data that were given did not include GPS addresses for the locations. To ascertain an increase or decrease in road crashes, further statistical test (ANOVA) was conducted with the secondary data.

Regarding transport related security threats, only a trend analysis was conducted due to the scanty nature of data provided. In projecting the figures for crashes and security for the next 10 years based on the current data, the excel forecast function was used. This software was used because the data was not appropriate for a regression analysis, for example.

With the data from the survey, entries were made into the kobo tool kit on the field, which helped to extract summaries of the various measures. Descriptive statistical analysis was performed to determine the frequencies of the responses. Some of the responses were cross tabulated with some of the demographic characteristics of respondents to know the distribution of such responses. The results from the survey were also compared with the secondary data to ascertain if they reflected each other. The statistical method adopted was based on the fact that the variables in the survey data were categorical in nature, and most of them were measured at the nominal level.

The recordings of the in-depth interviews were transcribed with the assistance of the o'Transcribe software. The o'Transcribe software is an open source software for transcribing qualitative data. The recordings were loaded unto the software, and they were played one after the other and transcribed at the same time. The software provided an interface where the audio could be played and typing done at the same time. The advantage was that, there was no need to be switching between the audio player and the word processor; both activities were done in the same interface. The transcripts of the audio recordings were saved according to the sequence in which they were transcribed, and were saved as transcript RA, TO, ESP, and PR for Regulatory Authorities, Transport Organisations, Emergency Service Providers and

Passenger Respondents respectively, and they were numbered from 1 to the last interview in each category. The major disadvantage with the software was that the audio files which were saved with a .aac extension because of the device used for the recordings, could not be played directly, but had to be converted into either an Mp3 or Mp4 file before it could be played. Unfortunately, if the file was larger than 50MB, it could not be converted by the software and in such a situation, it had to be played outside the software in the original file and transcribed directly with a word processor. This process was very tedious as one file could take about six days to transcribe. This problem was however resolved when the Max QDA software was acquired, as it had options for transcribing both audio and video files of any size and in any format.

The individual transcripts were imported into the Max QDA which is also an advanced software for analysing qualitative data. The imported files were organised into the categories to which they belonged, for example regulatory authorities, transport organisations etc., and the transcripts were analysed both deductively and inductively, using the thematic coding strategy. Based on literature and also the objectives of the study, some codes were deductively generated, but additional codes were inductively generated from the transcripts as they were read through. All the codes generated were colour coded with the aid of the software for easy identification and grouping. The codes were put into categories, which were later reduced into themes. The transcripts were then analysed one after the other by going through the text and identifying words, phrases or sentences that were significant and assigning appropriate codes to them. In addition to assigning codes to the transcripts, memos of sections of transcripts that were of interest to the study were written which were

later used for the write-up. After all the transcripts had been coded, a code frequency and code relation matrices were extracted with the help of the software, and the various categories were further reduced and grouped into themes. The themes that were generated, together with the memos and the text describing them were exported into a word document for the write-up of the qualitative report which was used to explain the data in the quantitative report that had already been written.

Field Experience and Challenges

As indicated previously under the sampling section, some of the transport organisations were very apprehensive in allowing their settings to be used for the study. For this reason, two of the organisations had to be replaced in order for the study to progress. One of the two organisations that were selected to replace the initial two for instance refused to take part in the in-depth interview although they allowed their passengers to be surveyed. Some of the passenger respondents were also apprehensive during the survey and refused to participate. Those who were very apprehensive were replaced with those who were willing to participate since the method of selection was based on convenience. It was observed that those passenger respondents who were in the company of either their relatives or friends tended to engage in conversation even as they were responding to the questions. Some of them could engage themselves in these conversations for more than five minutes before coming to continue with the responses, and such persons were prone to respond negatively to most of the questions. Absolute patience had to be exercised by field assistants in such situations in order that they could contain the respondents.

Some respondents who had had previous experience in either a road crash or an incident of insecurity were uncomfortable in discussing their experiences, and in such situations the field assistants had to move on to other questions. Further, in requesting respondents to leave their names and contacts for the follow-up in-depth interviews, most of them were afraid of giving out their contacts because they thought their contacts could be used for fraudulent activities. In all, 110 people gave out their names, out of which 90 included their contacts. Even some of those who left their contacts for the follow-up in-depth interviews either refused to continue with the interview when they were contacted or refused to respond to the telephone call. It was observed that the appearance of research assistants was key to either people accepting or rejecting to participate in the survey, and they (research assistants) were admonished to dress decently.

The bureaucracy in some of the state agencies prolonged the schedule of the in-depth interviews because in some of the organisations, it was difficult to identify a lead person who would grant the interview. In such situations, it took several visits to the organisations before a person was appointed to grant the interview. With some of them, even after a lead person had been identified, the interviews had to be rescheduled on several occasions because of the busy nature of the work of the appointed officers. The secondary data on crime related to the public road transport system, for instance, took almost a year to get because it was indicated that a superior office had to scrutinise and approve the data before it could be given. Even after the long wait, the data that were given were very scanty and did not give the details that was needed for the study.

Ethical Considerations

To ensure that all protocols related to scientific research were followed, an ethical clearance was sought from the Institutional Review Board of the University of Cape Coast before data collection commenced. The first ethical issue that was considered was informed consent of all respondents. It was ensured that the purpose of the study was explained to each passenger respondent, and feedback was taken from them to ascertain if they really understood all the issues and whether they were prepared to take part in the study. Those who agreed to take part were asked to sign an informed consent form to confirm the agreement before the questionnaires were administered to them, which some did but others did not. Respondents were informed that they were at liberty to decide which questions to answer, and which ones to ignore if they felt uncomfortable. However, they were assured that, none of the questions was harmful to their person or dignity. They were also informed that they could opt out of the study at any point if they felt uncomfortable to continue.

With the transport organisations and the regulatory authorities, an explanation to the study was given in the letters that were sent to them requesting for their permission to conduct the survey and the interviews with their organisations. Notwithstanding the fact that permission was given for the conduct of the study, the purpose of the study was again explained to the representatives interviewed, and they were asked if they still would want to continue with the interviews. In addition, their permission was sought to audio record the interviews, and permission was also granted to this request before the interviews were done.

Regarding the follow-up in-depth interviews with some of the passenger respondents who took part in the survey, it was realized in advance that, some of the questions in relation to their experiences with road crashes or incidents of insecurity on the transport system could trigger emotional issues. In view of this, it was ensured that, the minds of those who had had previous experiences were adequately prepared through the expression of our sympathy and words of consolation before the questions were asked.

Furthermore, it was ensured that the findings that were reported strictly emanated from the data (both quantitative and qualitative) that were collected on the field and not what had been preconceived.

Limitation of Study

As is a normal practice in the scientific community, any research that seeks to generalise its results to the population must adopt a rigorous probability sampling technique in selecting respondents for the study. The aim of using a probability sampling technique is to ensure representativeness, and avoid any form of sampling bias that could affect generalisation. A major requirement in using a probability sampling method in any study is the drawing of a sampling frame. In this study however, the characteristics of the study population made it difficult to draw a sampling frame in order to be able to use a simple random sampling for instance. Although the multistage sampling, which is also a probability sampling method was used for the study, the final selection of passenger respondents was based on convenient random sampling, which is not a true probability sampling method. Generalization of the results from the survey may therefore be contested by some critics of the scientific community.

Notwithstanding, it must be emphasized that, mixed methods research adopts various forms of sampling techniques in a particular study, and this study was no exception. The results of the secondary data for instance painted a picture of the prevailing situation with respect to road crashes in the road transport sector in Ghana. On security, however, the scanty nature of the available data did not allow for any rigorous analysis for statistical inferences and generalisation. In effect, the results of the study reflect the prevailing state of road crashes but not the true state of passenger security in Ghana. The findings however may be of essence to policy formulation and enforcement.

Chapter Summary

This chapter focused on the research methods used for the study. The discussion indicated that the study was conducted in Accra, the capital of Ghana, but the focus was on some transport routes in the country that are prone to road crashes and security threats. It was explained that the pragmatist approach to research was the philosophy that drove the study. In line with the philosophical underpinning, the explanatory sequential mixed method was used for data collection, and data were collected in three phases. Both probability and nonprobability sampling methods were used to select a total sample size of 412 for the study. It was also indicated that although the multistage sampling method was used for selecting respondents for the survey, the final selection was done by using convenient random sampling, and this may affect the generalization of the findings.

CHAPTER FIVE

STATE OF PASSENGER SAFETY AND SECURITY IN GHANA

Introduction

The focus of this study is to assess the state of passenger safety and security in road travel based on available data and also from the perspective of passengers, transport operators, and regulatory authorities. This chapter begins the analysis using secondary data on road safety and crime related to public transport, collected from the National Road Safety Authority and the Criminal Investigation Department (CID) of the Ghana Police Service. The crash records for the period 1991-2020 is examined, with emphasis on the number of crashes recorded, number of deaths (fatalities) that occurred during the period, as well as the number of injuries and property damage. Another important issue that is discussed is the contribution of public transport to the fatalities, injuries and property damage. The data acquired on crime associated with public transport is also presented in the chapter. Based on the data available presently, the chapter also makes a projection of how the crash and crime situations would be within the next ten years.

Trends in Road Crashes in Ghana from 1991 to 2020

Road safety is one of the critical aspects of national security that affects the socio-economic development of countries around the world. In Ghana, concerns over the casualties and economic and social cost of road accidents have been a major issue of public concern over the years. Data from the National Road Safety Authority's (NRSA) "Road Traffic Crashes in Ghana Statistics 2020", indicate that from the year 1991 to 2020, a total of 302,711 road crashes occurred. The lowest number of road crashes (6,467) within the three decades

occurred in 1993 while the highest (12,484) was recorded in 2020 (see Figure 4). The number of road crashes recorded between 1991 and 2020 showed an annual increase of 1.65 percent. The highest (26%) annual rate of increase in road crashes was observed between the year 1994/1995 and 1999/2000. The years 2012/2013 recorded the highest (23%) annual rate of decreased road crashes within the period.

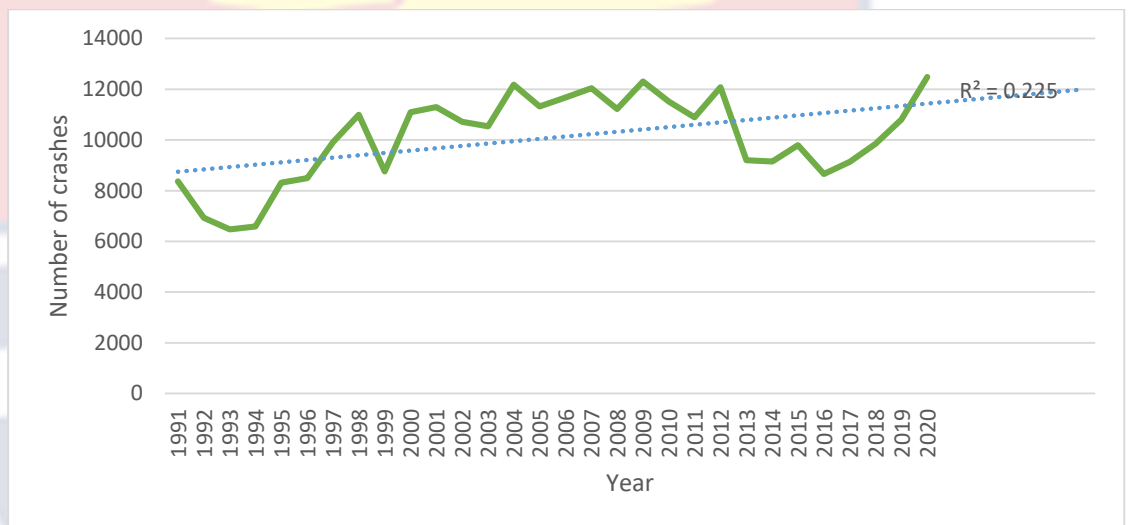


Figure 4: Trend in number of road crashes recorded in Ghana from 1991 to 2020
Source: NRSA (2021)

As the total number of road crashes increased annually, the number of crashes leading to damage only, injuries and fatalities also increased within the period. Although the highest number of road crashes occurred in 2020, the highest number of injury crashes (7,952), fatality crashes (1,782) and damage-only crashes (4,658) were recorded in 2004, 2019 and 2000 respectively (see Figure 5). Further, the lowest number of injury crashes (4,088), and fatality crashes (632) were both recorded in 1994, whereas the lowest damage only crashes (2,348) was recorded in 1993.

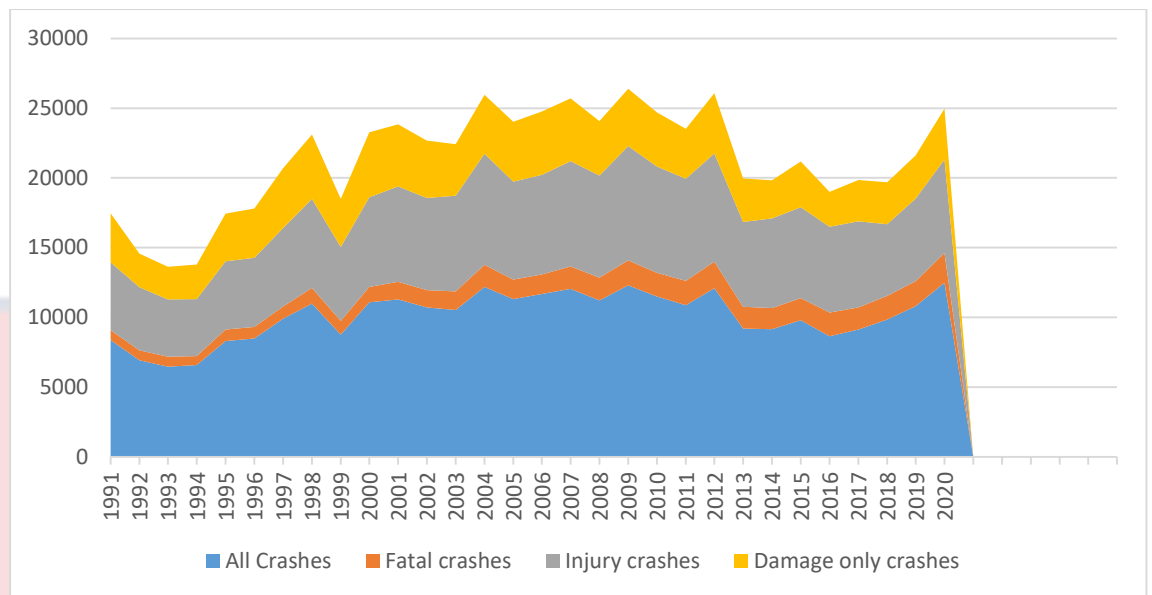


Figure 5: Trends in forms of road crashes recorded in Ghana from 1991 to 2020
Source: NRSA (2021)

To better understand the trends in road crashes within the period, the years covered are categorized into 1991-1995, 1996-2000, 2001-2005, 2006-2010, 2011-2015 and 2016-2020. Road crashes resulting in fatalities, injuries and damage were then disaggregated by these six-year categories. As shown in Figure 6, the percentage of fatal crashes increased from 9.8 percent in 1991-1995 to 17.5 percent in 2016-2020. On the other hand, the percentage of injury crashes reduced slightly from 61.3 percent in 1991-1995 to 59.0 percent in 2016-2020. In the same manner, the crashes that led to only damage decreased from 38.7 percent in 1991-1995 to 29.9 percent in 2016-2020.

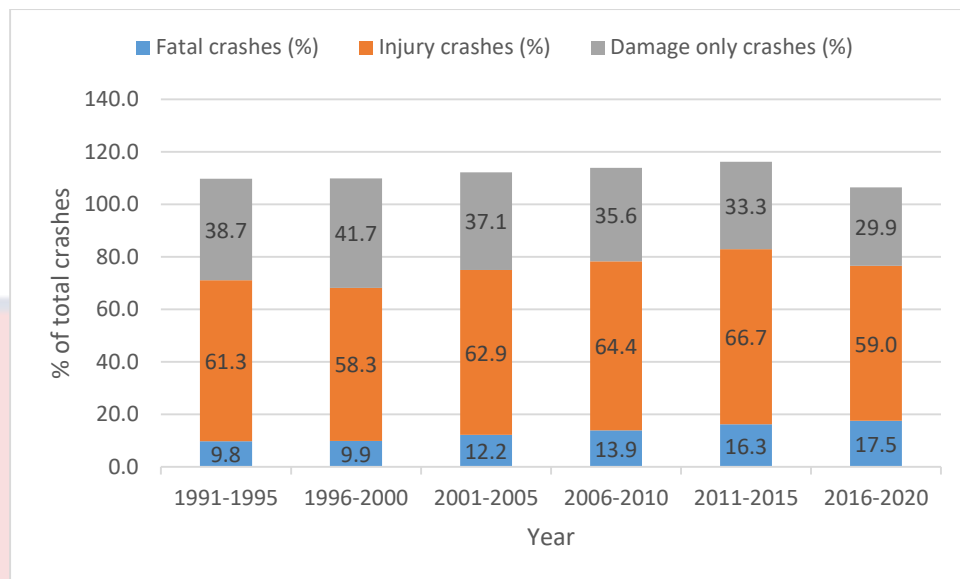


Figure 6: Trends in forms of road crashes recorded in Ghana by year groups
Source: NRSA (2021)

The road crashes recorded over the six-year categories were compared to provide further insights on the trends. The one-way ANOVA test conducted showed (Table 3) that the mean number of fatal crashes, injury crashes and damage only crashes varied significantly across the years.

Table 3: ANOVA Test for Mean Number of Crash-type Across Six-year Groups

		Sum of Squares	df	Mean Square	F	Sig.
All Crashes	Between Groups	58430529	5	11686106	10.27	0.000
	Within Groups	27308378	24	1137849		
	Total	85738907	29			
Fatal crashes	Between Groups	4518678	5	903735.7	41.439	0.000
	Within Groups	523414.4	24	21808.93		
	Total	5042093	29			
Injury crashes	Between Groups	30335576	5	6067115	20.012	0.000
	Within Groups	7276184	24	303174.4		
	Total	37611761	29			
Damage only crashes	Between Groups	9220650	5	1844130	8.106	0.000
	Within Groups	5459714	24	227488.1		
	Total	14680365	29			

Source: NRSA (2021)

A multiple comparison test (Tukey's HSD) was then carried out to further examine the differences. The results show that the mean number of all crashes recorded for 1996-2000, 2001-2005, 2006-2010, 2011-2015 and 2016-2020 were statistically higher than that of 1991-1995. However, there was no significant differences in the mean numbers of all crashes recorded in 1996-2000, 2001-2005, 2006-2010, 2011-2015 and 2016-2020. With regard to fatal crashes, the mean number recorded in 2001-2005, 2006-2010, 2011-2015 and 2016-2020 were statistically higher than that of 1991-1995 and 1996-2000. There were however no significant differences in the mean numbers between 1991-1995 and 1996-2000, 2001-2005 and 2006-2010, and 2006-2010 and 2011-2015 as well as 2016-2020. Comparison between the other year groups were however found to be statistically different from each other. The mean number of injury crashes recorded between 1996-2000, 2001-2005, 2006-2010, 2011-2015 and 2016-2020 were greater than that of 1991-1995. Further, the year 2006-2010 recorded the highest mean number of injury crashes among the six-year groups. On the contrary, the difference between the mean number of injury crashes recorded in 1996-2000 and 2016-2020 was not statistically significant. Similarly, there were no statistically significant differences in the mean number of injury crashes between the years 2001-2005, 2006-2010, 2011-2015, and 2016-2020. Slight differences in the means of "damage only crashes" were observed. With damage only, the mean of crashes recorded in 1996-2000, 2001-2005 and 2006-2010 were statistically higher than that for 1991-1995, 2011-2015 and 2016-2020 (Appendix G).

Trends in fatalities from road crashes in Ghana from 1991 to 2020

The number of fatalities resulting from road accidents expressed per 10,000 vehicles, 100,000 population, 100 casualties and 100 crashes is presented in Figure 7. Aside from the number of fatalities recorded per 10,000 vehicles which continuously decreased annually, the number of fatalities per 100 casualties and fatalities per 100 crashes all increased steadily from 1991 to 2020. With regard to fatalities per 100,000 population, a peak of 12 fatalities was recorded in 2004. This decreased steadily to eight fatalities per 100,000 in 2020.

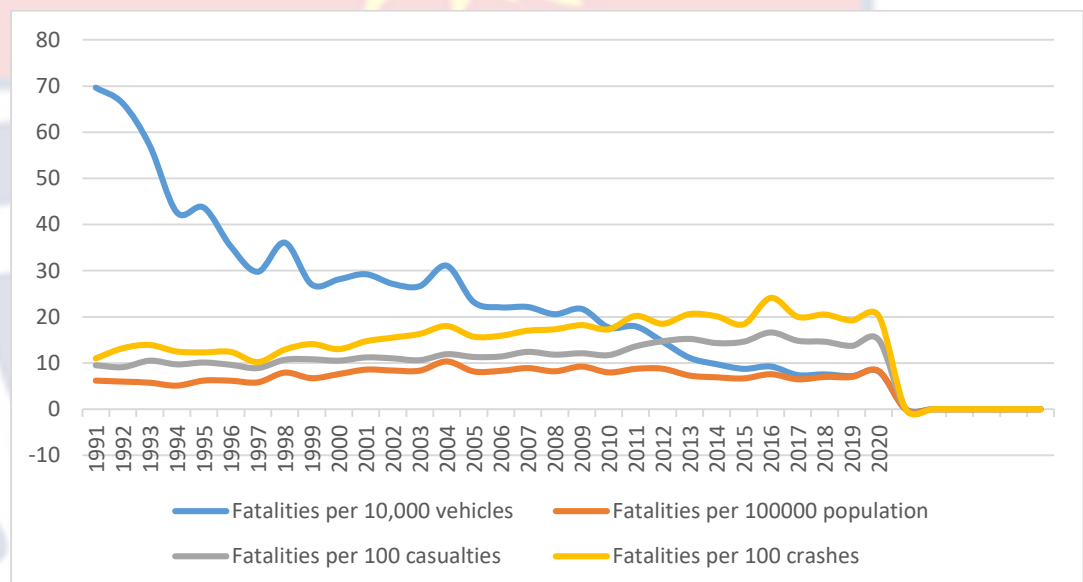


Figure 7: Trends in fatalities from road accidents in Ghana recorded from 1991 to 2020
Source: NRSA (2021)

The number of fatalities recorded was disaggregated by type of road environment across six-year groups (Figure 8). Generally, the number of fatalities recorded from road accidents on non-urban roads exceeded those on urban roads across all the year groups. Fatalities from non-urban road accidents increased from 64.1 percent for 1991-195 to 66.6 percent for 2006-2010. There was then sharp decrease by close to seven percent for 2016-2020.

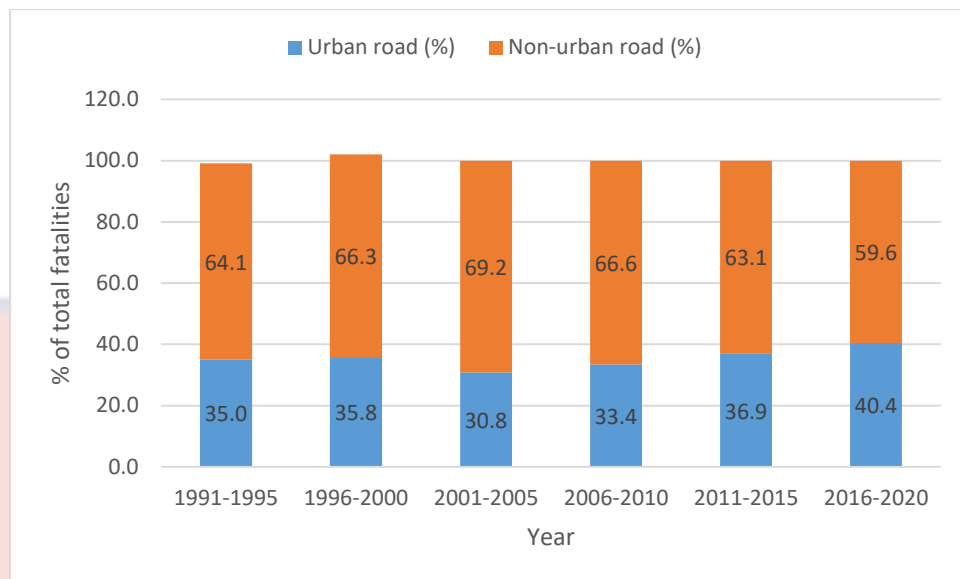


Figure 8: Trends in fatalities from accidents in Ghana by road environment
Source: NRSA (2021)

Understanding the age distribution by fatalities could also be important in tailoring road safety advocacy and communications in the country. The data show that across the six-year groups, young adults (aged below 36 years) have consistently constituted more than half of the fatalities recorded in road accidents (Figure 9). This is followed by middle-aged adults (35-55 years) who constitute 20-36 percent and old-age adults accounting for a little above five percent. Noteworthy, however is the fact that the percentage of young-adult fatalities increased from 46.7 percent in the period 1991-1995 to 59.5 percent in the period 2006-2012 but decreased to 32.1 percent in the period 2016-2000. In the same manner, the percentage of middle-aged and old-age adults respectively increased from 21.4 and 2.9 percent from 1991-1995 to 35.8 and 5.3 percent for 2011-2015 but decreased to 21.4 and 2.9 percent again for 2016-2020.

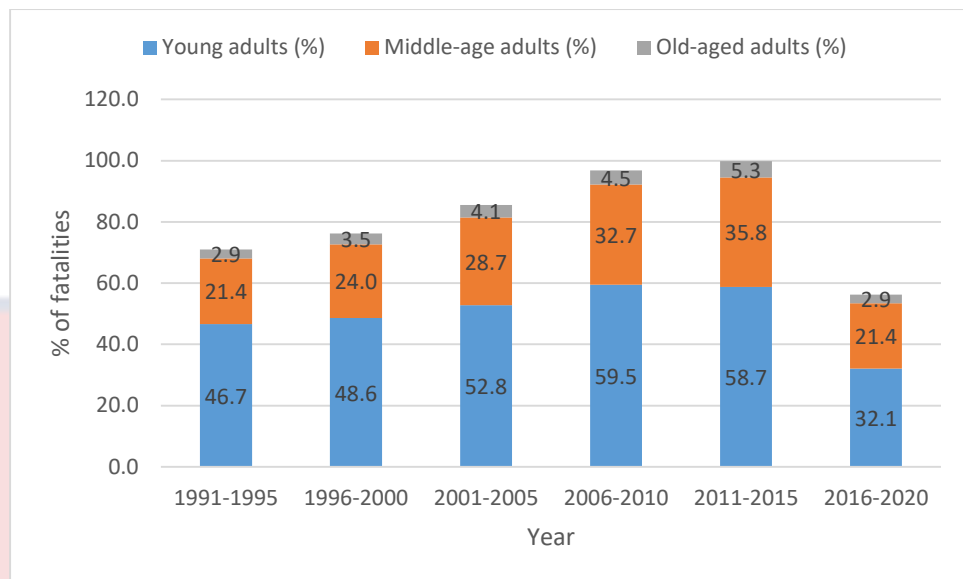


Figure 9: Trends in fatalities recorded in road accidents in Ghana by age groups
Source: NRSA (2021)

Similar to the need for understanding the age distribution in the number of fatalities is the distribution by sex. The number of fatalities was disaggregated by sex to reveal further nuances in the data (see Figure 10). The results showed that more than 70 percent of fatalities recorded within the period were males. Females constituted 21.9 percent to 27.3 percent of fatalities recorded from 1991 to 2020. Interestingly, while the percentage of males in recorded fatalities has seen a continuous increase, the percentage of females in fatalities declined over the period. The highest (79.4%) percentage of male fatalities was recorded in the period 2016-2020 while the highest (27.4%) female fatalities were recorded in the period 1996-2000.

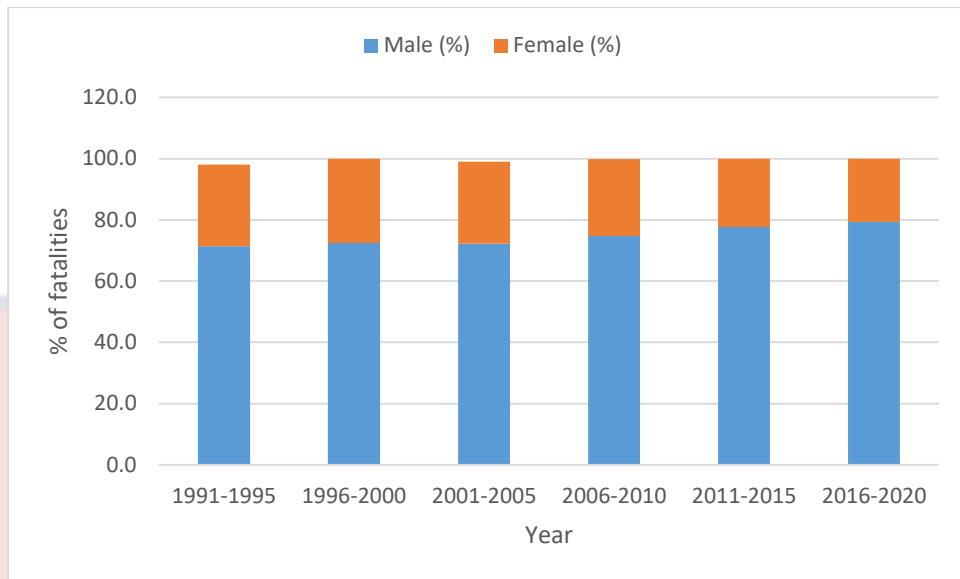


Figure 10: Trends in number of fatalities recorded in Ghana disaggregated by sex
Source: NRSA (2021)

Trends in casualties from road crashes in Ghana from 1991 to 2020

The number of casualties (killed, seriously injured or slightly injured) is an important indicator of the road safety situation in the country. Between 1991 and 2020, the number of casualties from road accidents increased slightly. The highest number of casualties (18,496) was recorded in 2009 while the lowest (8,488) was recorded in 1994 (Figure 11).

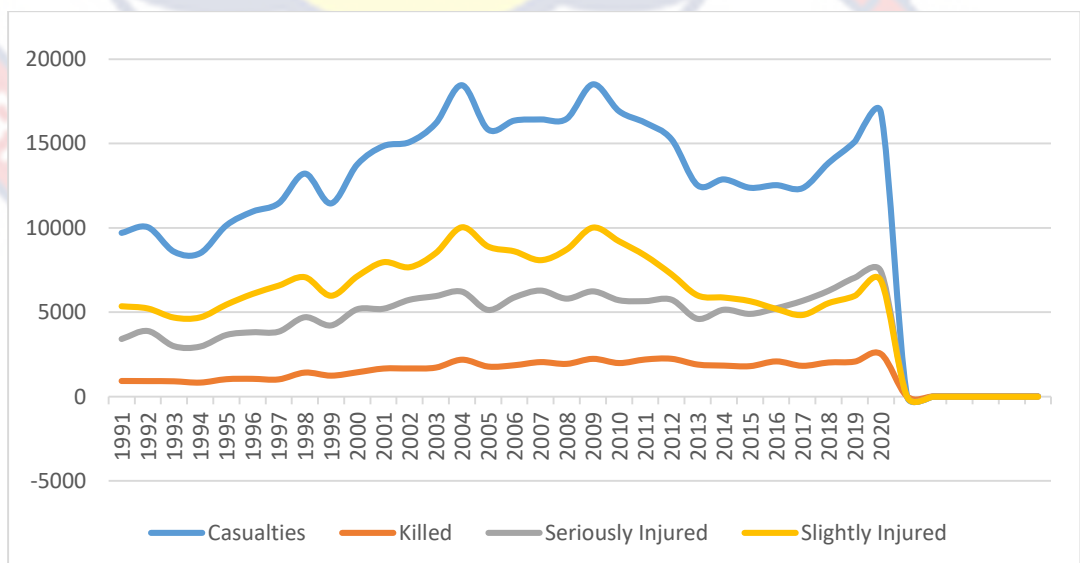


Figure 11: Trends in number of casualties from road accidents in Ghana recorded from 1991 to 2020
Source: NRSA (2021)

To better understand the severity of the situation concerning the number of casualties, a disaggregation by the form of casualty (fatality, slight injury and serious injury) is presented (Figure 12). It is observed that the percentage of slightly injured casualties consistently exceeded other forms of casualties across the six-year groups. However, an alarming trend of the increasing proportion of fatalities from almost ten percent in the period 1991-1995 to 14.9 percent in the period 2016-2020 is observed. Also, the proportion of seriously injured casualties increased from 36.0 percent in the period 1991-1995 to 44.8 percent in the period 2016-2020.

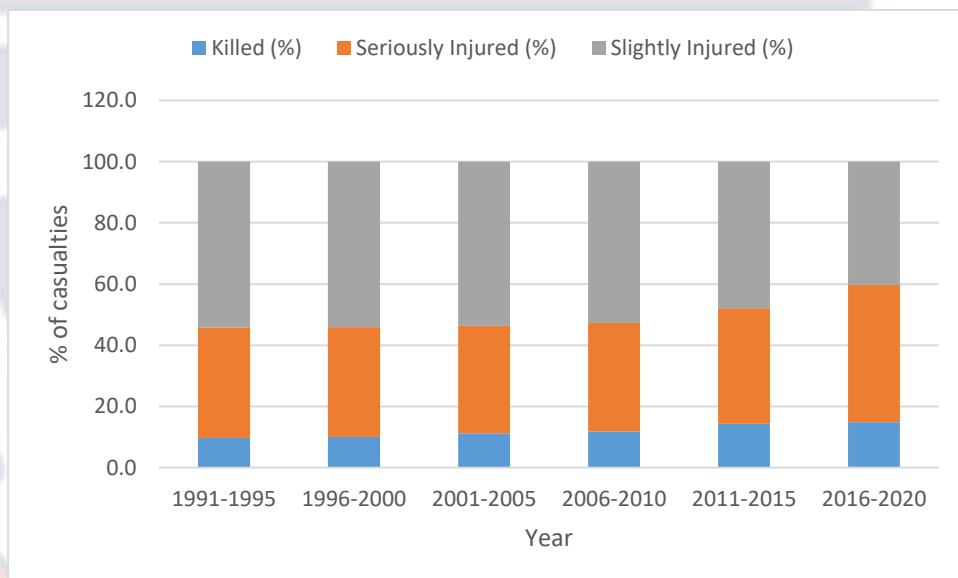


Figure 12: Trends in casualties by form of casualty recorded in Ghana from 1991 to 2020

Source: NRSA (2021)

There is the need to determine whether the number of casualties differed statistically across the six-year groups. A one-way Analyses of Variance (ANOVA) test was conducted to ascertain mean differences in the number of casualties recorded over the years. It was observed that there were statistically

significant differences in the means of individuals killed, slightly injured and seriously injured over the period (Table 4).

Table 4: ANOVA Test for Mean Number of Casualties Across Six-year Groups

		Sum of Squares	df	Mean Square	F	Sig.
Fatalities	Between Groups	5943160	5	1188632	31.856	0
	Within Groups	895505.2	24	37312.72		
	Total	6838665	29			
Seriously Injured	Between Groups	30552933	5	6110587	19.646	0
	Within Groups	7464993	24	311041.4		
	Total	38017926	29			
Slightly Injured	Between Groups	60042398	5	12008480	19.256	0
	Within Groups	14967136	24	623630.7		
	Total	75009533	29			

Source: NRSA (2021)

To further examine these differences, a Tukey HSD multiple comparison test was implemented. The results show that the mean number of fatalities in the years 2001-2005, 2006-2010, 2011-2015 and 2016-2020 were statistically higher than the mean of fatalities in road accidents in 1991-1995 and 1996-2000. However, the mean number of fatalities in road accidents between 1991-1995 and 1996-2000, as well as between 2001-2005, 2006-2010, 2011-2015 and 2016-2020 were not statistically different. Similarly, the mean number of serious injuries recorded in 2001-2005, 2006-2010, 2011-2015 and 2016-2020 were higher than that recorded in 1991-1995. On the other hand, there was no statistically significant difference in the mean number of serious injuries recorded between 1991-1995 and 1996-2000. In a similar manner, the mean number of serious injuries recorded between 1996-2000 and 2011-2015 was not statistically different. In terms of the number of slight injuries, the mean numbers recorded in 2001-2005 and 2006-2010 were statistically higher than

that recorded in 1991-1995, 1996-2000, 2011-2015 and 2016-2020. However, the number of slight injuries recorded in 1991-1995, 1996-2000, 2011-2015 and 2016-2020 were not statistically different (Appendix H).

The associations between the total number of road crashes, casualties, population and registered vehicles were assessed using the Spearman's rank order correlation. This tool was deemed fit for the data considering that the variables were either counts of events or people or items. The results showed a strong positive correlation between the total number of road crashes and the number of casualties recorded (Table 5). Also, the number of road crashes is positively correlated with the population of the country. Further, a significant association was observed between the population and the number of casualties recorded from road accidents as well as between the population and the number of registered vehicles in the country.

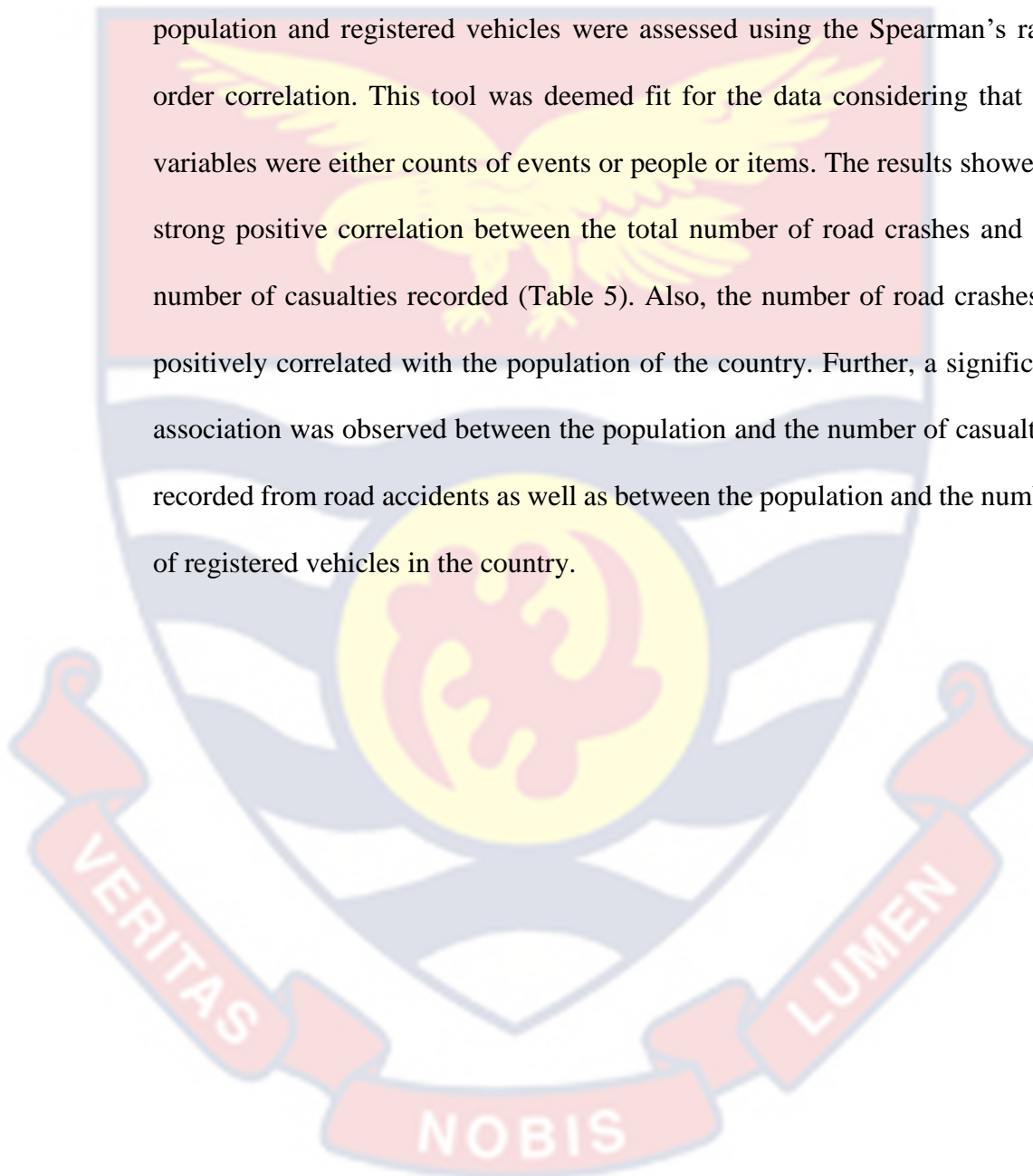


Table 5: Spearman's Rank Order Correlation of Relationships Between the Total Number of Road Crashes, Casualties, Population and Registered Vehicles

	All Crashes	Bus/mini bus crash	Casualties	Fatalities	Population (X106)	Registered vehicles	Fatal crashes	Killed	Seriously Injured	Slightly Injured	Injury crashes
All Crashes	1										
Bus/mini bus crash	.736**	1									
Casualties	.930**	.702**	1								
Fatalities	.773**	.383*	.844**	1							
Population (X106)	.469**	0.053	.529**	.868**	1						
Registered vehicles	0.196	-0.146	0.256	.680**	.948**	1					
Fatal crashes	.722**	0.301	.777**	.986**	.923**	.763**	1				
Killed	.773**	.383*	.844**	1.000**	.868**	.680**	.986**	1			
Seriously Injured	.819**	.470**	.876**	.912**	.777**	.608**	.891**	.912**	1		
Slightly Injured	.822**	.787**	.884**	.535**	0.117	-0.154	.437*	.535**	.555**	1	
Injury crashes	.907**	.692**	.925**	.806**	.489**	0.233	.750**	.806**	.744**	.856**	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Source: NRSC (2021)

Trends in crashes involving public transport vehicles

The trend on road accidents involving vehicles commonly used for public transport such as buses and mini-buses was assessed. As shown in Figure 13, the lowest number (288) of road accidents involving these vehicles was recorded in 1991 while the highest number (4,849) was observed in the year 2004. Further, it was observed that public vehicle accidents increased from an average of 2,151 between 1991 and 1995 to 4,548 in 2006-2010. This decreased steadily to an average of 2,950 between the period 2016-2020 (Table 6).

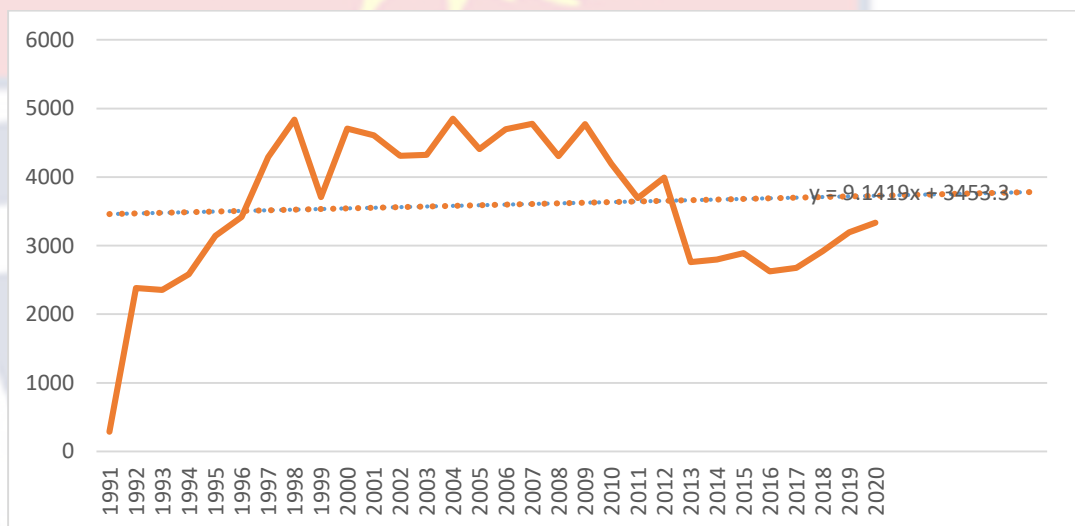


Fig 13: Accidents involving public transport (bus/mini-bus)
Source: NRSA (2021)

Table 6: Distribution of Average Number of Public Vehicle Accidents Across Six-Year Groups

Year Category	Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum
			Lower Bound	Upper Bound		
1991-1995	2151.00	1088.817	799.06	3502.94	288	3145
1996-2000	4192.40	617.123	3426.14	4958.66	3419	4839
2001-2005	4500.80	227.468	4218.36	4783.24	4312	4849
2006-2010	4548.40	278.525	4202.57	4894.23	4192	4777
2011-2015	3227.20	572.690	2516.11	3938.29	2760	3991
2016-2020	2950.40	311.665	2563.42	3337.38	2625	3334

Source: NRSA (2021)

To broaden understanding on the trends in public vehicle accidents, the mean number of accidents recorded in the six-year groups were subjected to a one-way Analyses of Variance (ANOVA) test. The results (Table 7) showed that the mean number of public vehicle accidents of at least one-year group is statistically different from the mean number of accidents recorded in the five other year groups.

Table 7: ANOVA Test for Mean Number of Crashes Involving Public Transport Vehicles Across Six-Year Groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	23611270	5	4722254	13.36	0.000
Within Groups	8483157	24	353464.9		
Total	32094427	29			

Source: NRSA (2021)

To further examine the differences in the mean number of crashes involving public transport between the six-year groups, a Tukey HSD multiple comparison test was conducted. The results showed that the mean number of crashes recorded in 1996-2000, 2001-2005, and 2006-2010 were statistically higher than that recorded in 1991-1995, 2011-2015, and 2016-2020 (Appendix D). However, there were no statistically significant differences in the mean number of crashes recorded in 1991-1995, 2011-2015, and 2016-2020; and also between 1996-2000, 2001-2005, and 2006-2010.

Crash trend by vehicle type from 1991 to 2020

Crashes by vehicle type from 1991 to 2020 were compared and it could be realised that although crashes involving public transport rose to a peak in 2004, the rate reduced in 2020 (Figure 14). With crashes involving cars, there was a steady increase between 1991 and 2020 with 2020 recording the highest

ever. Crashes involving motorcycles, tricycles, and rickshaws saw the highest rise in number between 1991 and 2020 as compared with the other two categories of vehicle type.

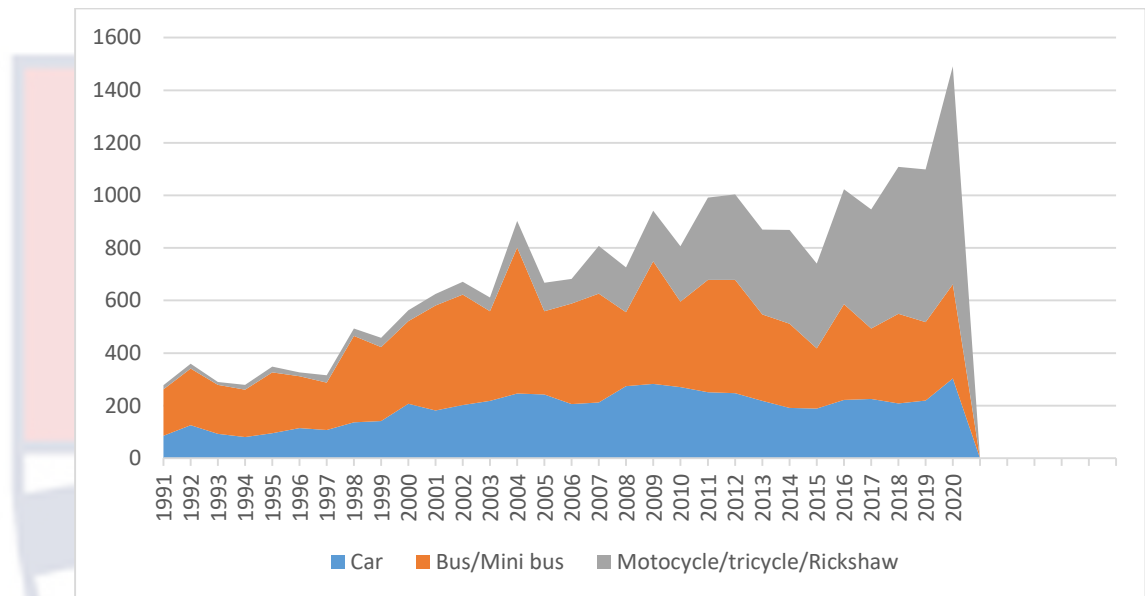


Figure 14: Trend of crashes by vehicle type from 1991-2020

Source: NRSA (2021)

Fatalities recorded through road crashes involving public transport was also compared using the six-year groups and it was realised that the number of fatalities rose from 990 for the period 1991-1995 to 2,034 in 2001-2005, but reduced to 1,631 in 2016-2020 (Figure 15)

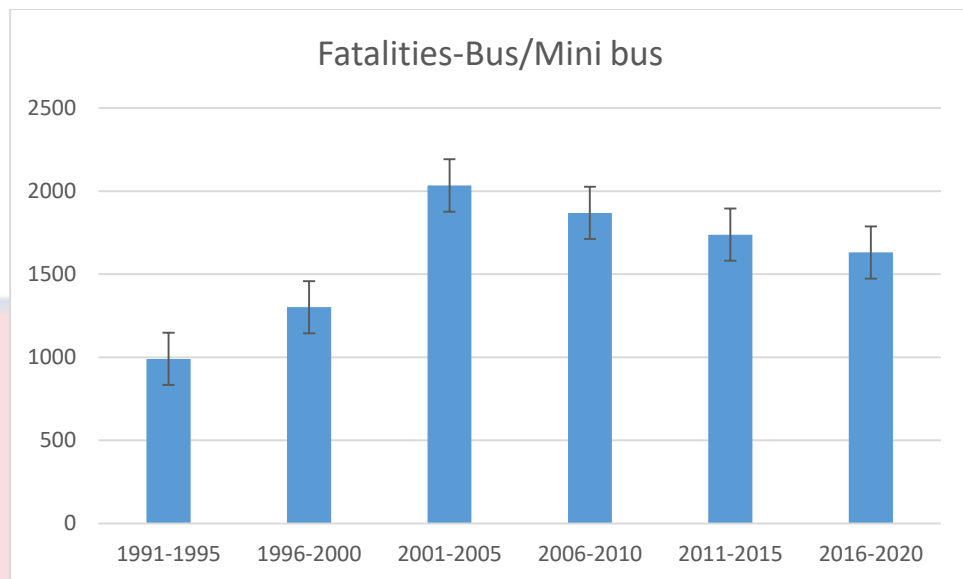


Figure 15: Fatalities recorded through crashes involving public transport vehicles from 1991-2020

Source: NRSA (2021)

A comparison was made between total crashes recorded and that of public transport from 1991 to 2020. It is observed that the lowest percentage of crashes involving public transport to total crashes (2.94%) occurred in 1991, whereas the highest percentage (28.30) was recorded in 1998 (Figure 16). Comparing the percentage of public transport crashes to the total number of crashes by year groups, it emerged that there was an increase from 20.83 per cent in 1991-1995 to 27.07 per cent in 1996-2000, but reduced steadily to 17.64 per cent in 2016-2020 (Figure 17).

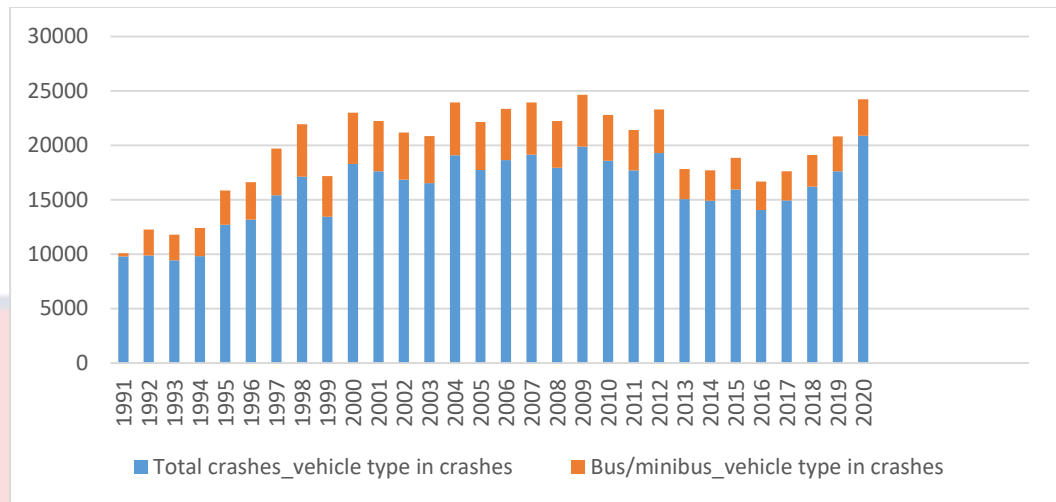


Figure 16: Comparison of total crashes and public transport crashes from 1991-2020

Source: NRSA (2021)

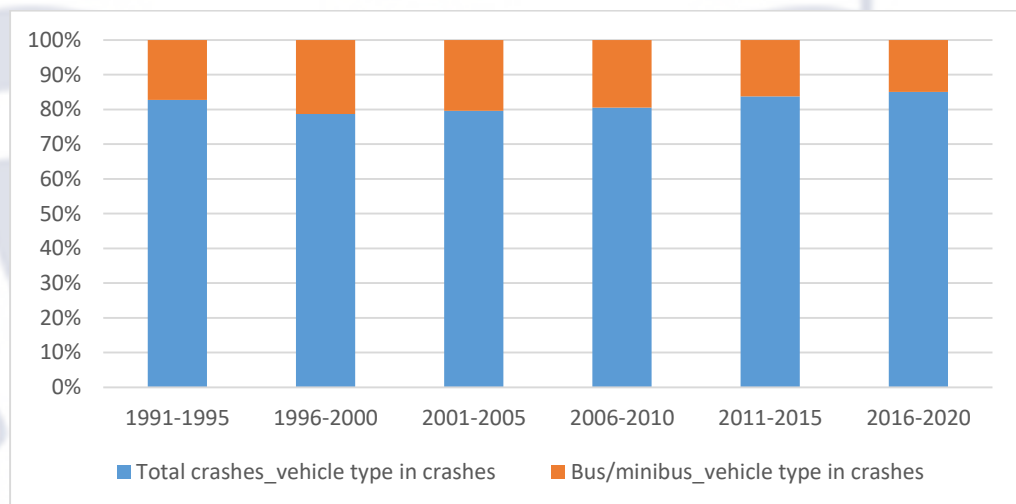


Figure 17: Percentage of public transport crashes to total crashes by year group
Source: NRSA (2021)

An unsteady trend was observed in comparing the casualty rate of public transport with that of total casualty rate. The lowest percentage of public transport casualty to total casualty (24.69%) was recorded in 2020 whereas the highest (40%) was recorded in 1999 (Figure 18). With the year groups (Figure 19), the percentage of public transport casualty to that of total casualty increased from 33.39 per cent in 1991-1995 to 39.15 per cent in 2001-2005, but reduced steadily to 28.11 per cent in 2016-2020.

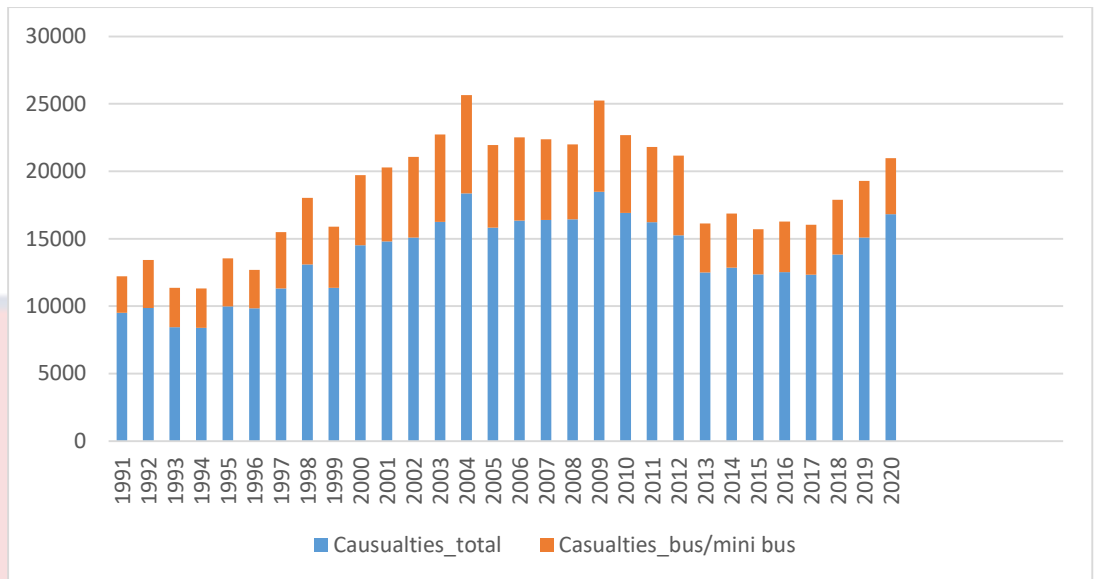


Figure 18: Comparison between total casualties and public transport casualties from 1991-2020

Source: NRSA (2021)

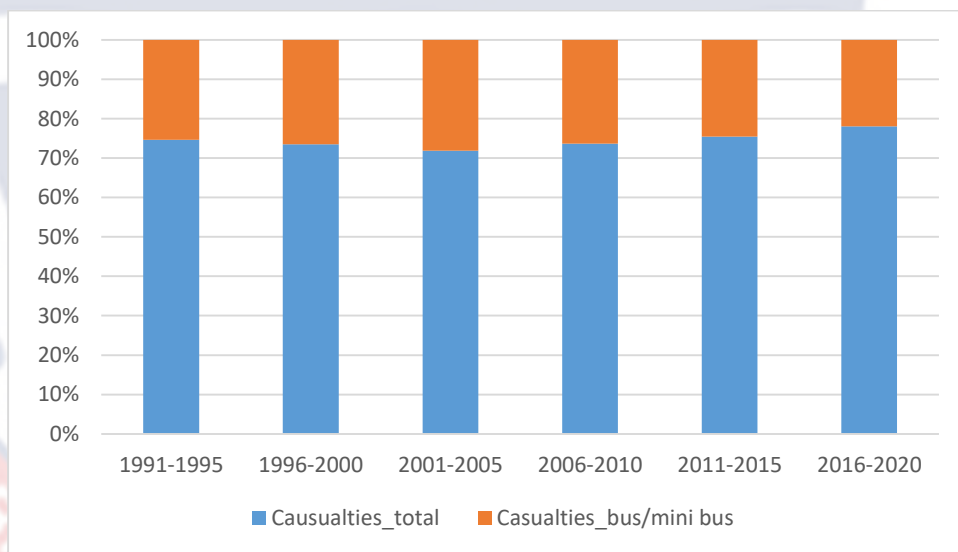


Figure 19: Percentage of public transport casualties to total casualties by year groups

Source: NRSA (2021)

Comparing the fatalities recorded through crashes involving public transport vehicles with the total number of fatalities recorded from 1991 to 2020, it could be realised that both saw a fluctuating trend (Figure 20). However, the lowest percentage of fatalities recorded through public transport

vehicle crash to total fatalities was in 2015 (12.71%), whereas the highest (31.79%) was in 1995. With the year groups (Figure 21), the percentage of public transport fatalities to total fatalities reduced from 23.85 per cent in 1991-1995 to 15.49 percent in 2016-2020.

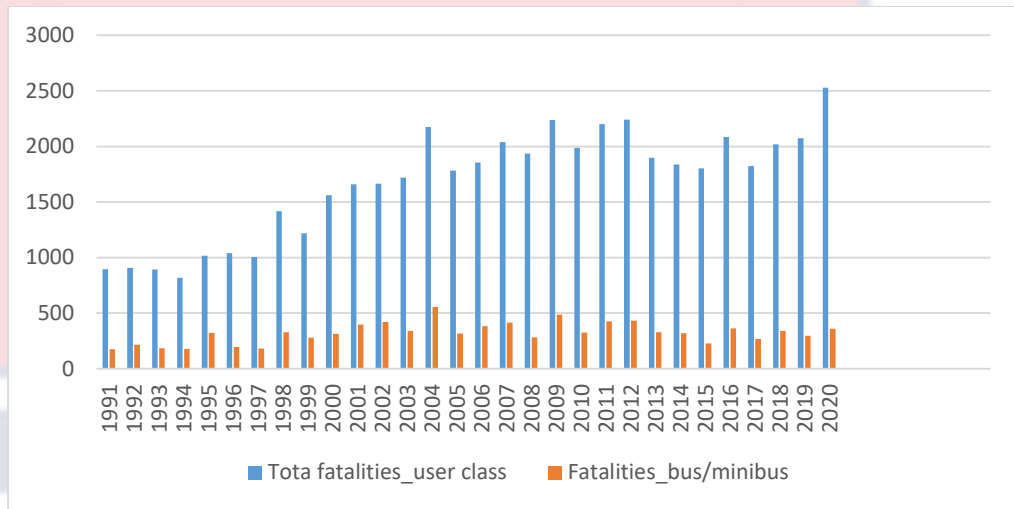


Figure 20: Comparison between public transport fatalities and total fatalities from 1991-2020
Source: NRSA (2021)

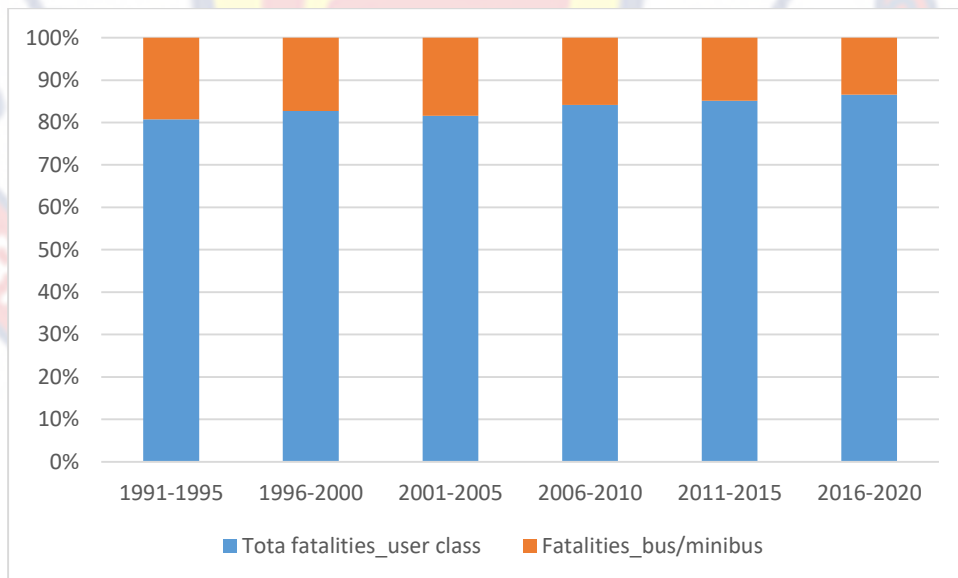


Figure 21: Percentage of public transport fatalities to total fatality rate by six-year groups
Source: NRSA (2021)

Road crash indices for 2012 to 2020

The total number of crashes, casualty rate, fatalities, seriously injured, and slightly injured were calculated to ascertain the rate of change after the declaration of the Global Decade of Action on Road Safety in 2011. Using the year 2011 figures as the baseline (Table 8), total crashes increased by a margin of 15.51 percent, total casualties increased by 11.44 percent, fatalities increased by 21.95 percent, serious injuries increased by 5.29 percent, and slight injuries increased by 15.03 per cent by the end of 2020.

A similar analysis of crash indices involving public transport (Table 9) was conducted using the year 2011 figures as the base. It is observed that crashes increased by eight percent in 2012 but reduced to 75 percent in 2013. There was some fluctuation between 2013 and 2019 but reached an index of 90 percent in 2020. With the casualty rate, it reduced to 88 percent in 2012 and then fluctuated from 2013 till 2020 when an index of 74 percent was recorded. Similar to the crashes recorded by public transport, fatalities increased by one percent in 2012, but reduced drastically to 54 percent in 2015. It however increased to 85 percent in 2016 and saw a fluctuation in between 2017 and 2020 which recorded an index of 84 percent. In general, the number of crashes, casualties, and fatalities saw reductions in the indices between 2011 and 2020 as compared to the total number of crashes, casualties, fatalities and injuries.

Table 8: Road Crash Indices for the Period 2012 to 2020

Year	All Crashes	Index	All Casualties	Index	Fatalities	Index	Seriously Injured	Index	Slightly Injured	Index
2011	10887	100.00	16219	100	2199	100	5663	100	8357	100
2012	12083	110.99	15241	93.97	2240	101.86	5748	101.50	7253	86.79
2013	9200	76.14	12509	82.07	1898	84.73	4611	80.22	6000	82.72
2014	9152	99.48	12863	102.83	1836	96.73	5153	111.75	5874	97.90
2015	9796	107.04	12367	96.14	1802	98.15	4905	95.19	5660	96.36
2016	8651	88.31	12522	101.25	2084	115.65	5237	106.77	5201	91.89
2017	9133	105.57	12339	98.54	1823	87.48	5677	108.40	4839	93.04
2018	9840	107.74	13837	112.14	2020	110.81	6275	110.53	5542	114.53
2019	10808	109.84	15094	109.08	2073	102.62	7048	112.32	5973	107.78
2020	12484	115.51	16820	111.44	2528	121.95	7421	105.29	6871	115.03

Source: NRSA (2021)

Table 9: Crash Indices Involving Public Transport Vehicles from 2012 to 2020

Year	Crashes	Index	Casualties	Index	Fatalities	Index
2011	3692	100	5594	100	427	100
2012	3991	108	4931	88	432	101
2013	2760	75	3629	65	329	77
2014	2800	76	3996	71	321	75
2015	2893	78	3342	60	229	54
2016	2625	71	3757	67	364	85
2017	2678	73	3694	66	269	63
2018	2919	79	4052	72	341	80
2019	3196	87	4195	75	298	70
2020	3334	90	4153	74	359	84

Source: NRSA (2021)

Causes of Road Traffic Crashes in Ghana

As indicated in the road safety literature (Abane, 2012; WHO, 2018), between 80 to 90 percent of road crashes are caused by human error, which mostly is attributed to the driver of the vehicle. The data from the National Road Safety Authority list about eleven causes of road crashes in Ghana. These include inexperience, inattentiveness, speeding, tailgating (driving too close), no signal, improper overtaking, improper turning, loss of control, and other (causes that are not specified). The data show that driver inattentiveness for instance which contributed about five percent to fatalities and about six percent to injuries in 2001 increased to 39.1 per cent and 43.4 percent of fatalities and injuries respectively in 2020. The data suggests that driver inattentiveness is the leading cause of road crash fatalities and injuries in Ghana presently, contributing about 7,165 casualties in 2020 alone. Table 10 shows the causes of road crashes for four-year periods; 2001, 2011, 2019, and 2020.

Table 10: Causes of Road Traffic Crashes in Ghana as of 2020

Driver Error	2001		2011		2019		2020									
	Killed No	Injured %	Killed No	Injured %	Killed No	Injured %	Killed No	Injured %								
None	264	29.3	3072	30.1	233	10.6	2802	20.0	330	15.9	2740	21.0	456	18.0	3297	23.1
Inexperience	17	1.9	197	1.9	26	1.2	169	1.2	75	3.6	516	4.0	46	1.8	220	1.5
Inattentive	47	5.2	648	6.3	823	37.4	4425	31.6	734	35.4	4838	37.2	989	39.1	6196	43.4
Too Fast	120	13.3	779	7.6	609	27.7	2380	17.0	676	32.6	3659	28.1	710	28.1	3275	22.9
Too Close	5	0.6	113	1.1	8	0.4	132	0.9	30	1.4	271	2.1	30	1.2	241	1.7
No Signal	2	0.2	19	0.2	1	0.0	15	0.1	3	0.1	80	0.6	3	0.1	43	0.3
Improper Overtaking	36	4.0	218	2.1	65	3.0	289	2.1	81	3.9	356	2.7	120	4.7	422	3.0
Improper Turning	6	0.7	152	1.5	7	0.3	66	0.5	7	0.3	70	0.5	16	0.6	79	0.6
Fatigue/Asleep	3	0.3	65	0.6	10	0.5	37	0.3	6	0.3	63	0.5	5	0.2	79	0.6
Other + Lost Control	345	38.3	4475	43.8	394	17.9	3671	26.2	37	1.8	293	2.3	46	1.8	282	2.0
Unknown	56	6.2	483	4.7	23	1.0	34	0.2	94	4.5	135	1.0	107	4.2	158	1.1
Total	901	100.0	10221	100.0	2199	100.0	14020	100.0	2073	100.0	13021	100.0	2528	100.0	14292	100.0

Source: NRSA (2021)

Crime Associated with Public Transport from 2010 to 2020

To ascertain the magnitude of crime associated with public transport vehicles and their occupants, data was solicited from the Criminal Investigation Department (CID) of the Ghana Police Service. Table 11 shows data on number of police reported robberies from 2010 to 2020. The figures include highway robbery attacks on public transport but which is not disaggregated. Table 12, however, provides data on police reported highway robbery attacks related to public transport from January to December 2020. It is observed that a total of 367 highway robbery attacks were recorded in 2020, which constituted approximately 18 per cent of total robberies recorded in the same year. There was no data available on other crimes like baggage theft, assault, sexual harassment, and robbery attacks on passengers while they were accessing public transport.

Table 11: Police Records of All Reported Robberies in Ghana from 2010-2020

Offence	Year										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Robbery	1260	1235	1126	1235	1116	1371	1397	1772	1919	1979	2025

Source: CID, Ghana Police Service (2020)

Table 12: Police Reported Highway Robberies for 2020

Highway Robbery	Cases Reported
January	34
February	32
March	36
April	38
May	35
June	40
July	17
August	29
September	22
October	26
November	36
December	22
Total	367

Source: CID, Ghana Police Service (2020)

For want of data on highway robberies related to public transport in the years preceding 2020 (2010-2019), the percentage of highway robberies to the total number of robberies (18%) in 2020 was used to extrapolate the figures for 2010-2019. Assuming the percentage of highway robberies to total robberies was constant throughout the preceding years, then the number of robbery attacks related to public transport for the years 2010 to 2019 would be as shown in

Table 13.

Table 13: Calculated Highway Robberies from 2010 to 2019 based on 2020 Figures

Offence	Year											
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Robbery	1260	1235	1126	1235	1116	1371	1397	1772	1919	1979	2025	
Highway Robbery	227	222	203	222	201	247	251	319	345	356	367	

Source: CID, Ghana Police Service (2020)

Projection of Crash Trend and Crime on Public Transport for 2021 to 2030

Based on the crash statistics from 1991 to 2020, the Microsoft Excel Forecast Function was used to do a basic forecast using all crashes, injury crashes, and damage only crashes to ascertain how the trend would be between 2021 and 2030. The basic forecast was used because it is able to learn from the historical data and ascertain whether it fits a linear, quadratic or exponential function before predicting. The forecast figures in excel were then used to plot the charts in Figures 22 and 23, as well as Appendices J, K, and L. The results (Figure 22) shows a downward trend for all the three categories of crash type (total crashes, injury crashes, damage only crashes) for 2021 to 2030 except fatal crashes that shows a slight upward trend. With crashes by vehicle type (Appendix J), an almost stable trend is expected between 2021 and 2030, whereas crashes involving public transport vehicles is expected to continue to see a downward trend within the same period. For crash casualties (Appendix K), it is expected to see a stable trend from 2021 to 2024 and then a downward trend thereafter. On the other hand, casualties resulting from public transport crashes is expected to record an upward trend between 2021 and 2030. Last but not least, fatalities resulting from total crashes (Appendix L) is expected to record a steady upward trend within the period 2021 to 2030, whereas public transport crash fatality rate is expected to see an almost stable trend within the same period but with a little decrease by the close of 2030.

With highway robberies, the forecast indicate that the figures could rise to 568 by 2030 (Figure 23; Appendix M).

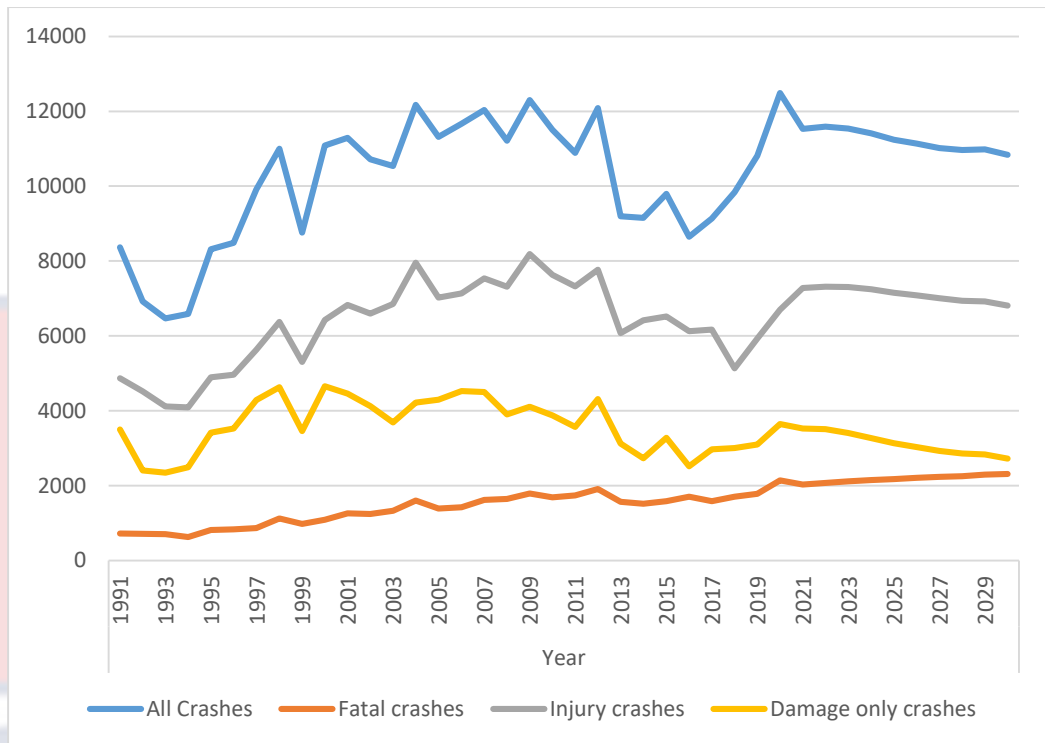


Figure 22: Projected crash trend for 2021-2030
Source: Based on NRSA (2021)

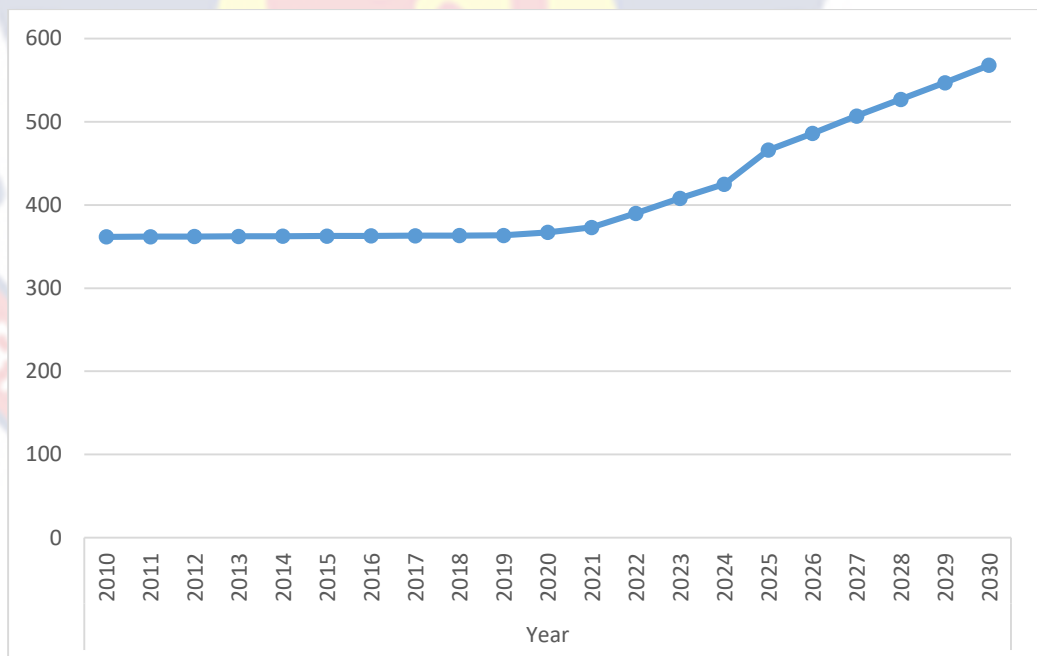


Figure 23: Projected highway robberies from 2021-2030
Source: Based on NRSA (2021)

Discussion

This chapter assessed the state of road safety and security in road travel in Ghana, based on statistics available from the National Road Safety Authority and the Criminal Investigation Department of the Ghana Police Service. The results indicate that road crashes recorded a fluctuating trend between 1991 and 2020, with 2020 recording the highest crash ever in the thirty-year period. On the contrary, crashes, casualties, and fatalities involving public transport vehicles experienced some fluctuations but recorded a downward trend at the end of 2020. Regarding road transport security, no true reflection was observed since the data acquired was scanty. The following paragraphs discuss the results.

The road crash trend from 1991 to 2020 generally was fluctuating in nature as sometimes there were reductions, whereas at other times there were increases. Just as the crashes increased, so did fatalities and injuries increase. The results suggest that road traffic fatalities and injuries are high and continue to be an important morbidity and mortality problems in Ghana (Afukaar, Antwi & Ofosuhen, 2003; Coleman, 2016). As indicated by Abane (2012), it appears Ghana as a country is losing the fight against road carnage and this is portrayed by the statistics available. Crashes and casualties (including fatalities and injuries) involving public transport vehicles generally recorded decreased trends between 1991 and 2020. A careful look at the data (especially crash by vehicle type) indicates that the influx of motorcycles and tricycles for commercial purposes contributed immensely to the increase in the crash rate. It was also observed that crashes in non-urban environment increased over the period as compared with urban environment. This could result from the fact that speed

restrictions in non-urban environments is more relaxed than the urban environments, and this motivates drivers especially, to speed in such environment. The data also indicates that most crash victims were within the working age group, and this is a serious threat to the economic development of the country since a lot of human resources is lost through crashes. Further, men are the most affected victims in terms of fatalities, and this has the potential of affecting families negatively since men are mostly breadwinners of families.

Judging from the indices calculated for 2012 to 2020, Ghana could not achieve the target set by the United Nation's Decade of Action on Road Safety (UN, 2011). The target set by the UN was to stabilise and then reduce road crash fatalities and injuries by 50 percent by the year 2020. It is observed that Ghana's fatality rate rather increased by almost 22 per cent at the end of 2020. Notwithstanding, the fatality rate of eight persons per 100,000 population as indicated in the 2020 Road Crash Statistics seems to be low as compared to the global average of 18 persons per 100,000 population (WHO, 2018). The average death rate for high income and low income countries are 8.3 persons per 100,000 population and 27.5 persons per 100,000 population respectively. With public transport on the other hand, some success was made although it was not up to even half of the target set by the UN.

Contrary to other studies (WHO, 2018; Yadav & Velaga, 2020) which identified drunk driving as one of the leading causes of road crashes globally, the leading cause of crash fatalities and injuries in Ghana as of 2020 was driver inattentiveness (distraction). The fact that drunk driving is not listed among the leading causes of crashes in Ghana is surprising, considering its contribution to crashes globally as reported by World Health Organisation (2018). Several

studies (Choudhary & Velaga 2017a; 2017b; 2018; 2019a; 2019b; Tarkowski & Rybicka, 2020)) however suggest that driver distraction come in many forms including the use of mobile phones for calling or texting, tuning radio, eating, and engaging in conversation with other occupants of vehicle whiles driving. As indicated by Antwi, Mensah and Dadzie (2015), it appears the proliferation of mobile phones in Ghana over the past two decades may be contributing to the high incidence of driver inattentiveness.

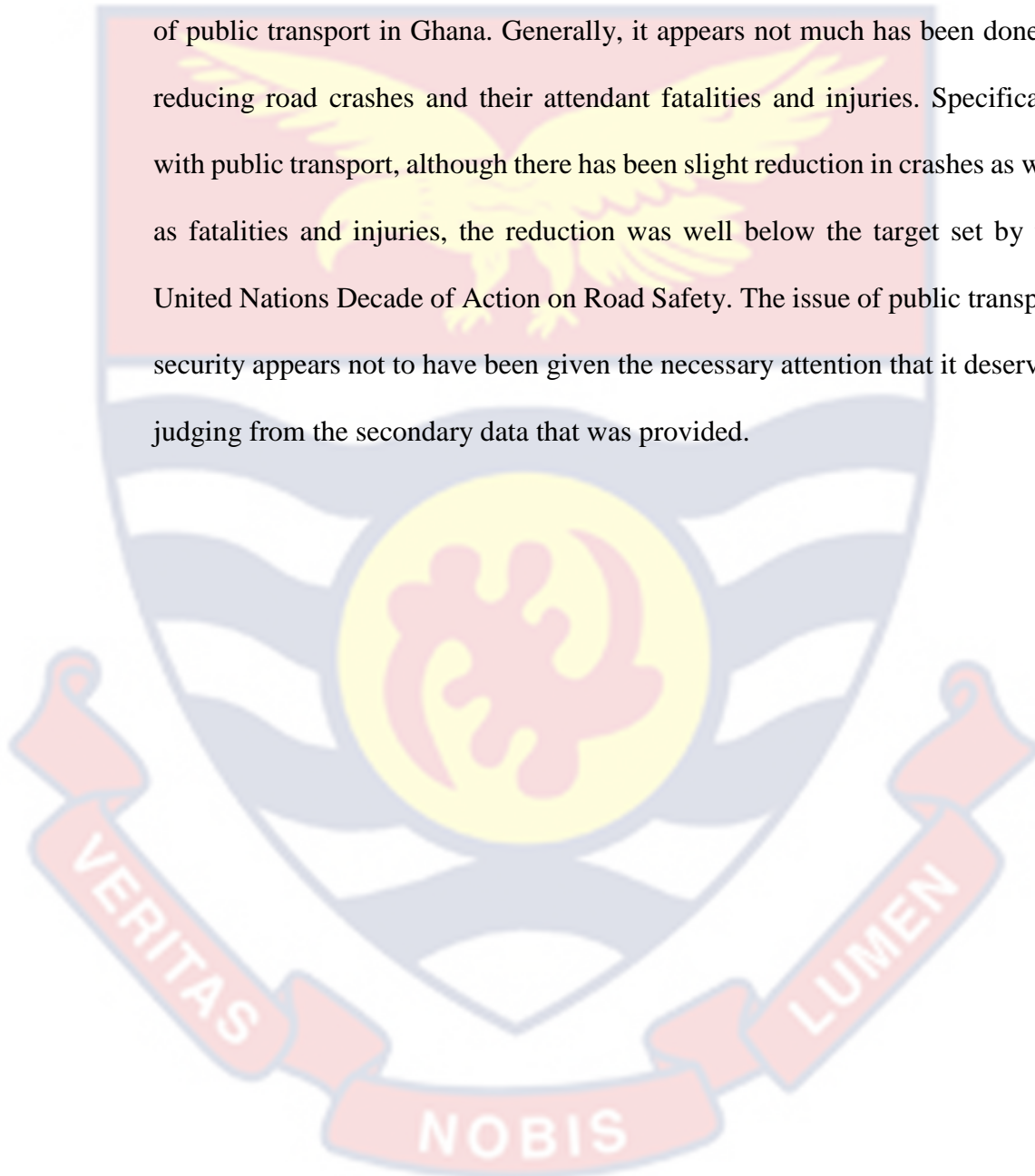
With security of public transport, it appears there is no rigorous form of data collection on crimes committed on the system, and this could result in either non-reporting or under reporting. As indicated previously, the data acquired on crime related to public transport was only on highway robberies, and this covered only the year 2020. There is the need therefore to intensify the surveillance and data collection on crime associated with public transport to make it easy for policy making and for future studies.

The projections made for 2021 to 2030 indicate that all things being equal, there is going to be a downward trend in the total crash rate by 2030. Notwithstanding, the forecast shows that there is going to be an increased trend in the fatality rate. There is the need therefore to put in measures that would help reduce the rate of fatalities since the ultimate aim of road safety is to reduce, if not prevent deaths that result from road crashes. With public transport which is the focus of this study, the forecast for the next ten years indicates that there would be a downward trend in crashes, as well as fatalities and injuries. This however, can be achieved through extra efforts by all stakeholders to improve upon the gains that have been made so far. In the area of public transport security, highway robberies for instance could escalate if stringent interventions

are not put in place. This situation could affect road travel in Ghana negatively since it is the major mode of internal travels.

Summary

This chapter focused on assessing the state of road safety and security of public transport in Ghana. Generally, it appears not much has been done in reducing road crashes and their attendant fatalities and injuries. Specifically with public transport, although there has been slight reduction in crashes as well as fatalities and injuries, the reduction was well below the target set by the United Nations Decade of Action on Road Safety. The issue of public transport security appears not to have been given the necessary attention that it deserves, judging from the secondary data that was provided.



CHAPTER SIX

PERCEIVED STATE OF SAFETY AND SECURITY IN ROAD TRAVEL

Introduction

Passenger safety and security in road transport is the main focus of this study, and this chapter presents the findings from a survey conducted with passengers, as well as in-depth interviews with transport operators, regulatory authorities, and some passengers. The chapter begins by describing the background of the organisations that were involved in the in-depth interviews, and the demographic characteristics of the passengers that participated in the survey. The chapter continues with the views of respondents on the state of road safety and security and some of the causes of crashes and crime on public transport in the country. The views of those passenger respondents who also participated in the follow-up in-depth interviews are blended with that of the other category of participants to explain the responses from the survey.

Background of Organisations and Participants Involved in the Qualitative Study

The passenger respondents used for the study were drawn from the terminals of six transport organisations, comprising two state assisted and four private companies. Five out of the six transport organisations, four regulatory authorities, two emergency service providers and 21 passengers participated in the in-depth interviews. One focus group discussion, comprising eight drivers was also conducted. The fleet size of the organisations ranged between 45 and 934 buses with a total manpower of 60 to 2,353 personnel. All the organisations had branches in almost all the sixteen regions. All the organisations indicated that they had a system of recruitment and continuous training for their drivers,

but it emerged that only the state-assisted organisations had a more rigorous system of recruitment and training as compared to the private organisations. Even among the state-assisted organisations, there were variations in the rigour in their system of recruitment and continuous training. Additionally, whereas the state assisted organisations had their own established system of continuous training of drivers and maintenance of their fleet, almost all the private ones depended on third parties for their training of drivers and maintenance of their fleet. It was also established that some of the companies had well documented operational guidelines which they followed in their daily operations.

With the regulatory authorities, it was indicated that the task in road safety management is multidisciplinary in nature. For instance, it required a systems approach in dealing with it. In order to ensure effective management of road safety, therefore, each of the key players had to perform a specific mandate or role that was backed by law. The core mandate ranged from the provision of road infrastructure through road safety education to enforcement of various road traffic regulations, emergency management and also the provision of road transport security. The National Road Safety Authority (NRSA) which is the lead agency in road safety management, for instance, was found to achieve its mandate through various institutions from the national through the regional to the district levels. Both the regulatory authorities and the emergency service providers were found to be under various ministries, namely the Ministry of Transport, Ministry of Roads and Highways, Ministry of Interior and Ministry of Health. For example, the National Road Safety Authority, the Driver and Vehicle Licensing Authority and the National Drivers Academy which provided continuous driver training for commercial drivers were directly under the

Ministry of Transport. The three road agencies (Ghana Highways Authority, the Department of Urban Roads and the Department of Feeder Roads) were under the Ministry of Roads and Highways whereas the Motor Traffic and Transport Department of the Ghana Police and the Ghana National Fire Service were under the Ministry of Interior. The Ghana Ambulance Service was under the Ministry of Health. Other support services in relation to emergency management were provided by the Ghana Red Cross Society and the Saint John's Ambulance Service both of which are private organisations. It could be realized from this arrangement that there was the need for coordination and collaboration among the various ministries as well as the agencies if effective road safety management and synergy in their activities was to be achieved.

Demographic Characteristics of Respondents

Table 14 depicts the demographic characteristics of passengers who participated in the survey. Out of a total of 372 respondents, 53.2 percent were males whereas the females constituted 46.8 percent. The modal age group of the respondents fell between the ages of 35 and 44 years, with the 65 years and above group recording the least number of respondents. Traders formed the largest group in terms of the occupation of respondents, followed by business people and those in the civil/public sector. Some students also took part in the survey, but the least among the respondents were engaged in other occupations. More than half (63.2%) had up to secondary education, including technical and vocational, with 28.2 percent having tertiary education. About eight percent had primary education whereas only about one percent did not have any formal education. Most of the respondents (72.8%) were married, and those who were single constituted about 21.8 percent. The rest were either divorced, separated,

or had lost a partner. The dominant religions of respondents were Christianity and Islam.

Table 14: Passengers' demographic information

Variable		Frequency	Percent
Sex	Male	198	53.2
	Female	174	46.8
Age	15-24 years	21	5.6
	25-34 years	111	29.8
	35-44 years	156	41.9
	45-54 years	59	15.9
	55-64 years	19	5.1
	65+	6	1.6
Occupation	Civil/Public Servant	101	27.2
	Business person	103	27.7
	Trader	116	31.2
	Student	36	9.7
	Other	16	4.3
Education (highest level attained)	No formal education	4	1.1
	Primary (Basic)	28	7.5
	Secondary/Tech/Voc.	235	63.2
	Tertiary	105	28.2
Marital status	Married	271	72.8
	Separated	2	0.5
	Single	81	21.8
	Divorced	17	4.6
	Widow/Widower	1	0.3
Religious affiliation	None	1	0.3
	Christian	225	60.5
	Muslim	138	37.1
	Traditionalist	6	1.6
	Other	2	0.5

Source: Field survey, February 2021

Travel Frequency and Accident Records of Respondents

In order to get information on whether respondents or their relatives or friends had ever been involved in an accident, they were asked to state their frequency of long-distance travel, and the means mostly used for these journeys.

Information on frequency of travel was based on the assumption that the more frequent one travelled, the more he/she would be exposed to the risk of being involved in a crash and security threats. In all, only about three percent of the respondents travelled twice or more in a week. Forty-one percent travelled at least once a week, whereas more than half (55.4%) of the respondents travelled at monthly intervals or more. Public transport was the major means for long distance travel for most of the respondents (96.2%). Only about three percent of the respondents used the private car as the major means for long distance travel (Table 15).

Table 15: Respondents' Travel Records and Mostly Used Means of Long Distance Journeys

Variable		Frequency	Percent
Frequency of long distance travel	Once a week	154	41.4
	Twice a week	6	1.6
	Thrice a week	4	1.1
	More than thrice a week	2	0.5
	Other	206	55.4
Means of transport mostly used for long distance travel	Private car	11	3.0
	Public transport	361	97.0

Source: Field survey, February 2021

Regarding respondents' personal involvement in a road crash on a public transport, more than three quarters indicated that they had never been involved in any road crash. About 14 percent had been personally involved in a road crash on public transport. With those who indicated they had ever been involved in a road crash on public transport, most of them (78.8%) sustained minor injuries,

13.5 percent did not sustain any injury whereas 7.7 percent sustained serious injuries (Table 16).

Respondents were also asked to indicate whether any of their relatives or friends had ever been involved in a road crash on a public transport, and only about 19 percent responded yes to this question. With those who responded yes to the question, 60 per cent involved relatives, 34.3 percent involved friends and about six percent involved both relatives and friends of respondents. Further, 72.8 percent out of the total sustained minor injuries, about nine percent sustained serious injuries, and 15.7 percent deaths were recorded (Table 16).

Table 16: Crash Records of Respondents and their Relatives/Friends

Variable		Frequency	Percent
Personal involvement in crash on PT	Yes	52	14.0
	No	320	86.0
Injury or no injury if yes to personal crash on PT	No injury	7	13.5
	Minor injury	41	78.8
	Serious injury	4	7.7
Relative or friend's involvement in PT crash	Yes	70	18.8
	No	302	81.2
Please specify whether relative, friend or both	Relative	42	60.0
	Friend	24	34.3
	Both relative and friend	4	5.7
Death or injury of relative or friend on public transport	Death	11	15.7
	No injury	2	2.9
	Minor injury	51	72.8
	Serious injury	6	8.6

Source: Field survey, February 2021

Responding to passengers' personal involvement in road crashes on public transport vehicles, a respondent commented as follows:

As for that one I thank God that I have never encountered such thing before and then my family too never. But it is just that somebody in the neighbourhood, one time they were going to Kumasi when the lorry was involved in an accident and he passed away. Just last week, one of my brothers [a guy in the neighbourhood but not a family member] was

going to Tamale and around Yendi on the Yendi-Tamale road they were involved in an accident and a lot of people got injured (Passenger, 38years, Male).

Respondents' Knowledge and Perceptions of Road Safety

In exploring the knowledge and perception of respondents on road safety in Ghana, they were asked to indicate how often they heard about road crashes. More than half (56.7%) of the respondents indicated that almost every week they heard about a road crash. Almost an equal percentage of respondents (21.5%) and (21%) indicated they heard about road crashes every month and daily respectively (Table 17). Respondents were also asked to indicate the medium through which they heard about road crashes, and since this was a multiple select option, all the mediums provided in the questionnaire (electronic media, print media, social media, personal experience, and experiences of relatives and friends) had almost the same number of responses (Table 17).

Table 17: Respondents' Frequency and Medium of Hearing About Crashes

Variable		Frequency	Percentage
Frequency of hearing of accidents	Everyday	78	21
	Every week	210	56.5
	Once a month	80	21.5
	Once a year	3	0.8
Medium of hearing about road accidents	Through electronic media	370	99.5
	Through the print media	368	98.9
	Through social media	367	98.7
	Experiences of relatives and friends	365	98.1
	Personal experience	302	81.2
	Other	2	0.5

Source: Field survey, February 2021

Respondents' Perceptions of Causes of Road Crashes

Views of respondents were sought on the causes of road crashes and because a particular crash could be caused by a combination of factors, the question was also multiple select. All the options provided in the questionnaire

(drunk driving, fatigue driving, driving under the influence of other substances, reckless overtaking, speeding, the use of mobile phone while driving, and leaving disabled vehicles on the road) again attracted almost equal number of responses. Other causes of road crashes were attributed to overloading, poor vision, poor maintenance, distraction and influences from passengers, unqualified drivers and supernatural causes. However, a ranking of the causes indicated respondents considered drunk and fatigue driving as the leading causes of road crashes in Ghana (Table 18).

Table 18: Respondents' Perception of Causes of Road Crashes

Variable	Frequency	Percentage	
Perception of causes of crashes	Drunk driving	370	99.5
	Fatigue driving	370	99.5
	Other substances (drugs)	369	99.2
	Reckless overtaking	369	99.2
	Speeding	368	98.9
	Unrecovered disabled vehicles	368	98.9
	Use of mobile phone while driving	368	98.9
	Other	16	4.3

Source: Field Survey, February 2021

To get further insight into the causes of road crashes during the in-depth interviews, interviewees were asked to come out with their subjective views of some of the causes of road crashes and which one of them they thought was the major cause. Most of the causes indicated were not different from what had been identified in the road safety literature including speeding, drunk driving, fatigue, distraction, reckless overtaking, attitude and negligence which could be put under the human factors. With speeding for instance, it was indicated that congestion was compelling drivers to speed. The explanation was that journeys that took two hours were now being done in four hours because of congestion.

For this reason, the least opportunity that a driver got, they would speed to make up the time.

The causes identified under technological factors included issues related to road design or engineering and road maintenance, as well as those related to the road vehicle itself. On the issue of bad roads for instance, it was explained that although it was a problem, drivers could mitigate it by familiarising themselves with the environment in which they operated. Other issues that were raised as being part of the causes of road crashes were poverty and policy related issues especially inconsistency of some of the issues in policy formulation. Judging from the responses of the interviewees, issues related to human factors contributed over 90 per cent to the causes of road crashes. The major causes of road crashes were summarised as follows:

So, when you look at the top four driver errors, you will realise that driver inattentiveness is the highest, followed by speeding, wrongful overtaking and I think alcohol or so. So based on this, we are able to come out to develop national campaigns to target these road safety causative factors (NRSA Officer, 37years, Male)

In trying to understand why human factors constitute a chunk of the causes of road crashes from the perspective of interviewees, it was observed that the actions and inactions of the industry players in the road transport sector was a major reason for the increase in road crashes and this was labelled “negligence” as explained by one of the regulatory officers:

I think it is clear to all of us that incidents of road crashes are preventable incidents, that it is induced by human beings, that it is either the negligence on the part of the vehicle owner, a driver, a passenger or vehicle occupant or road user who is on foot (pedestrian), or in certain instances the negligence on the part of a state agent that was not forthcoming with certain countermeasure facilities such as road design, provision of road furniture, replacement of damaged road furniture among others, or not being quick in delivering certain services that in the end will increase the risk of a road user either getting him/herself

involved in a crash or dying out of his or her injuries (MTTD Officer, 49 years, Male)

Although attitude was identified as one of the major causes of the human factor, it also came up that poverty was an underlying factor that affected the attitude of road users in Ghana, which translated into the behaviours exhibited on the road which made the road unsafe. It was asserted that poverty led to inability of the state to provide road infrastructure that are road user friendly, and maintain the existing infrastructure. Further, poverty does not enhance the use of available technology for road safety and emergency management. Additionally, poverty impedes the provision of adequate logistics for road safety and emergency management. Poverty also affects adequate maintenance of road vehicles in the sense that vehicle owners cannot afford the cost of genuine spare parts, and therefore resort to improvising and alteration which most of the time lead to those parts failing. With the technological factors, the major cause identified was poor road design and maintenance of the road which made it unsafe to drive on, whereas those related to vehicle was mainly focused on regular maintenance and road worthiness. This was explained by one of the regulatory officers and a passenger interviewee as follows:

...and the other thing of importance that I see which is also causing accident is attitudinal. Attitude is playing about 80 per cent per my own observation. (DVLA Officer, 53 years, Male)

...so one of the biggest challenges has to do with poverty. Poverty is an underlying factor for all these issues that we quote as issues of road accidents. So for me, if I would turn the table, number one is about poverty, yes, poverty is number one for me (Passenger, 43years, Male)

It was, however, observed that issues related to human factors went beyond the driver, to include other road users like pedestrians and mechanics who sometimes did shoddy jobs on vehicles which in many cases led to

mechanical failures. Surprisingly, no environmental factor was indicated in the interviews. It was also observed that the cause of road crashes was multi-faceted and that different causes could come together in some situations to cause a road crash. One other cause that was identified through a focus group discussion with some drivers was emotional instability. This was explained as a situation in which a driver becomes financially bankrupt, and is unable to provide money for housekeeping at a particular point in time. The result was that the driver would carry this emotion along even as he drives, and this could affect his focus, which could eventually lead to a crash. In their view, this situation on many occasions had resulted in drivers crashing their vehicles. This was how a participant elaborated on the assertion:

Yes, for example today is 29th and I have not received my salary, meanwhile, I have to take care of the home. If I am leaving home for work and I am not able to leave money for the family, the woman will talk anyhow to me and as I sit behind the steering wheel, my mind will be on what happened at home and therefore there will be lack of concentration which could lead to an accident (Focus group participant, 50years, Male).

Based on secondary data from the National Road Safety Authority, an attempt was made to seek respondents' views on the most affected people by road crashes in terms of sex, road user category, and age group. In terms of sex, more than half of respondents (65.9%) indicated that women formed the most affected casualties in terms of deaths and injuries. With the road user category, private car occupants were perceived to be the most affected (36.8%) followed by public transport occupants (32.5%). Regarding the age group, more than half of the respondents (58.3%) could not guess which age group were the most affected victims. With the other responses put together, it was realised that the

age group between 30 to 49 years was the most affected victims of road crashes (Table 19).

Table 19: Respondents' Views of Most Affected Victims of Road Crashes in Terms of Sex, Age and Road User Categories

Variable		Frequency	Percent
Category of person that lose their lives most through accidents	Male (adult)	90	24.2
	Female (adult)	245	65.9
	Children	16	4.3
	Can't tell	21	5.6
Category of road users affected most by RTCs	Pedestrians	22	5.9
	Cyclist and motor cyclist	92	24.7
	Private car occupants	137	36.8
Most affected age group by accidents	Public transport occupants	121	32.5
	20-29	3	0.8
	30-39	46	12.4
	40-49	93	25.0
	50-59	7	1.9
	60 and above	5	1.3
	Can't tell	218	58.6

Source: Field survey, February 2021

Respondents' Assessment of State of Road Safety in Ghana

Respondents were asked to assess the state of road crashes in Ghana, and their responses indicated that most of them (over 60%) thought crashes were declining steadily. Further, almost an equal percentage (60.4% and 58.1%) of respondents with secondary education and those with tertiary education indicated road crashes were declining steadily. Similarly, almost an equal percentage of respondents with secondary and those with tertiary education (30.2% and 31.4%) indicated road crashes were increasing steadily (Table 20).

Table 20: General Assessment of State of Road Safety by Level of Education

General assessment of state of road safety	Level of education recorded				Total	N
	No formal education	Primary	Secondary/ Technical/ Vocational	Tertiary		
Accidents are declining rapidly	0.0	0.0	3.4	1.9	2.7	10
Accidents are declining steadily	25.0	82.1	60.4	58.1	61.0	227
Accidents are increasing rapidly	25.0	0.0	1.3	4.8	2.4	9
Accidents are increasing steadily	50.0	17.9	30.2	31.4	29.8	111
Don't know	0.0	0.0	4.7	3.8	4.0	15
Total	100.0	100.0	100.0	100.0	100.0	372
N	4	28	235	105	372	

Source: Field survey, February 2021

On the safety of public transport vehicles, an overwhelming majority (85.2%) indicated that passengers' safety was assured. A little more of respondents with either secondary, technical, and vocational education (86%) indicated passenger safety is assured than those with tertiary education (82.9%). On the contrary, more respondents with tertiary education (9.5%) indicated passenger safety is not assured on public transport than those with secondary education (1.7%) (Table 21).

Table 21: Assessment of Safety of Public Transport Vehicles by Level of Education

Assessment of safety of public transport vehicles %	Level of education				Total	N
	No formal education	Primary	Secondary/ Technical/ Vocational	Tertiary		
Don't know	0.0	14.3	12.3	7.6	11.0	41
Passengers safety is assured	100.0	85.7	86.0	82.9	85.2	317
Passengers safety is not assured	0.0	0.0	1.7	9.5	3.8	14
Total	100.0	100.0	100.0	100.0	100.0	372
N	4	28	235	105	372	

Source: Field survey, February 2021

In trying to ascertain whether respondents personally felt safe on public transport vehicles, a little over 90% said yes (Table 22). Those who said they did not feel safe gave their reasons as emanating from personal involvement in a crash on PT, experiences from their relatives and friends, media reportage of road crashes involving PTs, poor maintenance of some of the PT vehicles, and recklessness of some PT drivers (Table 22).

Table 22: Respondents' Feeling of Safety on Public Transport and Reasons for Feeling Unsafe

Variable	Frequency	Percentage	
Personal feeling of safety on PT	Yes	340	91.4
	No	32	8.6
Reasons for feeling unsafe on PT	Personal involvement in accident	9	28.1
	Poor maintenance of vehicles	8	25
	Media reportage of PT accidents	6	18.75
	Careless driving by PT drivers	6	18.75
	Relative or friend's involvement in PT crash	3	9.4

Source: Field survey, February 2021

Contrary to respondents' majority view which indicated that road crashes are declining, responses from the in-depth interviews showed that most of the respondents thought road crashes are increasing. Generally, more than three quarters of interviewees described road safety in Ghana as being in poor state. Out of the thirty-two people interviewed from the various categories and the eight drivers who took part in the focus group discussion, only five indicated that road safety was improving. Those who were of the view that road safety in Ghana is improving explained that if one assessed the state of road safety generally by looking at the number of crashes only, one would conclude that road crashes are increasing. However, if the assessment is done by comparing the number of crashes with the increase in vehicle population, then it could be concluded that road safety is improving. This is how one of the participants described the situation:

Okay, so, maybe I can provide you with our statistics, and you know that we have been able to reduce road traffic crashes from 1991, and we call something, there is a term called road safety fatality rate, as vehicle population increases, automatically road traffic crashes increases. But in our case, the more, I mean as the vehicle population is growing, when you compare with the number of crashes that we record, you will see that the fatality rate is rather coming down. Now it is even a single digit; it used to be around twenty-something, now it is around seven point something per cent, taking into consideration the vehicle population and all that (NRSA Officer, 37years, Male).

Additionally, the seemingly increasing trend being recorded is as a result of the increase in the use of motorbikes (okada) and tricycles for commercial purposes especially in the carriage of people. It was explained that although some attempt had been made in the past to ban the use of motor bikes and tricycles from being used for moving people for commercial purposes, lack of political will to implement the regulation had resulted in a lot of crashes involving these type of

vehicles and a lot of casualties. The following remark explained the reason for the increasing trends in crashes and casualty rate:

Yeah, as I have said, if we take into consideration the fatality rate, which is used by international organisations, then I can tell you for a fact that even in Africa, we and Nigeria and I think South Africa are the leaders when it comes to road safety management. But when you look at the statistics, comparing previous years and all that, for the past three years you will realise that the numbers are increasing. But we attributed that to the election last year, per the trend, every election year road traffic crashes increase. So maybe that is the reason why last year we recorded higher number of crashes, but when you do trend analysis you will see that rising trend. So let me give you the reason why we are recording high number of road crashes, when you look at the other indicators like pedestrian knockdown, child fatalities and all that, they are coming down. Now what is increasing more is the motor cycle fatalities and you know the reason, the okada, the pragia, the aboboyaa, you know their population is increasing. Every year the numbers are increasing and that is resulting in the high number of road traffic fatalities in Ghana. So if we are able to regulate their activities, then automatically I can tell you that we can bring road crash fatalities down (NRSA Officer, 37 years, Male).

The majority that indicated road safety was in bad state generally expressed their views based on the increasing reportage of road crashes almost daily and the fact that road traffic laws and regulations are not being strictly enforced. The lack of enforcement, according to the views resulted in road users, especially drivers being reckless on the road, consequently, leading to increased road crashes. This view was reemphasised and agreed by a group of drivers during a focus group discussion. The following narratives show how some interviewees described the state of road safety in Ghana:

State of our road safety, well if I am to rate it I will rate it as probably ten per cent, we have a very poor state in maintaining, actually if you look at the global indicators for addressing road safety, I don't think the infrastructure we have in Ghana for instance is ready enough to address the problems that we have (Passenger, 43years, Male).

Why I am saying accident is increasing is that we the road users are not being careful. Especially those who drive are not careful. Sometimes long-distance journeys should have two drivers so that when one is tired the other can take over. But instead of using two drivers, one driver

would rather take stimulants to energise him so that he can make the journey alone. And in the course of the journey you see him dozing off and eventually he is involved in an accident (Passenger, 32years, Male).

Definitely, road accident is increasing master. It is increasing, because day in and day out we are recording, it doesn't go low, it is always high. And I even forgot, sometimes some of the roads are not good, so we have to put in place mechanisms that would make the road look very nice and motorable (Passenger, 38years, Male).

Interviewees' assessment of the key issues that are normally discussed under road safety management namely engineering, education, enforcement, and emergency or post-crash management which is popularly referred to as the four Es is elaborated in chapter seven.

In exploring interviewees' views on the safety of public transport, it was observed that public transport operators' commitment to road safety in general and passenger safety in particular is very low. A lot of the interviewees indicated that public transport operators are only interested in their revenue and not necessarily the safety of passengers. It was observed from the interactions that interviewees, especially passengers, thought they did not have any alternative for internal movement apart from public road transport therefore they felt that regardless of the shortfalls of the transport operators, passengers were still compelled to patronise the services of public transport. Some interviewees shared their thoughts as follows:

I see them to be self-seeking individuals whose only interest is the money they would make for themselves and nothing else. GPRTU for instance has been in existence for over thirty years if I am not mistaking and yet I haven't heard them sponsor any road project in Ghana despite the large sums of money they take from union members (Passenger, 39years, Male).

I should say that although a few of them have done their best in terms of road safety, most of the transport operators do not actually care about the safety of the passengers, all they are interested in is the money. Money, money, money, and nothing else (Passenger, 26years, Female).

It was however observed that the state-assisted and some of the private transport organisations were safer in their operations than the others, especially those belonging to the unions who normally use mini buses as indicated in the comments of two interviewees:

I think public transport is safer as compared to GPRTU. In fact, one of the goodwill Metro Mass for instance has is because of the safety, anywhere you go, they may not be reliable, they may be disappointing, but I tell you because passengers feel that when they are in a Metro Mass bus they are safer than say 207 or sprinter buses, so I think that public buses are safer than the private ones (Passenger, 31years, Male).

As far as I know, the commercial transport I use, I think they have reduced their speed drastically and that makes them safer than the others. I think in general the state transport companies are safer than the individual owned transport companies (Passenger, 40years, Female).

On passengers' personal safety, it was observed that they did not really rely on the safety of public transport but rather relied on their belief in some supernatural beings, especially God for their safety and protection in road travel. This observation reflected the responses from the survey which showed that a lot of passengers personally felt safe on public transport vehicles. In effect, a lot of passengers thought that if they entrusted themselves into the hands of God, no matter what happened on the road they would definitely arrive at their destination safely. An interviewee commented as follows:

I strongly believe that as I am travelling, when I pray to God for His protection and guardance He will take me to my destination safely. The driver may play a part but for me, my belief and trust in God is the ultimate. With Him, I am ever protected (Passenger, 32years, Female)

As part of assessing the state of road safety in Ghana, passenger interviewees were also asked to indicate in their own view what things had been done well with regards to road safety. A lot of the interviewees found it difficult to identify any particular thing. One passenger responded as follows:

Well, well, well, what have we done very well? That is a difficult one because from where I sit it will be very difficult to actually pinpoint what we have done very well because the road safety, the commission has to be partnered with Ghana roads people responsible for that. You ask yourself how many times have we heard of them? You see, we need to be seeing these people on our television and radio. We shouldn't wait for accident to happen before we see you working. So for me when I see you intervening when an accident happens, you see, you are just reacting to a situation, so we should be proactive, and I think we have not done that at all, for me if I am to rate out of five I will give it may be one, so there is a lot to be done. We need to be proactive, that is what I think we should be doing (Passenger, 31years, Male).

On the other hand, some interviewees thought that we have done well in policy formulation as far as road safety is concerned, but they were quick to add that what is difficult to do is the implementation of policies. They indicated that some of the policies are disjointed and inconsistent, making it difficult to implement. An example was cited with the policy on the importation of used vehicles in the sense that when over aged vehicles are confiscated they are still sold into the system and even at cheaper prices. In the view of one respondent, it did not make sense for a vehicle that has been confiscated for being over aged to be sold back into the system. He indicated that issues are decoupled when it comes to policy formulation and this results in policies that are vertical instead of horizontal. The following is how he explained the issue of policy inconsistency:

...and also we have not done very well in the regulation, I mean the laws governing importation of cars, I honestly don't get the sense in it as at the moment. Because even if let's say over age cars are seized they are still sold into the system and sold so cheaply, you know... Unfortunately, most of our policies and stuff, you realise that we decouple issues so we are having vertical policies and not horizontal policies. So road safety, everything is about safety but we forget that safety doesn't stand on its own, it stands on the person's ability to maintain his vehicle (Passenger, 43years, Male)

In general, there were divergent views of the state of road safety in Ghana from the perspective of participants in that whereas some thought road safety is

improving and that road safety is being managed effectively, others were of the view that the state of road safety is poor and that road crashes as well as casualty rate are increasing. It must be emphasised that although there were divergent views on the state of road safety in Ghana, those who said it was in poor state were more than those who thought that it was improving.

Constraints Identified

To round-up assessment of state of road safety in Ghana, an inquiry was made into some of the constraints that the regulatory agencies and the emergency service providers faced in executing their core mandate and how those constraints hindered the effectiveness of their performance. Some of the constraints identified by the regulatory authorities were funding, logistical challenges, staffing, resistance from the populace in terms of implementation of some regulations, and interference from political and traditional leaders. The following narratives express the views on some of the constraints identified:

Okay, so, we use to have funding challenges, and the second was staffing, I mean capacity as well as logistics. For example, the police, their main issue is logistical challenges, they don't have, and even if you go to Ghana Police Service, the department which the management board doesn't give much attention to is the MTTD, you get it. We also had issues with political interference when it comes to enforcement, not only political but traditional; I mean high profile personalities interfering with the enforcement of road traffic regulation, that is also one thing. (NRSA Officer, 37years, Male)

As you can see, our equipment are old but we have to manage with it as we struggle to perform our mandate. We perform a lot of emergency services, and we need to be adequately resourced. Our equipment, after they have been provided should also be well maintained in order to prolong its useful life. Without adequate resources, it will be difficult for us to achieve the desired results (Fire Officer, 41years, Male).

We have a lot of laws existing in our books, but sometimes the implementation becomes difficult, and I must emphasise here that sometimes we blame the politicians that they are not doing what is required of them, but we forget that we the citizens also have a part to play. As I mentioned previously, I have served for eighteen good years.

In other words, what I am saying is that I have worked under different governments. I quite remember during President Kuffour's era, there was a survey on these used tyres, and based on the outcome he decided to ban its importation. He therefore encouraged those who were into this business to rather engage in trading of new tyres, but they kicked against that decision, threatening that they will not vote for him the next time. Eventually, the government withdrew that policy because it also wanted to retain power. So, resistance from the populace is also one thing that affects effective road safety management in this country. (DVLA Officer, 53years, Male).

Further, lack of political will to implement some of the legislations and the ambiguity of some of those legislations made it difficult for implementation. For example, it emerged that the legal backing of the NRSA did not enable it to ensure enforcement and compliance, but their mandate was limited to coordination of activities and provision of road safety education. It was however indicated that a new draft of legislation was before parliament which was expected to give the authority the legal backing to ensure compliance and enforcement. Additionally, it was clear that some of the provisions in the Road Traffic Regulation are not being implemented because no specific agency has been mandated to carry out that function.

But for the political interference and all those things, we need strong political will, if we don't have a leader who will be firm to say that no, I will ensure that no one interferes and all that, then we can't move forward. And then there was the issue of we not being able to demand compliance from stakeholder institutions because we have a strategic action plans where all of us have come together to develop, but if they are unable to undertake those activities that they have planned to undertake, we didn't have that power to demand compliance from them. So, per our new LI, you know when an Act is passed, for it to be very effective, a legislative instrument must also be passed, so we have drafted our LI and it is before Parliament. Now, that LI will supersede that Road Traffic Regulation (2012). So now we are going to issue the license to operators, because in the 2012 one, no specific agency was mentioned, and it looked like it wasn't important to the Ministry at that time NRSA (Officer, 37years, Male).

The emergency service providers also identified lack of adequate logistics, difficulty in identifying locations during emergency calls, congestion

on some road networks, bad nature of some of the roads and high incidence of prank calls which inhibited the incoming of genuine emergency calls, and no bed syndrome at the emergency units of most hospitals as some of the major constraints that they face in the performance of their duties.

One major challenge we have is that, we need to respond to call on time, what we call the response time, but sometimes there are a lot of prank calls. so when a genuine call is coming, somebody has engaged the line because of prank calls because they don't have anything to do but just call the line and it delays when there is real call coming. So prank call is one of our major challenges that also affect our operations. Number two, congestion on our roads, you are responding to a call and there is a lot of traffic congestion so it makes it difficult for us to reach the scene on time. Again, there is the issue of location, even though we have tried to put our station along the main road corridors, but sometimes there is also the problem of trying to identify the address. When somebody calls trying to give you the exact location of the incident is also another problem. And even the road condition, sometimes the road is so deplorable that even responding becomes an issue. So these are some of the challenges that I can raise (NAS Officer, 56years, Male).

Perceptions on the State of Security of Public Transport

In trying to get respondents to assess the state of security of public transport, they were first asked if they had personally encountered any incidence of insecurity while patronising public transport. In response, more than 90 percent of them said no, with only about nine percent indicating yes (Table 23).

Those who said yes were asked to describe the nature of the insecurity. A lot of the incidents involved baggage theft (15) and highway robbery (13), Table 23.

Further, respondents who said they had had a personal encounter with insecurity were asked to indicate the location of the incident. The majority were found to have occurred between the point of access and the terminal (23). To further probe the incidence of insecurity on the public transport system, respondents were asked if any of their relatives or friends had had any encounter with incidence of insecurity. Once again, over 91.7 percent said no whereas only 7.3

percent said yes. Robbery attacks and baggage theft were the named incidences of insecurity with 13 and 12 respectively. Majority of the incidents occurred between the point of access and the terminal (Table 23).

Table 23: Passengers' Personal Encounter with Insecurity

Security issue		Frequency	Percentage
Personal encounter with insecurity	Yes	34	9.1
	No	338	90.9
Nature of insecurity encountered	Assault	3	8.8
	Robbery	13	38.2
	Baggage theft	15	44.1
	Sexual harassment	1	2.9
	Other	2	6.0
Location of insecurity encountered personally	Between point of access and terminal	27	79.4
	At the terminal	2	14.7
	In transit	5	5.9
Relative or friend's encounter with insecurity on PT	Yes	27	7.3
	No	345	92.7
Nature of insecurity encountered by relative or friend	Assault	1	3.7
	Highway robbery	13	48.1
	Baggage theft	12	44.5
	Other	1	3.7
	Between point of access and terminal	21	77.8
Location of insecurity encountered by relative or friend	At the terminal	1	3.7
	In transit	5	18.5

Source: Field survey, February 2021

Assessment of Road Transport Security

Having had some information on respondents' experience of insecurity on the public transport system, they were then asked to specifically assess the state of public transport security. More than three-quarters (79.3%) of respondents indicated that passengers felt secure on public transport. Additionally, more respondents with secondary based education ((83%) indicated passengers are secured on public transport than those with tertiary education (73.3%). On the other hand, more respondents with tertiary education (13.3%) indicated

passengers are not secured on public transport than those with secondary level of education (6%) (Table 24).

Table 24: Assessment of State of Security of Public Transport Vehicles by Level of Education

Assessment of the state of security on the public transport system %	Level of education recoded				Total	N
	No formal education	Primary	Secondary/ Technical/ Vocational	Tertiary		
Don't know	25.0	21.4	11.1	13.3	12.6	47
Passengers are not secured	0.0	7.1	6.0	13.3	8.1	30
Passengers are secured	75.0	71.4	83.0	73.3	79.3	295
Total	100.0	100.0	100.0	100.0	100.0	372
N	4	28	235	105	372	

Source: Field survey, February 2021

An inquiry into the personal security of respondents showed that most of them (84.9%) personally felt secure on public transport (Table 25). The few who said they did not personally feel secure on public transport were asked to give reasons for their observation. In response, they mentioned the absence of security personnel on the transport system. It also emerged that those who said they did not feel secured on public transport relied on media reportage, rather than personal experience or experience of relatives and friends (Table 25).

Table 25: Passengers' Feeling of Security on Public Transport

Variable		Frequency	Percentage
Personally feel secured on public transport	Yes	316	84.9
	No	56	15.1
Reason for feeling insecure on public transport	No security at terminals and on vehicles	24	43.6
	Media reportage of robbery on PT	14	25.5
	Personal experience	9	16.4
	Encounter by a relative or friend	8	14.5

Source: Field survey, February 2021

Assessment of security using qualitative data

In assessing the state of road transport security using the qualitative data, there were some positive comments from all category of participants. Some indicated road transport security was in appreciable state, and that the transport organisations themselves were doing their best to ensure passenger security in road travel. Others were also of the view that road transport was relatively more secure than other modes of transport. Notwithstanding these positive comments, a lot of the responses pointed to the fact that road transport security was in bad state because highway robberies on public transport vehicles have become a daily occurrence especially on some particular routes in the country. A participant commented thus:

With road transport security I think that one is no, no, no, no. Security, we are less protected, less and less protected on our roads. Most of the transport companies are not security conscious. Even within the station in which they operate you always hear of petty thievery at that place, telling you that the security there is poor. Nobody is checked coming in to take a bus, you know. In this day and age of terrorism, you take a bus and they don't even check who is going to sit in the bus, what the person has in his body and all that. That tells you that we have no security (Passenger, 45years, Male).

Expressing their views on the commitment of the transport organisations to the security of passengers, it came out that the transport operators do not really care much about the security of passengers and that all they are interested in is their money. In the view of those who took this stance, those transport operators who even demonstrated some commitment to passenger security are not doing enough judging from internationally accepted standards. It was reiterated that security is not about putting an armed person to escort a bus from one point to the other; rather it starts with putting in internal mechanisms that

help with intelligence, detection, and apprehension of suspected criminals. This was how a passenger explained transport security:

Security is not putting a policeman to accompany a bus from one station to the other, no, no, no. No, it has nothing to do with security; security is ensuring that all levels are respected in terms of security for both staff and passengers that come to the place. The internal mechanism and the external mechanisms that are put in place to ensure that people have safe travel is done (Passenger, 41years, Male).

A participant underscored the fact that the nature of the public road transport system makes it easy for anybody to commit a terrorist attack without much effort. He asserted as follows:

In Ghana here, it is very easy if I want to commit terrorism. It will be very easy to blast many people with Metro Mass or STC, it will be very easy for me to do that. I will only need to put a bomb in each bag and even load it as a parcel that I am taking to Kumasi, am taking one to Accra, put in. I don't even need to go and kill myself in this thing, I will just give parcels to people in all these buses, and some of these drivers will even pass back and collect a parcel that is not even noted and then collect their money and then it does not pass through the system for them to know that this so, so and so parcel pass through (Passenger, 43years, Male)

It was clear from the conversation that some participants did not trust in the interventions that seemed to be provided by both the transport organisations and the state security agents as well. They rather believed and relied on the protection of God or whatever deity they believe in, during their journeys. A passenger who was critical remarked as follows:

Honestly, personally when I sit in the bus to travel anywhere, I pray and say God please take me to my destination, and I count on my God to take me there. I don't count on the driver, neither do I count on any safety thing because I am as vulnerable as any other person who has been robbed on the way, but is that how we are supposed to live? God blesses us anyway, He gives us blessing and blessing is the ability, the thinking, the talent, whatever that He has given us so that we do things that would be effective to us. So the rest is upon us, but when we don't use that talent it become useless for us (Passenger, 36years, Male).

It was also clear from the responses that the police who are supposed to be in charge of security are themselves understaffed and also under resourced. This makes it very difficult for the police to provide adequate protection to the general populace, let alone public transport users. The argument was that if the policeman himself was not well secured in terms of protective equipment how could he provide adequate security to the other citizenry?

Discussion

The state of road safety and security in Ghana has been assessed both objectively and subjectively by passengers, transport operators, regulatory authorities and emergency service providers through a survey, in-depth interviews and a focus group discussion. Generally, it was realised that although some of the responses converged, others diverged. It was also observed that some of the views of participants were inconsistent with available data. The following paragraphs discuss the major findings in relation to the conceptual framework that guided the study and also available literature.

Some of the constraints identified by the regulatory authorities have the potential to hinder effective performance of their duties. An example is the unavailability of logistics expressed by some of the regulatory authorities and the emergency service providers. Availability of logistics is essential to the performance of any organisation, and it is important that serious attention is paid to the provision of logistics to the key players in the road safety industry in Ghana in order to enhance their efficiency. Additionally, ambiguities in the enforcement of road safety laws and regulations (situations where regulations are developed but no specific institution is mandated to enforce it), and the lack

of political will to implement such laws could lead to the development of good laws that would never be implemented to achieve its intended purpose.

In responding to the causes of road crashes, it was observed that some respondents attributed it to supernatural forces. The implication is that people who subscribe to this view may be tempted to ignore the human factors that have been identified to be the major causes of crashes if they were to assess the state of road crashes in Ghana. This is on the premise that if people think that supernatural forces are responsible for causing road crashes, then it implies that their belief in, and commitment to those forces have the potential of protecting them from road crashes regardless of what happens on the road transport system. Abane (2012) made a similar finding where a section of drivers interviewed believed that prayer and other rituals could protect them from involving in crashes. As a result, they tended to relegate their negative behaviours that could lead to crashes to the background. If this perception is not changed, it could lead to serious escalation in road crashes that would be recorded in the future.

It was observed that whereas some of the views of respondents in the survey reflected reality, others did not. For example, majority of the responses showed that respondents thought that the most affected victims of road crashes in terms of sex are women. Likewise, the most affected victims by road user category according to the responses was private car occupants. However, data available from the National Road Safety Authority indicates that the most affected victims of road crashes by sex and road user category are men and pedestrians respectively. This result implies that peoples' subjective assessment of the road safety situation may not always reflect the reality, although sometimes their views may correspond with what is actually in existence. This

finding could be related to a study that was conducted by Rolison, Regey, Mountari and Feeney (2018) which also found discrepancies between public opinion of the causes of road crashes and data available from the Department of Transport in the United Kingdom. In this study, however, participants were made to watch videos of six different scenarios of crashes and they were asked to list what in their opinion caused those crashes.

The identification of poverty as a fundamental cause of road crashes in Ghana is not well elaborated in the road safety literature both locally and globally. This notwithstanding, some of the findings of other studies although not stated explicitly imply that poverty may be a fundamental cause of road crashes. For example, Iles (2005) asserted that most of the fatalities of road crashes occur in developing countries where most people depend on public transport for their travels. The Global Status Report on Road Safety (WHO, 2018) also observed that the African region has the highest road crash index and fatality rates as compared to Europe and the Americas. Poverty therefore may be an underlying cause of road crashes because poor countries may not be able to provide safer roads and safer vehicles as required by the safe systems approach (UN, 2011). Further, poverty may not allow some countries to employ technologies that are friendly for surveillance and enforcement of road traffic laws to enhance road safety in their countries.

Just like some studies conducted in other jurisdictions (Goel, 2018; Hordofa et al., 2018; Sarma et al., 2013), this study also suggests that human factors constitute a chunk of the causes of road crashes. The major thing that was identified that influence all human factors in this study is attitude, which is the way people perceive and value things. As indicated by Abane (2012),

attitude affects behaviours that are exhibited on the road by all categories of road users, and most of these behaviours are negative. In line with the accident/incident theory (Petersen, 1975), human beings always yearn for an opportunity to err and if this is coupled with a systems breakdown, there is the tendency for accidents to reoccur.

With transport security, some of the responses showed that it is a systemic issue that needs to be incorporated into the operations of every transport service provider. As suggested by the road transport safety and security intervening model, adopting a systemic approach to managing transport security has the potential of enhancing passenger security. This means that road transport security should not be limited to providing police escort (capable guardian) but systems must be put in place to enhance detection and apprehension or make the perpetration of crime very difficult for motivated offenders (Cohen & Felson, 1979). It also requires that employees of all transport organisations are given adequate training in matters of security to make them security conscious.

It also emerged that most of the incidences of insecurity on the public transport system that respondents had experienced occurred between the point of access and the terminal rather than at the terminal or in transit. This finding implies that road passenger transport providers should not only focus on providing security for their passengers at the terminal and in transit, but also focus attention on providing security between the point of access and their terminus. On the other hand, it is incumbent on passengers to ensure their personal security by engaging a capable guardian to accompany them between their homes and the point of access to public transport. This could help in

reducing the possibility of them being attacked while in the process of connecting to public transport.

There were disparities in the assessment of road safety and transport security in the survey and the in-depth interviews. Whereas the survey generally showed that road safety is improving, the in-depth interviews showed that road safety and transport security are in a poor state. As indicated earlier, peoples' belief in supernatural beings for protection during their travels may on the surface affect their view of safety and security. However, if their views are probed further, a different picture may be painted.

Chapter Summary

This chapter focused on participants' assessment of the state of road safety in general as well as the safety and security of public road transport. The assessment was done through a survey of passengers and a follow-up in-depth interviews with some of the passengers who participated in the survey, transport operators, regulatory authorities and emergency service providers. The data collected showed some disparities in assessment between the two methods of data collection. It was also realised that although some of the views of participants reflected what was indicated by available data, others did not. In the next chapter, participants' views of existing interventions and their effectiveness are evaluated.

CHAPTER SEVEN

EXISTING INTERVENTIONS AND THEIR IMPACT ON ROAD SAFETY AND SECURITY IN GHANA

Introduction

In chapter six, the focus was on assessment of the state of road safety in general, and the safety and security of public transport in particular from the perspectives of respondents. Other issues covered in the chapter were respondents' personal experiences with road crashes and security threats on public transport. In this chapter, the searchlight is on the discussion of respondents' knowledge and assessment of existing interventions that seek to improve road safety and security of public road transport. The results of a desktop review conducted to ascertain whether there are existing documented regulations that seek to improve road safety and transport security are also discussed. Some of the observations made are discussed. The chapter ends with a discussion of the implications of the results of the data presented in this chapter for policy and practice.

Knowledge of Existing Road Safety Interventions and Their Effectiveness

To assess existing road safety interventions and their effectiveness, respondents were asked to indicate their level of knowledge of any existing interventions. Almost all respondents (91.1%) indicated their knowledge of at least one intervention (Table 26). Having indicated their knowledge or otherwise, respondents were asked to select all the interventions they were aware of from a list of interventions indicated in the questionnaire. With the interventions that were listed, the erection of appropriate road furniture, as well

public education on road safety in the media were considered the most known (Table 26).

Table 26: Passengers Knowledge of Existing Safety Interventions

Intervention		Frequency	Percentage
Awareness of road safety interventions in place	Yes	339	91.1
	No	33	8.9
Known interventions	Erection of appropriate road furniture	337	90.6
	Public education in the media	336	90.3
	Public education in the schools	335	90.1
	Public education in churches and mosques	335	90.1
	Training of drivers at National Drivers Academy	335	90.1
	National road safety awards	335	90.1
	Implementation of Road Safety Practices by Transport Operators	334	89.8
	Strict enforcement of Road Traffic Regulations	333	89.5

Source: Field survey, February

Respondents views were sought regarding whose responsibility it is to ensure road safety, and cyclist and motorcyclists were considered to have a greater responsibility (98.1%) as compared to the National Road Safety Authority (93.3%) (Table 27). Road safety is said to be a shared responsibility, so the respondents were asked to indicate whether they agree or did not agree with this statement. The result shows that almost all respondents agreed to the assertion, with less than one percent disagreeing (see Table 27).

Table 27: Passengers' View of Who is Responsible for Road Safety in Ghana

Variable		Frequency	Percentage
Responsibility for ensuring road safety	Cyclist and motor cyclist	365	98.1
	Pedestrians	355	95.4
	Transport operators	355	95.4
	Police	354	95.2
	Passengers	353	94.9
	DVLA	351	94.4
	National Road Safety Authority	347	93.3
Road safety is a shared responsibility	Strongly agree	317	85.2
	Agree	53	14.2
	Neutral	1	0.3
	Disagree	0	0
	Strongly disagree	1	0.3

Source: Field survey, February 2021

As indicated by the literature (WHO, 2018), over 90 percent of road crashes globally are caused by human related factors, and since crash prevention is the main aim of any road safety intervention, putting in every necessary measure to prevent a crash from occurring should be the objective of all stakeholders. It follows therefore that all actors in the road transport industry have a role to play in achieving an effective road safety management. As such, it emerged from the follow-up in-depth interviews and the focus group discussion that various interventions had been put in place to reduce the contribution of human factors in road crashes. The interventions that are in existence in Ghana were explored from the perspective of the transport operators, regulatory authorities, emergency service providers and passengers.

For the transport operators, the first step for ensuring safety in their operations was related to their system of recruitment of drivers. It was found that although all the operators had a system of recruitment of drivers and other

operational staff, some of them had a more rigorous process of recruitment than others. It was also realised that the rigorousness of the recruitment processes ensured that only drivers who are disciplined and committed to safety are employed. This is how a participant responded to how drivers are recruited in his organisation:

First of all, you should have license F for our coaches, C and D for the minibuses. Now you shouldn't be less than 35years and more than 45years. You should have an educational background of Middle School Leaving Certificate or O' Level, but the minimum is MSLC, and this is the basis for more or less selection. Now after this, we take you through an interview, then you are sent to our training school. This is to avoid the situation where people go to pay money to those driving schools and come back to tell us they are qualified drivers. We say no we don't want that because our image is so important; come and let us put you under our standards. Even before they are put in the classroom they are taken through obstacle driving where some are eliminated. As part of the training process, we call the police, fire service, and the first aid people to tell you what to do on the road and also how to handle people during emergency. We then call our people to teach accident reporting. So, we teach you basic things before you handle the vehicle, things that you have to check, from your mirror to your water level to your fuel oil, and everything (Head of Traffic, 56 years, Male).

Apart from the recruitment processes, some of the operators also had systems of continuous training and education to ensure that drivers are always abreast with current road safety issues. The following narrative shows how a participant responded to the question on continuous training:

Every year, we organise two refresher courses for our drivers; one towards the Easter festivities and the other before Christmas. During these programmes, drivers share their experiences in driving with each other, in addition to what they are taught in class. In sharing their experiences, problems that they might have encountered are also brought to the fore and possible solutions are suggested. Those who distinguish themselves within the period are also commended for their excellent performance. This is done to encourage others to also improve upon their performance (Head of Traffic, 56 years, Male).

Another intervention that was identified with the transport operators was the attachment or apprenticeship given to new drivers to familiarise themselves

with new terrain in which they operated. All the transport organisations interviewed indicated that when new drivers are employed, they are put on attachment/apprenticeship with old drivers to ensure that they are familiar with the terrain in which they are supposed to operate. A participant said thus:

After taking new drivers through that rigorous selection and training process, we also attach them to our old drivers to familiarise themselves with the terrain in which they are expected to drive. During the attachment period, the old drivers are made to observe the new ones and report their performance and conduct to us, so we can make informed decision in our final selection. Those who do not perform well during this last bit of the process are certainly dropped because we insist on quality (Assistant Traffic Operations Manager, 50 years, Male).

Some of the companies also had operational guidelines that they follow to ensure that drivers adhere to safety and security rules. It was observed from the interviews that those operators who strictly enforced their operational standards in addition to the rigorous selection and training processes, seemed to record few accidents.

Some of the transport organisations also indicated that they had systems in place which investigated crashes whenever they occurred, and drivers who were found to have been reckless were taken through disciplinary process and appropriate sanctions meted to them. To avoid excessive speeding for instance, some of the companies had their vehicles' speed adjusted within a certain range and they ensured that drivers did not have any means of tempering with this adjustment. A participant responded as follows:

We have our own internal investigation committee referred to as Regional Board of Inquiry, which looks into crash occurrences. Apart from the police conducting their investigations, we also conduct our internal investigation. So, although the police may discharge a driver, our committee may find that same person guilty because our criteria may be different from that of the police. Our decisions are mainly based on what we call defensive driving; that is, although the other road user might have done the wrong thing, was it possible that you could have saved the situation. The fact that the person crosses you doesn't mean

you must run into him, because you have been trained to always anticipate and as much as possible save such situations. So, we have systems for punishing offending drivers, and also for rewarding drivers who distinguish themselves (Head of Traffic, 56 years, Male).

On long distance routes, whereas some of the companies used two drivers to reduce the incidence of fatigue, others used only one driver for such journeys because of cost. Others also used the break-the-drive system which requires that a driver rests for thirty minutes after driving continuously for four hours, or alternatively resting for fifteen minutes after every two-hour drive to compliment the use of two drivers for long journeys. It was also realised that to ensure that the fleet of vehicles used for operations are always roadworthy, operators adhered to strict maintenance schedules where every defect that could render the vehicle unworthy for the road was detected and rectified. This was indicated by a participant as follows:

This is our workshop (pointing to the workshop from his office). STC has its own workshops in about six of the regions; we have it in Accra, Kumasi, Bolgatanga, Tamale, Sunyani and Takoradi. We have planned maintenance and that of regular maintenance in the sense that, at certain kilometres of every bus, say 10000km for example, it is compulsory under our procedures to service each of the buses, and then there are others that the driver will come to report of a fault even if the 10000km has not been reached, and the fault has to be rectified. During servicing of the buses, a lot of issues may be detected, but the first thing that will keep the buses in good condition is the servicing. Is just like you going for a regular check-up (Head of Traffic, 56years, Male).

This was however not present in all the transport organisations as reported by one of the interviewees from the transport organisations and some drivers during a focus group discussion. One of the focus group participants, commenting on the issue of maintenance said thus:

Maintenance of buses is also another factor. When there are defects under the vehicle and they are not rectified, it could lead to you veering off the road and this could lead to accident. I remember a few days ago, I was given a bus to go on one of our routes but the front of the bus was so unstable that if I did not exercise extra caution, I would have veered

off the road. At a point, even the passengers realised that for the little pothole that we encountered, the bus was pulling to one side. Meanwhile I reported the fault before leaving the yard but I was told to manage it. So, maintenance is very key (Focus Group Participant, 40years, Male).

In addition to the interventions indicated above, some of the transport organisations backed them up with a system of rewards to encourage drivers to be safety conscious as well as sanctioning of drivers in case they fell foul of both internal and external safety regulations. From the perspective of some of the transport operators, safety and security interventions come at a cost but investing in them is worth it since one can only generate revenue by investing and that being safe and secure as an operator saves cost in the long run.

In order to ascertain the impact of the interventions adopted by the transport organisations on safety, an inquiry was made into the average number of crashes recorded monthly. It emerged that whereas some of the operators did not record any crash in a month, others recorded as many as fifteen crashes per month. Responding further to how crashes recorded affected the operations and especially patronage of their services, there were divergent answers. Whereas some indicated that it did not affect them so much, others said it affected their operations negatively. Those who said crashes affected their operations indicated that the effect was two-fold: some customers withdrawing from patronising the services of those operators in the short term; and unavailability of those buses for routing since those buses involved in crashes had to be parked for some time to undergo repairs.

From the regulatory perspective, the authorities indicated education as a major intervention that they had put in place to ensure road safety. As part of enhancing driver education, the National Drivers Academy was established to organise periodic nationwide training for drivers especially those involved in

commercial transport operations. There had also been the introduction of the lollipop crossing stands for school children to reduce pedestrian knock down which is the highest in terms of casualty and fatality rates as indicated in the road safety statistics (NRSA, 2021). There had also been the installation of speed calmers especially in the urban centres to reduce pedestrian knockdown.

This was explained thus:

Apart from the extensive education that we have done over the years, we have also come out with some engineering interventions in collaboration with the road agencies. We have installed traffic calming measures or what we call speed calming measures, speed humps and rumble strips to reduce speeding especially within settlement areas along major highways. This has also helped to reduce pedestrian knockdown in these settlement areas, and that is also bringing down pedestrian fatalities. We also introduced what we call crossing aids for school kids popularly known as lollipop stands, whereby if a child or a school kid wants to cross the road, he just takes the flag, raise it and then vehicles will stop for them. So that is one innovation that we also introduced. We also introduced National Drivers Academy, I think it is going through restructuring, the purpose was to train commercial road transport drivers nationwide (NRSA Officer, 37 years, Male).

The presence of the traffic police at various sections of the road also was cited as one of the enforcement strategies that had been used to ensure road safety. To augment the effort of the police and the DVLA in relation to enforcement, it was indicated that the NRSA had taken steps to recruit and train some enforcement officers who were being used to establish an enforcement unit directly under the authority. It was indicated that these officers were at the various terminals to conduct some checks on vehicles before they departed.

Now, the new department as I said, the road safety inspectors, we have started a nationwide activity whereby these road safety inspectors go to the major terminals to conduct pre-departure checks. So before a vehicle sets off, we check the tyre condition, the drivers condition and all that. We have just started so it is not that intensive but that is one thing that we have also introduced. So these are the major things that we have done (NRSA Officer, 37 years, Male).

The DVLA was said to have strict rules for licensing both drivers and vehicles, and to ensure effectiveness and efficiency, the authority had automated its processes. However, it was observed that the law was vague on some issues especially with the age of drivers. For example, the law required a person who applied for a driver's license for the first time to be at least 18 years, and also satisfy other requirements after which the applicant would be issued with a license B class. The law also specifies that a licensed driver could upgrade a class of license to a higher class at two-years interval, for example from B to C class which qualified a driver to drive a commercial vehicle. This meant that an 18-year old who acquired a license B class could upgrade to C class when he/she attained the age 20 years and would be eligible to drive a commercial vehicle. Notwithstanding, the law was silent on which type of commercial vehicle that such a person would be permitted to drive. As explained by an officer:

Okay, a person who applies for a driver's license for the first time must be at least 18 years of age, and this must be supported with documented evidence. The applicant is then taken through both theory and practical tests which he/she must score at least 70 per cent in each case. The applicant is then issued a "B" class license. Now, the average weights of various classes have been changed and the B class for instance has been increased to 5000kg, which is almost the weight of a Sprinter bus. Subsection 3C of the Road Traffic Act 683 indicates that a person can only drive a commercial vehicle if that person is 25 years and above, but which type of commercial vehicle is not stated. So at 18 years the person qualifies to hold a license B, and then after two years he can upgrade the license to C, but you say he shouldn't drive a commercial vehicle. So that one to me is a challenge that needs to be addressed because my opinion is that a 25-year old person should not be allowed to drive a VIP bus so that he would gamble with people's lives (DVLA Officer, 53 years, Male).

One of the requirements for declaring a vehicle road worthy is that all the communication gadgets (head lamps, traffic indicators, brake lights, horn etc.) should be functioning before a vehicle is sent for licensing or road worthy certification. For this reason, when vehicles are sent to the premises of the

DVLA, they are thoroughly examined to ensure that they satisfy all the conditions required for licensing before they are licensed. The problem was that most of these gadgets are considered to be perishables and could become faulty at any point in time. It is therefore important that vehicle owners take notice of this and make the effort to rectify those faults as and when they are detected. Additionally, it was indicated that some vehicles that are sent to the DVLA for licensing have some fixtures altered after they have been registered or issued with a road worthy certificate. For instance, it was indicated that the law required each vehicle to carry only four lamps (two standard and two fog) but some vehicles were adding other lamps which is against the law, and this is done after the vehicle has been certified for road worthiness. Another difficulty that was identified with the registration and licensing process is the connivance of some DVLA personnel with some criminals to hack into the system of the authority to license vehicles which are not worthy for the road and also persons who are not qualified to drive. This in a way affects the integrity of the licensing and the registration processes as was indicated by one of the regulatory officers:

Now, when the vehicle comes in, we check the suspension systems, we check the tyres and, the play in the steering system. And then one serious aspect has to do with the communication gadgets around the vehicle. We check those things, but they are, let me use the word perishable, that is, they soon fade away. Sometimes just an encounter with a bump, it will lose contact, and that does not mean that it is faulty, but you have to re-secure it to make sure that it is working. So, every gadget on the vehicle has a role to play in terms of safety. One thing I have also observed is these trucks, I think I showed it to you that they are not supposed to carry more than four lamps, two lamps at a time when you have four. Or when you have driven through a muddy place where there is no water to wash the lamps you use the fog because that is brighter and it can penetrate the dirt and you have vision to wherever you are driving to, and it should be a separate switch from the main beam. But after issuing the road worthy certificate, they go to add on (DVLA Officer, 53years, Male).

Participants' Assessment of Road Safety Interventions

Safety in transport is discussed around the three E's which are engineering, education and enforcement. Before assessing the various thematic areas of safety, passenger respondents were asked to make a general assessment of the interventions. Generally, the interventions were perceived to be effective (Table 28). Respondents were further asked to indicate which of the three thematic areas is considered the most effective intervention in ensuring road safety in Ghana. Education had the highest (73.7%) of the total responses (Table 28), with the least effective intervention being engineering (1.6%). In order to ascertain the consistency of the previous response, the question was put in the reverse order by asking which of the three thematic areas was considered the least effective intervention. Once again, engineering was considered the least effective intervention (58.9%) and education the most effective intervention with (11.6%) (Table 28). The second response therefore confirmed the assertion in the previous response that of the three thematic areas of road safety preventive interventions, respondents considered education the most effective in Ghana.

Table 28: Passengers' assessment of effectiveness of existing safety interventions

Variable		Frequency	Percentage
General assessment of effectiveness of interventions	Very effective	87	23.4
	Effective	246	65.1
	Don't know	3	0.8
	Ineffective	3	0.8
	Very ineffective	0	0
Most effective regulatory intervention	Education	274	73.7
	Engineering	6	1.6
	Enforcement	92	24.7
Least effective intervention	Education	43	11.6
	Engineering	219	58.9
	Enforcement	110	29.6

Source: Field survey, February 2021

Further assessment of the effectiveness of the existing road safety interventions in Ghana through the in-depth interviews and focus group discussion covered a vast range of issues but the focus was on the three key thematic areas namely education, engineering, and enforcement. A fourth issue which is emergency or post-crash management was also assessed. On each of these issues, there were divergent views on whether there was improvement or the situation was deteriorating.

Education

On the issue of education, most of the participants indicated that a lot of education was being done because they could hear it on both the electronic and the print media almost daily. For this reason, they asserted that there is high awareness of road safety amongst road users but because of negative attitude, road users are not putting the things they learnt into practice. A passenger interviewee remarked thus:

Currently, I believe the National Road Safety Authority is doing its best in terms of education. They have been sensitising drivers on many occasions, but just that sometimes the drivers are hard of hearing. Some of them are so recalcitrant that no matter how much they are educated or sensitized, they continue to misbehave on the road. But then, the sensitization still has to continue; it shouldn't be that because drivers are not heeding to advice, the NRSA will relent in its effort. They should continue to re-emphasise road safety measures (Passenger, 38 years, Male).

On the contrary, some participants were of the view that although there seemed to be some education on road safety, it is mainly reactive and seasonal in the sense that education is intensified only when crashes are recorded or when it was getting close to festive occasions. In their view, there is the need for continuous and consistent road safety education throughout the year. This was how a participant commented:

...Again, our road safety education is more reactive and seasonal than being proactive and continuous. We wait till it is getting to Christmas or Easter before we intensify road safety education, after that we go to sleep and come only when a fatal accident has occurred (Assistant Traffic Operations Manager, 50 years, Male).

Engineering

On the question of engineering, it was generally agreed that the roads in Ghana are in poor state and that a lot of the roads are not vehicle worthy or user friendly which poses a lot of danger to road users. Some participants also assessed the state of the roads in Ghana using the standards of the developed countries and indicated that most of our major roads which should be dual or multiple carriageways still remain single carriage roads, and this, coupled with poor maintenance of the roads increases the risk of crashes on such roads. Below are comments from two of the interviewees:

Our road engineering is done without considering all the conditions that need to be factored in the construction before work is started. It is when construction is complete that we go back trying to put in other measures. Take the N1 for instance, the road was constructed without any provision for pedestrians to cross from one side to the other, meanwhile there are a lot of settlements along the road. It was after construction that we thought of providing foot bridges, and even that is not adequate because where some of them are located is far away from where the people need to cross the road (Assistant Traffic Operations Officer, 50 years, Male).

...the other has to do with the poor nature of our roads and the unsafe nature our roads are, you know, if you go to many of these developed countries roads are usually dual carriageways, no oncoming vehicles meet the other in a way, so each has its lane. But here we use very narrow roads so how careful can you be (Passenger, 43 years, Male)

Other participants who held a contrary view indicated that although some of the roads are in bad shape, it is rather the recklessness of the driver that is the major contributor to road crashes and not the nature of the roads per se. Another issue of engineering that was assessed by participants is that of regular maintenance of road vehicles. It was generally indicated that most transport operators do not

adhere to regular maintenance of their fleet and this renders such vehicles unworthy for the road yet they are constantly found on the roads. This, in the view of participants, contributed to frequent road crashes. It was emphasised that one major reason that could have contributed to poor maintenance is the high cost of spare parts which makes it difficult for transport operators to afford genuine spare parts for the maintenance of their fleet. They therefore resort to alteration and this in most cases leads to mechanical failure after some time. A participant asserted that:

Vehicle maintenance for me is very poor. We still have so many vehicles at the various stations that don't even have good lower arms and what have you. And is it their fault, no, the cost of importation of spare parts is so high, so if he has to get a 14 bolt to fix a part and he is able to get a 13 bolt with some washers to adjust it, he will do that just to manage it in the meantime. But if we have good policies on importation of vehicles and spare parts, I mean policies that support the transport business and which also look into the safety aspect, it could help ensure regular and effective maintenance of vehicles (Passenger, 43 years, Male).

Enforcement

Participants agreed that although there seems to be some effort in enforcing road traffic laws and regulations, the situation is very poor. Even the law enforcement or regulatory agencies agreed to this view that enforcement is weak because of constant interference from both political and traditional authorities. It was also emphasised that enforcement of road traffic laws and regulations has turned into an opportunity for extortion of money from road users as explained by one of the regulatory officers and two passenger interviewees.

The enforcement is the problem, and you know it is the police that must come in. They have to step up, it looks like when somebody commits an offence, we say it does not matter or something small and then the person leaves. Because that something small has been taken, he would not be careful; still the same mistakes will be made (Regulatory Officer, 51 years, Male).

Secondly, the enforcement part of it has become more of a bribery thing than what do we call it, I mean the police will stop you on the road even embarrassing you, harassing you, waste your time and still collect money and let you go. And sometimes the police have used this as an opportunity to actually extort money from people (Passenger, 34 years, Male).

As for the enforcement, it is so weak because those who are supposed to enforce the laws are so corrupt that all they do when they go out for their so-called operation is to extort money from road users. Once in a while you see the police over there, but you ask yourself, when you see them, are they actually doing what is expected of them (Passenger, 31 years, Male).

Emergency (post-crash) management

There were also divergent views on the state of emergency/post-crash management in that whereas the emergency service providers indicated that their response time to post-crash emergencies had reduced as a result of increasing the number of ambulances, some of the regulatory authorities and the passengers indicated that emergency management is in poor state. Those who said emergency management had improved explained that, the coming in of the new ambulances had made it possible for each district in the country to have at least one ambulance and this had improved the response to emergency calls. Those who held a contrary view cited unavailability of ambulances when they were needed and in case of their availability, they are in poor condition. It was observed that the police for instance did not have adequate resources to attend to emergencies. In situations that people died during crashes the police did not have hearse to convey the dead to the morgue but relied on their operational pick-ups. It also emerged from the interaction that the traffic police was the least resourced department among the entire police service. The following extract gives an account of how respondents perceived the state of emergency management:

For emergency management I will score it three out of ten. Why am I saying three out of ten? Because a policeman goes to the accident scene, like I was saying, I don't know if the public is not aware, but I am going to do education on it, when you are involved in an accident call fire service first, do you understand? Emergency management, where is the ambulance? Even when you call they will tell you the ambulance has a flat tyre or the battery is damaged. The other time we went for an assessment of a crash and we were ten in number, at the time we needed an ambulance to carry some people and some had to carry the injured in the boot of their cars. So where is the emergency management (DVLA Officer, 53 years, Male).

Participants' views were sought on transport organisations' contribution to road safety. It emerged that although they seem to make some effort towards ensuring road safety, most of their effort was just a face-off thing. Strictly speaking, only a few of the transport organisations were actually found to be safety conscious in their operations.

The transport organisations like the various groups, GPRTU and those stuff. Honestly you see them to be making some attempt but I think it is just a face-off kind of attempt. Once a while the MTTD goes there and they have a dialogue and during such meetings the operators assert that they have advised their drivers. But just around that same time you see a driver coming to sit behind the steering wheel drunk. There are beer bars operating all around these lorry stations so what do you expect the drivers to do? They will still go and drink and come and sit behind the steering wheel to drive, and yet we complain about drunk driving (Passenger, 34 years, Male).

Regulatory and Other Forms of Intervention

One important factor in ensuring that transport is operated safely is safety regulation (Gubbins, 2003; UN, 2011). Safety regulation in transport is targeted at three elements; the vehicle, the operator, and the driver, each of which must be licensed prior to operating. This section discusses some regulatory interventions that were identified from the desktop review that was conducted and responses from the follow-up in-depth interviews and focus group discussions. The outcome of the desktop review informed the questions

that were asked during the in-depth interviews and focus group discussions. The documents that were reviewed included the Road Traffic Act, 2004 (Act 683) and the Road Traffic Regulation, 2012 (LI 2180). Whereas the Act 683 gave the legal backing to all the regulatory interventions, the LI 2180 was in a form of operational guidelines which ensured that the provisions in the Act (683) were operationalised.

Regulation on establishing a road transport organisation

As indicated previously, transport operators need to be licensed to enable them operate. Regulation 121 and 122 of LI 2180 specified the processes one has to go through to start a transport organisation for commercial purposes. Sub-section one of regulation 121 make it clear that a person cannot operate a commercial vehicle if the person has not obtained a road transport operator's license. Sub-section two of the same regulation also makes it clear that a person cannot drive or operate as a commercial vehicle driver if that person is not employed by a recognised commercial transport organisation. Sub-sections three to five specify the authorities that are mandated to issue operator's license to commercial road transport organisations and the requirements for issuing such licenses. Penalties for contravening sub-regulations one to five of regulation 121 are clearly spelt out in sub-regulation six.

Regulation 122 further outlined additional requirements needed for a person to qualify to operate a commercial road transport organisation of any category. Regulation 123 requires that a commercial road transport vehicle driver, in addition to the drivers' license should acquire a commercial driving permit before that person can drive such vehicles. The requirements for

obtaining this permit and the penalties for violating this regulation are outlined in sub-regulations two to four of regulation 123.

Regulation 125 emphasises the continuing education of commercial vehicle drivers, and the obligations of commercial road transport organisations and the regulatory authorities as well. Additionally, regulations 126 and 127 outline the standards and conditions needed to be satisfied for allowing a commercial road transport vehicle to operate. One of such important conditions is the road worthiness of vehicles. Sub-regulation 3(C) of regulation 127 empowers the Licensing Authority to reject issuing a permit to an operator if in their opinion the condition of a vehicle renders it unsafe or unsuitable for carrying people. Regulations 66-68 outline the requirements for mirror, windscreen, glass, materials for windscreen, windows and partitions, and also windows and windscreens of commercial vehicles.

It was however observed that although the regulation for establishing a commercial transport organisation is clearly documented, it was not being strictly enforced. In view of this, an inquiry was made into why the regulation was not being enforced. It emerged from the in-depth interviews that this provision was not being implemented because, no particular agency under the Ministry of Transport is mandated in the regulation to ensure compliance. It was also indicated that a new draft of the regulation was before parliament which sought to mandate the Road Safety Authority to ensure compliance. Some of the regulatory authorities also indicated that this was a gap that had been identified by the study, and they advised that the report of the study should emphasise on this gap to ensure that policy makers take it up. The following comments were made by some participants:

I think this is also a gap that you have identified. Some of these things, even the physical conversion, the enforcement is in disarray. Not that it cannot be enforced, but if you look at the law carefully, who is to ensure that commercial transport operation is regulated? It sits at the Ministry of Transport, but as to which of the agencies is mandated, you don't know, whether it is the Road Safety Authority, the DVLA or the Ministry itself. So if you cast your mind to the Act 992, it situated that one clearly with the National Road Safety Authority. So, it should tell you that, that LI has not been enforced, because at that time of its enactment it was not enforceable. Why, the law is made but you have to create procedure for issuance, you see what I am talking about. So all these things we have done it, the Act and the LI are also coming to support road safety to be able to regulate commercial transport companies in Ghana (MTTD Officer, 49 years, Male).

Although this particular regulation is documented in the Road Traffic Regulation Act 2180, no specific institution was mentioned to be responsible for its enforcement, and that is the challenge. It appears that although this provision was put in the regulation, it wasn't important to the Ministry at that time. This is why the commercial road transport business is not regulated. But we have drafted a new LI which is before Parliament, and in this new LI, the NRSA is mandated to issue the license to operators. So I believe when it is passed, we will start enforcing it (Regulatory Officer, 37 years, Male).

Regulation on licensing of drivers

Regulations 25, 26, and 27 indicate the requirement for a person to qualify as a driver of a motor vehicle and how to obtain such license. Regulation 25 in particular shows the two types of licenses (learner's license, and driver's license). Regulation 25 also indicates the issuing of more than one license to a person if that person passes the relevant and appropriate tests conducted by the Licensing Authority. Regulation 26 focuses on the learner's license and the processes that one needs to go through in acquiring such license. Regulation 27 focuses on how to apply for a driver's license, whereas regulation 28 outlines the actual conditions for the granting a driver's license. The need for eye test and the penalty for driving with an uncorrected eye are scheduled in regulations 29 and 30, respectively. Revocation, suspension, endorsement or cancellation

of a license is outlined in regulation 36. Requirements for driver re-training and re-testing, and offences that can lead to such retraining and retesting are stipulated in regulation 43.

Regarding the licensing of drivers, it came out that the regulation is being complied with. Notwithstanding, there are some challenges associated with its implementation. This stems from the fact that, some employees of the Licensing Authority are conniving with outsiders to issue fake licenses to some section of the driving public. This was expressed by a participant as follows:

It is true that some of our own employees connive with people to issue fake licenses to some drivers. There has been a case where my own subordinate hacked into our system and issued some licenses without my knowledge and approval. About a year ago, we carried out an operation and some fake licenses were retrieved. When we investigated, we traced it to a driving school which only had the mandate to train drivers but was issuing licenses. As a result, we revoked the license of that driving school (DVLA Officer, 53 years, Male).

Regulation on passenger carrying vehicles

Although road safety emphasises on crash prevention, the ultimate aim of any road safety intervention is to reduce to the barest minimum fatalities in the case of a crash. Fatalities following a crash could be compounded by congestion or overloading of vehicles. It has been observed that in Ghana, some vehicles that are used for carrying passengers were originally manufactured for the carriage of goods. In converting them, however, the arrangement of seats lead to congestion on such vehicles. An inquiry was therefore made to ascertain if there is an existing regulation on the conversion of such vehicles.

Regulation 131 outlines the use of passenger carrying vehicle. This regulation identifies a passenger carrying vehicle as a minibus, a 'tro tro', a charter bus, a mass transit bus, a school bus, a coach and any other high occupancy bus. The regulation also shows how operators should keep the

vehicle clean and to ensure that access-ways or gangways are kept clear of any obstruction that can cause any inconvenience to the passenger. The regulation also clarifies the provision of adequate space for passenger luggage and where to provide such spaces on the vehicle. Further, the regulation estimates the weight of a person to be 80kg which includes an allowance of 10kg for hand luggage. Sub-regulation seven stipulates the carrying capacity of passenger vehicles which should not exceed the number of passengers the particular passenger vehicle is required to carry. The number of passengers is determined by dividing the registered freight or load (weight) which the passenger carrying vehicle was constructed to carry expressed in kilogrammes by the number 80.

Regulation 134 outlines the requirements for construction of passenger carrying vehicle. Of particular importance is the spacing between seats. Sub-regulation 1(f) of this regulation clearly indicates the spacing between seats in the case where seats face the same direction. The space between the front of the back of one seat and the back of the seat immediately in front should be at least 70cm, out of which at least 30cm is clear of obstruction.

In relation to the regulation on the construction of the seats on passenger vehicles in a situation where vehicles meant for carrying goods are converted into passenger carrying, a question was asked concerning its compliance. One of the regulators in trying to explain from the technical point of view indicated that for lack of standards for manufacturing of vehicles within the country, we tend to rely on the specifications from other jurisdictions in terms of average height of the citizens and so the originally manufactured vehicles like the Toyota and Nissan mini buses that are brought from Japan for instance have four rows of seat with little space between them. Therefore, when transport

operators bring in vans that they convert into passenger carrying vehicles, they equally arrange the seats just like the original buses that are brought in from Japan and China. The interviewee cited an example that in the US, the standard for seat arrangement on vehicles is based on the average height of the American, and so even where vehicles for the American market are manufactured in countries like Japan and China, they are done according to the American standards. He explained that, that is why the American Models of those same vehicles that are imported from Asia are bigger and more spacious than those that are used in Ghana. In his words:

The US for instance uses Toyota vehicles, but if you see their Toyota pickup, it can carry five persons in the back seat, yet it carries three. This is because in manufacturing their vehicles, they consider the average height of the people in their country. I am not only making reference to the vans that people have been converting, but the original from Toyota GHAMOT, have you ever boarded one? Unless you turn a bit to the side, you can hardly get enough space to accommodate your legs. We do not have our own standards so we depend on the standards of those Japanese and Chinese who are averagely short. So, if someone also goes to buy a van and decides to convert, he will arrange the seats to conform with that of the original buses that are imported into the country. So, they use their standards to manufacture vehicles for us, but you can't take such vehicles to the American market. America will give you their standards according to the average height of the American. So look at their Ford vehicles in town, when you sit in, you can see the difference (DVLA Officer, 53 years, Male).

Regulations on speeding

As indicated in chapter six, speeding has been identified as one of the major causes of road crashes. Therefore, to ensure that drivers of commercial vehicles keep to the stipulated speed, regulation 135 requires each vehicle to have a speed limiter and tachograph installed and in good condition. In addition, each vehicle must have a logbook, and entries in the logbook must be strictly adhered to. Further on speed limits, regulation 163 indicates the speed limits for various sections of the road and road environment. Within a school, a

playground or health facility, a church, a mosque, a market, a shopping centre, a procession or where human activity is predominant, the speed limit is set at 30km/h. Where a road section is situated within an urban environment or a built-up area, the maximum permissible speed is 50km/h. Road environment situated outside an urban area or built-up area, other than motorway has a speed limit of 90km/h, while the maximum permissible speed on motorways is set at 100km/h. For heavy vehicles, buses and other passenger carrying vehicles, the speed limit is set at 75km/h and 80km/h respectively (Regulation 164).

From the interviews, it emerged that all the transport companies were not using the tachographs as required. However, some of the companies were adjusting their governors to stipulated speed limits beyond which drivers could not accelerate further. Additionally, whereas some of the companies were complying with the use of log books, others were not. This non-compliance was as a result of the Regulatory Authorities not demanding compliance from operators as is required by the regulation.

Road traffic offences that attract spot fines

Some of the road traffic offences that attract spot fines were also found to be outlined in the Road Traffic Regulation (2012) [LI 2180] pp 211-212. As indicated in the Road Traffic Act (683) of 2004, one penalty unit amounts to GH¢12.00 which is multiplied by the number of penalty units indicated against an offence, and this constitutes the total fine that an offender has to pay. The means of collecting these spot fines is also clearly stated in the LI 2180. A list of the various offences and the penalty units that they attract are shown in Appendix N.

Passengers' reaction to reckless driving

There are situations where passengers may intervene while on public transport to ensure that drivers are not reckless. Although it may be argued that passengers' reaction to reckless driving is not a standard or planned safety intervention, this could be classified as on-the-spot intervention. However, the manner in which this is done could either mitigate or escalate the situation. In this regard, interviewees' views were sought on how they react towards reckless drivers. It emerged that some passengers make the effort to caution public transport drivers who tend to be reckless in their driving but are sometimes opposed by colleague passengers who are always in a haste to get to their destination. Notwithstanding, most of the passenger interviewees said they would caution drivers who tend to be reckless but would go further to report them if they refuse to heed to their advice. It was indicated that there is a mobile app which has been developed to enable passengers report reckless drivers to the police. The following are some comments on how passengers react to recklessness:

Well, honestly there are many times I confront the driver, but we live in a system that I don't know whether it is eh, I don't know how I should put it but there is a lot of stupidity in our buses. Sometimes the passengers want the driver to get to their destination quickly so they will encourage the driver to over speed but for me, if you are over speeding doesn't mean you have to be reckless in your driving. You can over speed and still be careful. But if you are over speeding and you are doing overtaking in places you are not supposed to overtake and all that, it increases your risk, over speeding itself increases your risk at a certain level. But where you are adding other things, manoeuvres that you are not supposed to do and you are doing, this triples your whatever it is (Passenger, 43 years, Male).

I personally tell the driver that our ultimate is to arrive safely so he should exercise patience and unfortunately sometimes some of the passengers react in the opposite by verbally attacking the driver and a whole lot of things. But at the end of the day the driver takes it in good faith and also acts accordingly (Passenger, 41 years, Female).

Normally what happens is that with the public vehicles sometimes we have got some numbers that if the driver misbehaves you can call. And sometimes I will quickly prompt him that master you are going too fast, you should minimise the speed because that is very important. Once you are carrying human beings, you are carrying lives and for that matter you should respect us. I remember one time I encountered that problem and I told the driver that if he misbehaves, when we get to the next barrier I will report him. As for that one master, I wouldn't spare my life to reckless driving. So normally, we tell the drivers to take time and we get there safe (Passenger, 38 years, Male).

Respondents Awareness of Security Interventions and their Effectiveness

Passenger respondents' awareness of security interventions in place on the public road transport system was sought. More than half (56.5%) of the respondents indicated that they were not aware of any intervention (Table 29).

A list of security interventions was provided in the study instrument which respondents were asked to select those that they were aware of. In all, the use of police escort on public transport vehicles was considered the most known intervention with a score of 94.4 percent. The least known intervention was the installation of security cameras at terminals and on vehicles which attracted a score of 7.4 per cent (Table 29).

Table 29: Passengers Knowledge of Existing Road Transport Security Interventions in Ghana

Intervention	Frequency	Percentage	
Awareness of security interventions	Yes	162	43.5
	No	210	56.5
Known security interventions	Use of police escort on buses	161	99.4
	Police checkpoints on highways	43	26.5
	Highway police patrol	39	24.1
	Use of private security persons at terminal	32	19.8
	Screening of luggage by PT operators	25	15.4
	Restriction of com. gadgets on PT	23	14.2
	Use CCTV cameras at stations & on buses	12	7.4

Source: Field survey, February 2021

Respondents were asked to indicate whether passengers had a responsibility for ensuring their personal security on the public transport system. Most respondents (about 99%) said yes (Table 30). Respondents were further asked to indicate if they agreed or disagreed to the assertion that road transport security is a shared responsibility. There was almost a unanimous agreement to the assertion as indicated by the summary in Table 30. Respondents were again asked to indicate whose responsibility it was to ensure security on the public road transport system. To this, some options were provided in the questionnaire, and responses indicated that all the stakeholders listed in the questionnaire had some responsibility towards ensuring that public road transport is safe in Ghana (Table 30).

Table 30: Passengers' Views of Who is Responsible for Ensuring Security on Public Transport

Variable		Frequency	Percentage
Do passengers have responsibility for personal security	Yes	367	98.7
	No	5	1.3
Whose responsibility it is to ensure passenger security	Drivers	370	99.5
	Police	370	99.5
	Transport operators	369	99.2
	Passengers	368	98.9
	Government	366	98.4
	Other	2	0.5
	Agreement that security is a shared responsibility	Strongly agree	334
Agree		37	9.9
Neutral		1	0.3
Disagree		0	0
Strongly agree		0	0

Source: Field survey, February 2021

Assessment of security interventions

A general assessment of the interventions listed above was conducted and majority of the respondents indicated they were effective (Table 31). Three interventions that sought to provide security for road travellers; the use of police

escort by transport organisations, highway patrols, and the mounting of enough police check points on major roads, were provided for respondents to indicate which of the three was most effective. The responses showed that respondents considered the use of police escort as the most effective intervention (60.5%), and the mounting of police check points as the least (7%) as shown in Table 31. The three interventions were assessed because they were perceived to be the most known by passenger respondents, and this was confirmed by the survey. To confirm the previous responses, the question was reframed to ascertain which of the three was least effective, and the mounting of police check point had the highest score of 78.5 per cent which made it the least effective intervention. Further, the use of police escort had the lowest score of 8.3 per cent, which meant it was considered the most effective intervention (Table 31).

Table 31: Passengers' Assessment of Effectiveness of Existing Security Interventions

Variable		Frequency	Percentage
General assessment of security interventions	Very effective	57	35.2
	Effective	104	64.2
	Don't know	0	0
	Ineffective	1	0.6
	Very ineffective	0	0
Most effective security intervention	Use of police escort	225	60.5
	Highway police patrol	121	32.5
	Mounting of police checkpoints on highways	26	7
Less effective security intervention	Use of police escort	31	8.3
	Highway police patrol	49	13.2
	Mounting of police checkpoints on highways	292	78.5

Source: Field survey, February 2021

In the follow-up in-depth interviews, participants' views were sought on some of the security interventions that had been put in place in the road transport

sector and a number of interventions were outlined, but it was observed that the time of departure of public transport vehicles had a serious implication on security. It was indicated that departing too late (night) or too early (dawn) exposed public transport vehicles to robbery attacks. The most popular intervention that was identified by all categories of respondents was the use of police escort on long distance buses. The other interventions that were identified as being provided by the security services were the mounting of roadblocks and the use of the police highway patrol teams. On the part of transport operators, it was generally observed that they had their own way of ensuring security at their terminals. Some other interventions that were identified included the use of surveillance systems like security cameras, frequent education on security for both staff and passengers in connection with how to identify suspicious characters and how to avoid things that would threaten their personal security especially the carriage of physical cash when embarking on long distance journeys. One other intervention that was identified was the situation where passengers were allowed to be on board buses till daybreak before they were allowed to disembark. This occurs in situations where the buses arrive at dawn and it is perceived to be unsafe for passengers to disembark at that time. Some passenger participants asserted that carrying physical cash on them increased the risk of being attacked so they had resorted to keeping money for their business transaction in their mobile wallet. However, a security expert advised that even keeping so much money in mobile wallet was risky because in the event of a robbery attack passengers could be forced at gunpoint to transfer the money to the robbers. In responding to the expert advice some passenger participants indicated that they rather paid for goods in advance before they

travelled to the market centres, and that helped in avoiding carrying so much money in their mobile wallet. It was indicated during the interaction that the police had developed a mobile application for reporting accidents and highway robberies on public transport vehicles but the app was not in the public domain although some passenger interviewees also indicated having knowledge of it.

Although the survey data indicated that respondents considered the security interventions in place as generally effective, the picture painted during the in-depth interviews was on the contrary. Notwithstanding, just as indicated in the survey data, interviewees considered the use of police escort as the most effective road transport security intervention. The use of police escort was found to come at a cost, as a result, most of the transport organisations who could not afford the cost did not have escort on their buses. In assessing the effectiveness of using police escort on public transport vehicles, two participants commented thus:

Operations wise we are looking at highway robbery. What we have done is we engage the Ghana Police Service and now we have escort on our buses as we get threats coming from highway robbers. We are not encountering these robberies for the past two years. If there is an attempted situation like that I think the police have done a marvellous job in fixing the situation (General Manager, 35 years, Male).

Management now provides police escort on some selected routes while on other routes, operational times are varied. This has so far proven effective and has sustained operations and provided safe passage. (Assistant Traffic Operations Manager, 50 years, Male).

With the mounting of police check points on highways, it was indicated that the effect was very weak as compared to the other two interventions. The explanation was that there were inconsistencies in this particular intervention as sometimes the police were found at the check points but on other occasions they could not be found, although the locations of the check points are considered

robbery prone areas. In a focus group discussion with some driver participants, they indicated that, they plied the routes and knew where each police check point was located on those routes. But sometimes, the barriers were removed and most of the time just a few metres from the locations of such barriers, public transport vehicles were attacked by highway robbers. This situation raised suspicion among drivers as they thought some police officers were conniving with criminals to rob public transport vehicles. This is how participants expressed their view of the mounting of police check points during the focus group discussion:

Highway robbery has become a menace, and the unfortunate aspect is that they now use the police barriers. Sometimes the police who are put on duty at these barriers abandon their post and these robbers take advantage of the situation. As a driver, you always drive on this stretch of road and you know there is a barrier ahead of you, so if you get there and you are signalled, you stop. But sometimes you stop before you realise it is highway robbers on operation. For now, we have so many barriers but sometimes some of these barriers are abandoned and robbers take over. So instead of being confident that your security is assured because there are a lot of checkpoints on the road, you are rather thinking about those checkpoints being taken over by highway robbers. So, instead of roadblocks being a security intervention, it is rather enhancing the activities of highway robbers. My question is that why should the highway robber who is afraid of being arrested by the police use the same barrier that he is afraid of to commit crime (Focus group participant, 57 years, Male).

On the operations of the police highway patrol teams as a road transport security intervention, it was indicated that although it provided some form of security for travellers, it needed to be intensified to make it more effective. As indicated in chapter six, logistical constraints affected the effectiveness of the activities of the police. It emerged that the police did not have enough patrol vehicles as well as the personnel to cover all major highways identified as robbery prone in the country. A participant expressed his view as follows:

Okay, you see the highway patrols, you know, is like when you are searching for the police work, you start praying, you even invite friends and pastors to pray for you. But the moment you go inside the service then you change, you see. So these highway patrol teams, instead of them patrolling the highways and concentrating on providing security for vehicles going in and out, they rather go to block the road at another place and then stand. Meanwhile approved barriers are also mounted at various sections of the highways where vehicles are searched when they get to those points. The thing is that they too they will take something you see, that is the problem, but this one we have talked about it for so many years and still it is happening (Union Vice Chairman, 67 years, Male)

In effect, responses from the in-depth interviews confirmed the results from the survey that amongst all the security interventions, the use of police escort by transport operators is relatively the most effective road transport security intervention in Ghana presently.

Outcome of observation conducted

An observation was conducted to verify some of the interventions that were claimed to have been put in place by the transport organisations, regulatory authorities, and some of the problems indicated by the emergency service providers. With the transport organisations, the nature of the fleet and systems for maintenance was observed, and it emerged that the type of vehicles used varied both within and between. Almost all the vehicles observed were in appreciable state. Notwithstanding, some of the vehicles had seat arrangements that were considered not to be up to the required standard. As reported earlier in the chapter, these seat arrangements could rather contribute to the casualty rate in the event of a crash. Those organisations who claimed they had system for internal reward and punishment provided evidence to support their claim. It was also observed that some of the transport organisations strictly followed their operational guidelines. One of the government assisted operators, and one of the

private operators had restrooms for their drivers at the terminals to ensure drivers had adequate rest before embarking on their journeys.

Regarding security at the terminals, it was observed that whereas some of them operated in enclosed areas with dedicated access and egress, others operated in an open environment. Additionally, almost all the terminals observed were easily accessible. Only two of the operators had security personnel at their terminals. No security cameras were spotted at any of the terminals observed. It was also observed that there were no adequate systems for screening of passengers and their luggage. On board the buses also, no security cameras were spotted although some of the operators claimed they had tracking devices on their buses. It was difficult observing the presence of the police escort, since they operated under-cover. However, one of the operators was able to show clandestinely an officer in plain cloths who was waiting in the restroom of the drivers to accompany a bus that was being loaded.

With the regulatory authorities, the cameras that were claimed to have been fixed at various intersection within the city were observed to be present. A visit to the various terminals on different occasions however indicated that the road safety inspectors were not present as was claimed. The only time some form of sensitisation was observed at one of the terminals was in December 2021. In this observation, the Greater Accra Regional Manager of the National Road Safety Authority was spotted with some of her officers sensitising drivers at the terminal. The situational crime intervention that was claimed to have been done at Madina Zongo Junction was also observed, and it emerged that the strategy adopted had reduced the incidence of pedestrians crossing the road directly without using the footbridge available.

The major issue with the emergency service providers was that of the nature of the equipment for performing their duties. It was indicated that the equipment were old and in deplorable state but that was what they had to manage with. The equipment were observed and were found indeed to be in deplorable state.

Discussion

This chapter sought to assess the effectiveness of existing road safety and security interventions and their impact on the state of passenger safety and security in road travel in Ghana. The assessment was done from the perspectives of passengers, transport operators, regulatory authorities and emergency managers. It emerged from the survey that passengers have a good knowledge of existing road safety interventions. On the contrary, their knowledge of existing security interventions was below average. It also emerged that transport operators had some internal interventions that sought to provide passenger safety and security at the terminal and also in transit. On the part of regulators, it emerged that they had introduced several safety interventions, apart from the documented regulatory interventions that are in place. Besides passengers were adopting some personal security measures to augment that of the transport organisations, and they also sometimes intervened in situations where drivers were tempted to be reckless. Participants were also able to use their own standards to assess the effectiveness of the existing interventions and how they have impacted the state of safety and security in road travel in Ghana. The findings are discussed next in the paragraphs following.

On awareness of existing interventions, the data showed that out of 372 passengers surveyed, more than 90 per cent were aware of some road safety

interventions in place. With security on the other hand, the data showed that only a little over 40 per cent indicated their awareness of some security interventions in place. These results suggest that passenger respondents have a high knowledge of road safety interventions in place, but low knowledge of security interventions. This could be because road safety interventions are more visible as compared to security interventions. Regarding transport operators, it emerged that they have their own internal safety and security measures which they followed to ensure passenger safety and security as was also reported by Sam and Abane (2017). One important measure in terms of safety was how efficient drivers are recruited into the various organisations. However, the rigorousness of these measures varied from one transport organisations to another. From the narratives, it appeared that those organisations that employed more rigorous processes in their recruitment recorded less road crashes as well as security threats as compared to those with less rigorous measures. It also emerged that frequency of crashes recorded had negative impact on the operations as well as the image of a particular transport organisation. This negative impact is in two-fold; passengers withdrawing in the short term, and the availability of buses for routing within the period that those crashed buses are down for repairs.

Notwithstanding, the fact that some dissenting views indicated that the efforts made by some of the transport organisations is just a face-off thing means a lot more effort has to be put in by these operators to ensure effective safety and security of their passengers. Although there were documented regulatory safety interventions in place (Road Traffic Act, 2004 [Act 683] and Road Traffic Regulation, 2012 [LI 2180]), it appeared there is laxity in enforcement of the

provisions in these documents and this could be contributing to the increased rate of crashes in the country. Further, the absence of standard documented security interventions connotes that road transport security over the years has not been given the required attention that it deserves.

In assessing the effectiveness of the existing interventions, both the survey and in-depth interview data showed that of the three thematic areas in road safety, education was the most effective and engineering the least effective. Education might have been adjudged the most effective intervention because road safety education is aired on most of the electronic media, which participants must have been privy to. Enforcement on the other hand was found to be marred by continuous interference from both political and traditional authorities, and that may be contributing to the laxity in the system.

As indicated in the conceptual framework (Transport safety and security intervening model) and also the safe systems approach (UN, 2011), there is the need for a systemic approach to road safety management if a positive impact is to be achieved. The findings however suggest that road safety is not being managed holistically, consequently affecting its effectiveness. Focusing on the educational aspect alone without backing it up with enforcement and improving the engineering aspect would result in sub-optimality in road safety management (Gubbins, 2003; Coleman, 2013; Salmon, McClure and Stanton 2012).

Regarding security, the use of police escort, erection of police barriers on highways, and police highway patrols were the three most common interventions identified. Out of the three, the use of police escort was adjudged the most effective intervention whereas the erection of police barriers along the

highways was adjudged the least effective. Lack of a documented plan for road transport security has resulted in only a few transport companies focusing on the security aspect in their operations. Newton (2014) asserts that in developing plans for crime prevention on public transport, some basic questions should be raised. These include who are the potential targets and victims, and who can act as capable guardians; who are the likely offenders; and who can act as handlers to restrain the otherwise motivated offenders. Whereas police escort for instance should probably be made mandatory, it is rather left to those who can afford to engage the police. The results also indicate that all the three most common interventions used in ensuring the security of road transport involve the police. Notwithstanding, it appeared some drivers and passengers were suspicious of the police conniving with highway robbers to use barriers on highways to rather attack travellers. In this regard, the police need to step up their effort to redeem the trust from passengers and drivers.

For the regulators, it came out that they had introduced a number of interventions over the years, but the impact of some of these interventions are short-lived because they are not followed through after their introduction. This arose from the laxity in enforcement of road traffic laws and regulations which were found to be well documented in the books. For example, it was observed that most of the safety protocols regarding the acquisition of operator's license, arrangement of seats on vehicles that have been converted from good carrying to passenger carrying, the use of tachographs/logbooks, and the use of head lamps were not being adhered to, although they are indicated in the road traffic regulation. Additionally, it emerged that the objective of establishing the National Drivers Academy was not being achieved because only a few transport

organisations were making use of the services of the academy. Relating these findings to the conceptual framework for the study, it was realised that although documented, the enforcement of regulation was mainly being focused on the driver and the vehicle, but that of the operator had been relegated to the background.

Some of the engineering interventions that had been put in place included the installation of speed calmers like speed humps and rumble strips in built-up areas to reduce the incidence of pedestrian knockdown. There are also the lollipop crossing stands to ensure safe crossing of roads by school children. In other places, footbridges have been provided to aid the safety of pedestrians who intend to cross the road at a point in time. However, the places that some of these footbridges are sited are not convenient for pedestrians, making them cross the roads at unapproved sections which are closer to where they normally congregate. It appears there is little or no stakeholder consultation when it comes to road design and construction, especially the provision of safety facilities for pedestrians. As indicated by Porter and Abane (2008), road design and construction in Ghana is left in the hands of civil engineers. The implication is that the safety of vulnerable road users (those using non-motorised means) are not taken into consideration during construction. The focus of construction has always been the vehicle user. The result is that facilities are provided which are not used by the targeted road users. This situation has the potential to rather escalate the incidence of pedestrian knockdown which the construction of the footbridges seeks to reduce.

Regarding emergency management, it appears that although some effort has been made in ensuring that ambulances are provided to every district in the

country to ensure quick response to emergency calls, these ambulances are not enough to meet the emergency needs of the country. The maintenance of the ambulances also seemed to be ineffective, and this is affecting their availability during emergency calls. These situations, coupled with lack of adequate technology for effective identification of locations during emergency calls, and bad road network affects swift response to emergency calls. Studies conducted in other jurisdictions (for example Mladineo, Knezic & Jajac, 2011; Steenbruggen, Borzacchiello, Nijkamp, & Scholten, 2013; Amorim, Ferreira & Cuto, 2017) indicate that emergency management thrives on technology. Another challenge to post crash response is the issue of prank calls. It appears there has not been enough education on the essence of emergency calls, and this has resulted in most people using the emergency lines to make fun. This according to the finding has led to intense traffic on the emergency lines, which inhibited genuine incoming calls. It also emerged that, the emergency units of hospitals are not well resourced in terms of beds to accommodate emergency cases and this affects crash victims negatively. Since the aim of road safety is to reduce fatalities and injuries, the emergency units of the various health facilities should be adequately resourced to accommodate the injured.

As required by the safe systems approach, for road safety management to be effective, there is the need for safer roads, safer vehicles, as well as safer road users. In view of this, each stakeholder in the road safety fraternity has a role to play, and this needs a systemic approach to make it effective as indicated in the conceptual framework of this study (Road safety and security intervening model). The same systemic approach is needed in ensuring adequate security in road travel in Ghana.

Regarding the impact of the existing interventions on safety and security in road travel, it appears a few of the transport organisations have made a positive impact. However, considering the impact holistically in the road transport industry in Ghana, not much has been achieved, and as Abane (2012) indicated, it appears Ghana is losing the fight against road carnage. Security in road travel also seems to be fragile from the data gathered.

Summary

This chapter assessed the impact of interventions in place on safety and security in road travel in Ghana. Participants of the study were able to conduct their personal assessment of the interventions that they identified as being in place. It emerged that for road safety, there are documented Act and regulation which covers all aspects of safety, but there is laxity in enforcement. With transport security, no documented intervention was sighted but there were some interventions that were being implemented by the transport operators and the security agencies as well. The most effective interventions identified were education and the use of police escort for safety and security respectively. It also emerged that the road infrastructure in place is inadequate for effective road safety, and the country also lacks adequate technology for effective road safety and emergency management. The next chapter focuses on participants' suggestions to improving safety and security in road travel going into the future.

CHAPTER EIGHT

PASSENGER SAFETY AND SECURITY IN ROAD TRAVEL: A LOOK INTO THE FUTURE

Introduction

The previous three chapters focused on assessing the state of road safety and security, and also existing interventions. The assessment was based on secondary data from the National Road Safety Authority and the Criminal Investigation Department of the Ghana Police Service, as well as primary data from the perspectives of passengers, transport operators, regulatory authorities, and emergency service providers through a survey, in-depth interviews, and a focus group discussion. This chapter looks at other interventions suggested by respondents which in their view could help improve safety and security in road travel. The chapter begins with an overview of suggestions made by passenger respondents during the survey. The chapter continues with suggestions made generally during the in-depth interviews, followed by those by the regulatory officers and the emergency service providers. The chapter ends with a discussion of the findings in relation to existing literature and the conceptual framework guiding the study.

Suggestions from Passenger Survey

The survey conducted with passengers produced some suggested interventions that could improve road safety and public road transport security. The suggestions were categorised under the three Es (enforcement, education, and engineering) which underlie the discussion of transport safety. Most of the suggested interventions were already in place, but the data indicate that there is the need to improve them. The major word used to qualify the interventions was

In-Depth Explanation and Further Suggestions on Public Transport Safety and Security

Having explored the views of participants on the state of road safety and road transport security and the interventions in Ghana, it was important to solicit their views on how to improve public transport passenger safety and security. A look into the future of road safety must be based on the safe systems approach which includes safer roads, safer vehicles and safer road users. It has been established that it takes many people to cause a crash; and that the vehicle owner, the state, the driver, the passenger, the pedestrian, and of course all others who use the road have a responsibility towards road safety. Broadly, the need for attitudinal change was emphasised on the premise that if road users and the authorities change their attitude, every other thing about road safety will also change. A participant summarised what should be done to improve road safety and passenger security as follows:

There is the need for more and effective public education. Effective enforcement of existing laws would also help. Our roads across the nation must be properly lighted to improve visibility. Regular and effective maintenance of the roads would also help. Road network across board must also be improved. Additionally, all stakeholders in the road passenger transport industry must collaborate to ensure passenger security in road travel (Assistant Traffic Operations Manager, 50 years Male)

The suggestions made into the future of road safety and road transport security were categorised under six thematic areas namely; education, engineering, enforcement, emergency/post-crash management, security, and others.

Suggested road safety interventions

On the issues regarding road safety, the general suggestions made by all participants under the various thematic areas are discussed, followed by a specific question which was put to the regulatory officers and the officers in

emergency service provision on which one thing they would change about road safety in Ghana.

Education

In the previous chapter, it was observed that though education seemed to be the most effective intervention, public education on road safety seems to be more reactive and seasonal than being proactive and continuous. The importance of education in the driving profession was agreed on unanimously during a focus group discussion. However, participants in the focus group discussion were of the view that drivers who commit traffic offences should be sent to the classroom for retraining, and if certified by an appropriate body, their licenses be given back to them. The general views of participants were captured in an expression by one of them as follows:

I think for me, like I said previously, education is very important in the driving profession. I would wish that if a driver commits an offence, police should not take money from the person, but that he is sent to the classroom for a period of time and then certified by an appropriate body before his license is given back to him. But all this boils down to enforcement, because if a Minister of State or an MP commits a road traffic offence and he is asked to go to school for a period of time, will he oblige? Yet, we are all drivers (Focus Group Participant, 57years, Male)

The major issue that was suggested under education by all participants was the intensification of public education on road safety which in the view of participants could help create awareness with the view to influencing peoples' attitude. It was indicated that, road safety education should not focus only on drivers and riders of motorised vehicles, but on passengers as well. It was also suggested that education should not be limited to the electronic media but should be extended to the transport terminals and should be a continuous process rather than the seasonal nature as has been the case. Others also

suggested that road safety education should be made part of the curriculum for basic schools to create road safety awareness in school children right from their infancy. Some respondents, in expressing their views on road safety education going into the future remarked as follows:

Road safety education must start from basic school so as to inculcate safety consciousness in the children, so they would grow with it. (Passenger, 40years, Female).

Education, education, education, would always be reemphasised because as more people get to understand the issues that lead to their death they take some steps to address that. (Passenger, 36years, Male)

Going forward, we should move away from the seasonal and reactive nature of our road safety education, and rather concentrate on a continuous and effective form of public education. I believe that if we emphasise road safety education and strengthen our enforcement, we will make a head way (Assistant Traffic Operations Manager, 50years, Male).

Enforcement

It was established that although Ghana has a lot of road traffic regulations and institutions, the “will power” to enforce and the willingness by road users to abide by those regulations remain the main challenge. Participants therefore emphasised the need for strict enforcement of road traffic laws and regulations which in their view would compel the citizenry to change their attitude towards road safety. The following excerpts are illustrative of the general views expressed by the participants.

You see, the law must work, if they (road traffic offenders) should be prosecuted, it should be done, and I think that will save us. I know we have these cameras, but I don't know if the cameras are working. It would have helped a lot if they are really working (Regulatory Officer, 51years, Male).

I think that we already have enough institutions and people responsible for our safety on the road, just that we have not been able to actualise that. We seem to be too comfortable with what we have now, and that is what I am not going for. I am saying that let these institutions mandated to ensuring that our roads are safe, let us see them doing what is

required of them, and since it is a shared responsibility, let us all get involved in our security on the road and we will be making a head way. Let the government make it a priority because I tell you, the Corona virus that we are running away from, Citi news, did the calculation and realised that the number of people who die on the road is even more than the corona virus deaths but we are more concerned about it and vaccinating people and all that, you see now. So it means that we do not understand when it comes to peoples' lives and security of our people. When you understand and you appreciate the figures, you will know that it is more critical on the road, you will focus your attention on the road and make it a priority even than the Corona virus we are talking about, than the malaria you are talking about, than other things we are talking about, okay. So I think that government, the people, the citizen, the institutions, let us all make it a priority that our road will be safe and let us all do what is expected of us and I think that is the only way we can make our roads safe. (Passenger, 31years, Male)

I believe it is all about enforcement because the laws exist in our books. We have just indicated that about 90 per cent of road crashes are caused by human error. There are vehicles in the system which are not road worthy, and some roads are also not vehicle worthy. When I say a road is not vehicle worthy it means that road is not good. Meanwhile, there are institutions that are mandated to ensure the worthiness of both the road infrastructure and the vehicles. So if vehicles that are not worthy for the road have been certified for road worthiness, then who did it? If we are all able to enforce these laws and regulations, then even if crashes will occur, at least it will be minimal. Those roads that are not in good condition, who is supposed to ensure that they are maintained. So, for me, if we will be able to deal with the 90 per cent that is human caused, then when you train your driver and the institutions are also working effectively, we will be left with 10 per cent possible accident. So why don't you consider eliminating the 90 per cent which is human caused. (Head of Traffic, 56years, Male)

For enforcement to be devoid of familiarity and favouritism it was suggested that road traffic law enforcement be fully automated using available technology as has been done in other jurisdictions where evidence is demonstrated in the road safety literature (Kuo & Lord, 2019; Mali, 2020). One participant recommended thus:

Automation is key to ensuring effective enforcement. This has been demonstrated by the developed countries. Automation of enforcement makes detection of offenders independent of the police officer, and that reduces the incidence of corruption. On the other hand, it induces high

sense of detection and apprehension, which becomes deterrent to offenders. Automation of enforcement involves a lot of factors like the installation of cameras, the use of GPS, and the coordination of various institutions (MTTD Officer, 49 years, Male).

Other suggestions on enforcement included augmenting the numerical strength of the police and also motivating them to perform their duties to the best of their ability. It was also emphasised that the police must be adequately resourced in terms of logistics (vehicles, arms, protective equipment, and other devices) for easy detection of crime. Some of the suggestions are detailed below:

We need to improve on the numerical strength of the police, yes, we need to improve on that, other than that we will not be getting anywhere. Also, motivation, that is remuneration or remunerational motivation, if I can put it that way, their salaries, that will encourage them to do the work as they are supposed to do. Additionally, government must make sure that the police are provided with adequate ammunition and protective gadgets like bulletproof vest for their self-protection (General Manager, 54 years, Male).

Another strategy of enforcement that was mentioned is what is referred to as “situational crime prevention”. Situational crime prevention assumes that people are willing and capable of committing crime, therefore there is the need for the enforcement authority to re-engineer the environment to make it difficult for those who have the capacity and are willing to commit crime to do so. An example was cited of some re-engineering that was done at Madina Zongo Junction in Accra where pedestrians had refused to use a foot bridge that had been provided for them. The situation was that there were spaces for them to cross the road without using the footbridge but after the re-engineering, pedestrians were compelled to use the footbridge with the assistance of the police and the city authorities. In explaining the effect of adopting the situational crime prevention strategy, a participant remarked thus:

Situational crime prevention assumes that people are willing and capable of committing offence, and when they are capable and willing, you re-engineer the environment to make it difficult for those who have capacity, who are willing and want to commit crime, make it difficult for them for committing, and that is what has been done currently between Zongo Junction foot bridge and La-Nkwantanang, which is visible to the public. You see when you leave the road open the police will not be there always, police may have inadequate strength, police may not have the necessary logistics but with a little engineering intervention, reinforce the median, put in fence, put grass, put some flowers and other aesthetics, seal the open median, channel traffic, up a little traffic enforcers presence there, you have achieved your objective (MTTD Officer, 49 years, Male).

It was observed that getting transport operators to join associations or unions would help regulate drivers and check some of the behavioural issues like drunk driving and speeding for instance. It was emphasised that in other jurisdictions, one cannot buy a vehicle and just start operating a commercial service without being a member of a transport association. A participant expressed his view as follows:

...And then we limit speed, from here to Takoradi if first you were using four hours, because of congestion why don't we use five or six hours, you understand. The rule is saying that you cannot drive continuously for four hours so why don't we use two drivers? STC is doing it, when they are going to Kumasi they use two drivers. They have been given a speed limit to drive so how many STC buses get involved in accident? Those drivers who are not affiliated to any union should be made to join one. In China you cannot just go and buy a car and say you are coming to operate a commercial transport, you should have a union, so that the union, they should be an umbrella for them to be disciplined, do you understand? So that, no driver will operate without belonging to a union or a registered transport company. And if you are a car owner and you want to go into commercial transport, you have to liaise with these people and then they will tell you the kind of car to buy. Elsewhere, they are using tachograph to determine your speed limit. So, if you belong to an association and they have installed the tachograph, and you come and they detect you have broken the speed limit, they sack you, you understand. Now, it is like if everybody wants to do business the focus is buying a car, that is what brings money quickly and that kind of stuff (DVLA Officer, 53 years, Male).

One constraint to enforcement that was identified was the interference from both political and traditional leaders. In suggesting ways to further improve enforcement in the future, it was indicated that strong political will is needed to make enforcement of road traffic regulations very effective. Drawing from past experiences, it was suggested that things that had been done wrongly in the past regarding enforcement must not be repeated, but that a strong political will should be inculcated to ensure that every citizen, regardless of educational, social or economic status is dealt with according to the laws for violating road traffic rules. A participant who was critical asserted thus:

So as I said, for us to improve, we are doing very well when it comes to road safety management in the Africa region. When you compare the fifty-four regions, we are at the top with Nigeria so we are doing well. But still there is more room for improvement, and we would need political will, strong political will, if we don't get it, then it will be difficult for us to improve. For example, I think three years ago, we had wanted to enforce a certain regulation, commercial vehicles having seat belts for passengers, and these people rose up against us, GPRTU, and we know our politicians. ...I agree, but what I am saying is that there is a regulation, that all commercial vehicles should be fitted with passenger seat belt, but you know that as you said Sprinter whatever, it is only the big cars that have them, and they rose against us saying that DVLA and NRSA want to take their money and all that. And truly, there was a call from the "top" to suspend it. We wanted to enforce the regulation on banning of motorcycles for commercial purposes (okada), within two or three months even you know, a former Minister of State who was also a legislator, 2012 he was in parliament, he was part of the MPs that passed this regulation, and banning of motor cycles for commercial purposes it is in this LI. We wanted to enforce this regulation and this same man said hell no, he will not agree, including other ministers and MPs, they told us to stop. So, until we get strong political will, we would have all the documents, the Acts and other things, they won't go anywhere (NRSA Officer, 37 years, Male).

Engineering

As indicated in chapter six on road safety assessment, the state of roads in the country was perceived to be very poor, which participants thought

contributed hugely to road crashes. The major suggestion therefore on road engineering was that the roads in the country be improved to ensure that they are safe to drive on. Referring to the safe systems approach to road safety management which had been adopted by the United Nations, it was emphasised that the state had the obligation to provide safer roads for road users. It was therefore incumbent on the state to ensure that the major roads in the country are rebuilt to be safer than they are. It was suggested then that the road infrastructure should be built to suit the attitude and behaviour of the road users because people are corrupt by nature and so technologies that seek to influence human behaviour need to be incorporated into the construction of our road infrastructure. It was emphasised that most of the roads that exist in Ghana are not pedestrian as well as other road user friendly. The call for dualisation of roads in Ghana was therefore on the premise that the existing roads are too narrow and that contribute to head-on collision. Interviewees were of the opinion that converting the road into dual carriages would reduce the incidence of head-on collision and road crashes in general.

Yes, yes, I believe turning the major roads into dual carriages is one thing that would solve the problem. Because we are not a people who are patient by nature, and you see sometimes in building infrastructure, infrastructure is not like people need houses so you build the house, no, you build to the attitude of people, you build to the behaviour of people, because what is your main aim? One, is to make sure that people do not just get to their destination but get to their destination safe (Passenger, 41 years, Male).

Not only did participants suggest improvement in road engineering but they also advocated for regular maintenance of existing road infrastructure, and also the provision of adequate road furniture as well as lighting system to enhance night driving in particular. Further, it was suggested that the design and construction

of the road infrastructure should be done in a manner that will conform to the behaviour of road users. This was explained thus:

We should be using technologies that are tailored to solve our behaviour. Our behaviour is that we are impatient people, you can't change that, so how do you deal with it? Build roads for them that would not make them meet at all. So even if the person overtakes any how he will not meet the other to collide. The other aspect then will be that how do we address this over speeding? Put speed cameras at appropriate locations and make them visible to road users. You know, we conform to behaviours. When people know that there is a speed camera there and if it captures them they will be picked up and made to pay a fine, then they will conform, especially if they don't have the money to pay. So even if I speed, when I am getting close to the camera, I will slow down, and make sure I do not attract any fine (Passenger, 35 years, Male).

Another observation made was that because maintenance of roads is very expensive the state could go into partnership with private organisations to ensure that the roads are maintained effectively. It was suggested that a stretch of road could be divided into sections and given to different organisations who are interested to maintain and collect tolls on those sections to recover the cost of maintenance. It was believed that such an arrangement could relieve the state of investing so much money in the maintenance of roads, the money which could be channelled into other developmental projects. The following narratives shows the thought of a participant on the maintenance of roads:

I think that government should privatise the roads. Maybe from Cape Coast to Mankessim, if company A think that they would take toll let them do it, give it to them, give them certain terms that we should not see potholes on that road at any point in time. So which means that, that company will be responsible every time to ensure that the road is hundred per cent correct with adequate signage and all that. So this person is responsible for Cape Coast to Mankessim so if you get to Cape Coast Makessim you pay if it is ten pesewas you pay your ten pesewas and then you continue. Now from Cape Coast to Winneba company B will get that contract to do the road and ensure that the road is always in good shape, and then government can always take his ten per cent or twenty per cent as he also charges for these things. When we do that I think within a short time we would have a lot of our roads in good shape and well maintained, because it is beyond the government's capacity to

take care of our roads. But currently, government will build roads with toll booths and then give it out to private companies to collect the toll, what is the sense in that. And I think it will also create more jobs in the road sector (Passenger, 43 years, Male).

The issue of vehicle maintenance was high in the discussion under engineering. As indicated in the road safety assessment, it was emphasised that some of the transport operators do not take the maintenance of their fleet of vehicles seriously. It was observed that when faults are reported, some operators ask their drivers to manage until they get enough money to buy the part and in the course of managing some of these faults, they result in road crashes. In view of this discussion, it was suggested that vicarious liability be incorporated into the road traffic regulation and strictly enforced to ensure that operators are held responsible for non-maintenance of their vehicles. It was indicated that some of the faults that occur on vehicles do not occur out of the blue but they come with signs or symptoms which warn the drivers to take some action. It was observed that brake for instance does not fail because when there is a problem it would start giving signs to indicate that it is going to break down if not rectified. Transport operators were therefore encouraged to pay attention to the maintenance of their fleet, especially if the drivers detect faults and report to them. This could help reduce the incidence of mechanical failure which could result in crashes. This was how some participants commented on the responsibility of vehicle owners to maintain their vehicles when they become faulty and they are notified:

So in your report, there should be that kind of vicarious liability. When a driver is arrested and the driver is able to prove beyond reasonable doubt that I complained to my master that the tyre is not good so we should change and the man refused that I should manage, and in the process of managing an accident occurred, they should charge the car owner and let the driver go (DVLA Officer, 53 years, Male).

...We have to make sure that our cars are having good spare parts, or is it not part of it? Yes, the tyres we are using must be quality ones, so I think these are some of the things that we need, spare parts, tyres and everything. And I think when all these things are put in place, Isha Allah accident will never, even if it will happen, at the end of the year it will reduce. (Union Vice Chairman, 67 years, Male)

Emergency management

With emergency management there was the call for logistical improvement in the area of equipment for extrication and emergency recovery vehicles and ambulances as well to enhance the response time to emergency calls. There were suggestions also for the emergency units of the various hospitals to be adequately resourced to ensure that they are able to accommodate accident and other victims. The use of technology was emphasised as very key in effective road safety and emergency management. It was explained that countries like China are thriving on technology and automation of their road safety management. It was also emphasised that road safety management should not only focus on the preventive aspect, but the emergency response must also be given equal attention. The need to focus equal and particular attention on improving emergency management was emphasized by a participant:

Well, I will go for, even though looking at where I sit as emergency response agency, definitely I look up for improving on our emergency response, because that is where I will say my interest is. So, I have always been telling National Road Safety Authority that when it comes to education, they are always interested in preventive, but accident is something that can happen even though we are trying to reduce it but since the word says accident, something which is unplanned for, definitely it will happen, but when it happens what next? (Operations Manager, 56 years, Male).

An attempt was made to ascertain if the interviewees from the regulatory authorities and the emergency service providers would converge on one particular issue which when addressed would enhance road safety in Ghana.

The various suggestions that were made by interviewees focused on installation of adequate road furniture, coordination of activities of road safety management institutions, strict enforcement of existing laws, logistical improvement for both the enforcement and emergency service providers, and infrastructural development. The following narratives present some of the views expressed by the regulatory authorities:

Mine is to make sure that these road signs and markings are put in place, because there are certain places you will not see those markings there, you will not see any road sign, and these things actually cause a lot of problems. Already, when the signs are there, you still have these problems but, let's talk about the education that is going on, if these signs are there and you start educating people a lot more frequently, I think that will also change the mind-set of some of the drivers if not all about 70% it will change their mind-set (NDA Officer, 51 years, Male)

One thing I would like to see done in Ghana is that we should not allow our roads to be free as we have, the road is so free. I look forward to the day that we will be able to integrate all this sit alone ICT system so that there will be high sense of detection among road users day and night. Even when you are alone, there will be high sense of detection and apprehension. If we back it up with sanctions to do away with interference, and lay control to detection, then it doesn't matter whether the person is IGP, a High Priest, Pope, Bishop, MP, or President, you are caught on camera. Then evidence is sent to you, go and pay, and woe betides you if you don't pay, you will be published. That is what I want to see, and I expect to see deterrence. And when I see deterrence in compliance, speeds will go down. I will see it in the behaviour of drivers when they are approaching junctions. I will see it in the way they do their insurance and roadworthy. I will see it where they do their vehicle maintenance. I will see it wherever they are and people will say that ah, all of a sudden not by compulsion, everybody seem to be complying with safety (MTTD Officer, 49 years, Male)

Okay, because we have lot of agencies, that is one reason why it is making road safety management a bit complex. So if I had the power, I will decouple the MTTD from the Ghana Police Service, merge it with DVLA and NRSA into one body as is being done in Nigeria. In Nigeria, their Federal Road Safety Cop license, they enforce road traffic regulations, they almost do everything. And it is one body so if the Director General gives instructions, it is the whole body. In Ghana, you would come out with an instruction and the IGP will say no, it is not in line with our vision and mission, DVLA will come up with excuses, GHA will say we don't have money, and other forms of excuses. And this makes it very difficult for coordination of activities. I am not saying the

road agencies should be part, but these three key agencies to me should be merged into one body to make education and enforcement very effective. That is my view, so we decouple the MTTD from the Ghana Police, merge with DVLA and NRSA into one body. We do the licensing and regulate road traffic regulations. If the offence is a crime, maybe somebody knocking down a pedestrian intentionally then the police can come in. But if it is a road traffic regulation, the same body should be able to regulate so that one person will be the head, that is what I think should be done (NRSA Officer, 37 years, Male).

Not only were there a calls to merge some of the institutions involved in road safety management, but also the urgent need for coordination and collaboration between and among the various institutions was also emphasised. This was on the premise that the various institutions are performing their mandate individually and this hinders the synergy that could be achieved through collaboration. It was further suggested that the two ministries that play key roles in the road transport sector (Ministry of Transport and the Ministry of Roads and Highways) be merged into a single ministry with divisional heads for the transport and road sectors. This, according to the suggestion, could avoid the errors in road design for instance, because the transport division could identify appropriate places where some safety infrastructure could be provided whereas the roads division incorporates these suggestions into their design and do the actual construction.

Regarding post-crash or emergency service provision, it was indicated that it had somehow been neglected, and that all the attention was on the preventive aspect of road safety management. This was on the premise that, the National Road Safety Authority's education on road safety had always been focused on crash prevention without paying much attention to post-crash issues. It was asserted that, since crashes are inevitable in transport, no matter how careful road users would be, it is important to focus equal attention on post-

crash issues if the objective of road safety is to reduce injuries and death. Another suggestion was on intensive public education to reduce the incidence of prank calls which is posing a big challenge to swift response to genuine emergency calls. Further, it was indicated that provision of adequate logistics is a major constraint to effective post-crash management. It was therefore suggested that both the police and the emergency service providers be adequately resourced to enhance their response and performance during emergencies. The following are some of the narratives from the interviews:

So, what I want to see being improved is the post-crash response, where we educate the whole populace for them to know what to do when there is an accident so that if anybody has that knowledge definitely we will improve on the handling of accident victims so that we can improve on their survival rate instead of a lot of people losing their lives through road traffic crashes, so that is where my interest will be. The other aspect is intensive public education on the need to desist from prank calls which most of the time cause a lot of traffic to genuine incoming emergency calls (Operations Manager, 56 years, Male).

What most people think is that the Service is only for firefighting, so when accidents occur, they always call the police. But we are not limited to firefighting, we perform other functions like accident rescue and extrication. What we lack is adequate logistics; as you can see, this equipment before you are very old. But we have to manage with it because that is what we have at hand. So, what I would like to see is the Fire Service being adequately resourced to enhance our performance on the job. In fact, lack of adequate logistics make our work very difficult in times of emergency (Fire Officer, 41 years, Male)

If I had the power to change one particular thing in road safety, I would say it should be adequate resources. Because, before you take a decision to do something, you need resources. I am just giving you this background so we coil into the main issue. For instance, if we decide to construct a new road, or expand existing one like dualising the Accra to Paga road, or Accra to Tamale, that will be cost intensive. But when it comes to the acquisition of logistics like the Fire Service equipment or mobile vans, that may come at a lower cost. Those that were brought in by Former President Kuffour did not cost so much, you understand. So, for timely intervention, the Fire Service and the MTTD should be adequately resourced, and of course the Ghana Health Service also. Then we should also enforce speed limits to curb speeding on our roads, you understand (DVLA Officer, 53 years, Male).

Suggested interventions to improve security

On the issue of security, it was suggested that the public be educated on how to identify security threats on the road transport system and how to report such threats to the security agencies. There was also a call for all stakeholders including the passengers themselves to be interested in road transport security. Passengers especially were advised to desist from activities that could increase their security risk like carrying physical cash on them when embarking on long distance journeys, and engaging in conversations that could threaten their security when they are on the transport system. The following are some of the suggestions made:

The first person who should be security conscious is the individual, so as a passenger you should also be vigilant when on the vehicle. The other day for instance, I travelled from Accra to Kumasi and when I alighted the driver was exchanging my bag with that of another person and I said no that wasn't mine so he had to look for mine and gave my thing to me. If I were not vigilant he would have given my bag away, so security is also a shared responsibility (Passenger, 28 years, Female).

Yes, I think what we would do is that like we have realised that, that place is prone to this armed robbery and other things, it is always advisable that the security, maybe the police whenever the vehicles are going, they should get someone to at least go with them. I think we started it, I am an Assemblyman, and at a point in time we suggested that to the District Assembly and then any time at all that the vehicles were to move we had the police and they always moved in convoy and about two policemen would have to be on board and then they escort them, and I think that one reduced it in a way. This time round what most of the market women do is that they don't keep large sums of money with them, they rely on this mobile money, you understand. Sometimes where they have to buy the goods they pre-arrange so that the monies are sent so they only go to pick the goods. Me myself when I am travelling I don't keep cash on me, most often I make sure that my money is in the mobile money wallet or whatever. So that is the way we can prevent the armed robbery because when they attack and they don't get any money they would advise themselves (Passenger, 38 years, Male).

My advice to fellow passengers is that they should be mindful of how they discuss issues concerning their travels when in public. Not everybody should know your purpose of travel and your destination.

Additionally, business transactions should not be discussed on public transport since you may not know the intension of the person sitting next to you. Passengers should limit the extent to which they converse on board regarding their personal issues. And then in this age of technology, if a passenger is travelling you don't carry physical cash on you. If there is the need to send money across it could be sent electronically and then you go in person (Passenger, 41 years, Female).

It was advised that passengers begin to know the potential risks that they are likely to encounter when travelling and learn how to identify suspicious characters on public transport so they could alert the right authorities. It was indicated that sometimes people buy tickets for others who do not come to the terminals themselves, and in such situations those people are picked on the way. This was however said to be a security threat since one may not be able to know the intention behind a person deciding to board a bus along the way. Transport operators were therefore admonished to be vigilant in this regard. It was also suggested that the situation where public transport vehicles stop indiscriminately on route for people to urinate or attend to nature's call must stop. Rather, public transport vehicles should only stop at designated places where their security would be guaranteed. In this regard, it was suggested that, if it is possible, only vehicles with washrooms should be allowed to operate on long distance routes. A participant who was very critical asserted thus:

Sometimes tickets are sold to people who board the bus along the way, meanwhile it is a long distant bus that is supposed to pick passengers only at the terminal or at designated places along the route. But these people are picked at places that they themselves determine, even if it is not secured. But the question is, do you know why the person said he wants to wait for the bus at that particular spot, do you know what the person is carrying on him, or do you know why he is standing there? What if you get there and he has a gang of armed robbers that are waiting to rob the bus? But all these things we overlook them. Yes, passengers have a responsibility, there are several things they have to know. One is to understand what the potential dangers are to them when they are travelling on these public means. There are potential dangers the passengers themselves should be aware of that they are likely to encounter. I mean if you are able to go to Accra and come back safe it

doesn't mean that you are the best person in the world. Yes, we always say that God protects us which has always been my personal belief, but the question that comes to mind is what about others who were robbed on the way, didn't God protect them also? These are the questions you should ask yourself. So we should be mindful of when to travel, how to travel, who to travel with, and even be vigilant so as to identify suspicious characters, you know. And stopping over at places that are not designated, oh I want to urinate here, then you stop. I mean those issues must be addressed properly that buses can only stop at certain vantage places for people to pass water. And actually, certain buses should not be accredited for long journey travels, you see, especially on very dangerous roads and stuff like that. Only accredited buses that have internal washrooms and stuff like that should be permitted to travel on certain long-distance routes (Passenger, 43 years, Male).

One other suggestion that came up in the interviews was the collaboration between the transport organisations and the communities where they pass to their destinations on long distance travels. The argument was that members of these communities are aware of the security situations in and around their communities, and could provide such information to the transport organisations. This could go a long way to help the transport organisations to revise their schedules on particular routes, especially those that are prone to robbery attacks, so that journeys on such routes would only be made at times that are considered to be safe. Transport organisations were therefore advised to constantly engage communities in their operational areas to ensure that they are updated on the security situation so they could strategize to counter the potential threats that may be encountered in their operations. The following is how a participant expressed his views on the matter:

Yea, transport security is a shared responsibility, even the community where we pass, some can alert you that the time you are moving is dangerous because a portion of the road which is a few minutes' drive from here is not safe. You see, when the community is giving you this information, it helps you to prepare and you know your time of departure, otherwise we can reschedule. If the community is giving us information that some particular time, at a particular point the robbery cases or that place is not safe, then you as a transport company, you could come and revise your time of departure so that you can beat

that time before those incidents happen, that is when the police presence is not there. When you are not able to do the police escort and you have this information, you can also schedule in your own way to see that you can pass those places before the danger time arrives (Passenger, 31 years, Male).

The importance and benefits of collaborating with communities where transport companies operate was further emphasised during a focus group discussion with some drivers. Participants in the focus group discussion indicated that, sometimes, community members in their operational areas give information that is beneficial to ensuring the security of passengers. One participant, commenting on the issue based on a personal experience that he went through and how the community members saved the situation asserted thus:

Can you imagine one time I was on route to Abomosu and a guy joined the bus in haste because we were picking passengers along the way. Unknown to us, this guy was a member of a highway robbery gang so he was on the bus alerting his colleagues that we were getting closer. Fortunately for me, a taxi which was approaching in the opposite direction flashed his head light at me so I stopped. It was then that he informed me that just as he drove past a portion of the road which was a few metres ahead of us, he saw a group of guys mounting a road block behind him, and he suspected they were waiting for the bus so I should not go further. Luckily, I had the number of the Police Commander at Abomosu so I called and he also called Kwaabeng police who went to the scene to clear the roadblock. Not knowing, the guy who joined the bus in haste on the way was the leader of the gang who was residing in a hotel at Kwaabeng and he was being monitored by the community members. So, when they got the information, members of the community watch dog came to where the bus was and arrested the guy. Fortunately for us, he was not carrying any weapon on him at the time and the doors of the bus were pneumatically operated so I locked all the doors so he could not escape (Focus Group Participant, 50 years, Male).

It was also suggested that road transport security should not be limited to providing escort for long distance buses but should begin with adequate internal mechanisms which should be incorporated into the bigger transport system. To this end, it was suggested that people with expertise in security intelligence and

information and communication technology be part of the workforce of the transport organisations. A participant, commenting on this issue asserted thus:

You see, in road transport security, there are many stakeholders that will come in, it is not just the police. You need very good intelligence officers to be within these transport companies that set up very good intelligence system to even read on possible problems that are going to come to the place and advise properly on very good security apparatus or system that can be kept for that. The security agencies are just one part of it, a service that is rendered, but you need people very good in ICT to set up very good surveillance systems there. You need people who will supply you metal detectors that passengers bags could be run through a kind of conveyor system that would check what is in each bag that is being loaded into the vehicle you know can be done, body checks can be done using this strop and that kind of thing. All these are set of things, you need the IT setup, the IT personnel and stakeholders, you need also the passengers themselves. You know, passenger education every time be continuous at both the stations and then on air, that kind of thing to build their capacity on identifying some safety things. If you and an Israeli are walking, the person is conscious of everything that goes on around him because he knows that at any point in time his life can be a kebab, so they have taught them how to identify very basic things, you know. (Passenger, 45 years, Male)

It was further suggested that the process for recruiting people into the police service should be reviewed if we intend to improve security in Ghana. It was emphasized that unlike other jurisdictions where thorough background checks are done before people are recruited into the police service, that of Ghana is marred by nepotism and favoritism which results in non-commitment to the service. It was suggested that until that situation is checked, most police officers would continue to do their job haphazardly which would continue to affect the integrity of the police service. A participant expressed his view on how the process of recruitment into the Ghana police should be as follows:

In the US police for instance, before you are recruited, they would have done a background check on you to know your character and past record, but here it is not like that, protocol, and they put them in. So, after training they are given preference, if they look at your face, you are the strong one because of your stature, then you are transferred to the North. And when you are sent there, you will remain at that place until you are due for retirement. So going forward, the police should

revise their process of recruiting people into the service. If we continue to rely on protocol for recruitment, then we shall continue to recruit people who are not committed to the service, and even criminals into the service, and that is a big risk (Passenger, 35 years, Male)

The police were again advised to intensify their highway patrol and the erection of checkpoints on major roads. The situation where police checkpoints are abandoned and taken over by criminals to perpetrate crime against road travellers was re-emphasised and the police was advised to pay particular attention to this situation. In order for the police to perform their duties effectively, it was suggested that the number of the police be augmented to reduce the police to civilian ratio. Additionally, it was suggested that the police be adequately resourced in terms of arms and protective clothing, especially bulletproof vest to ensure that they themselves are protected so they can also protect the citizens. The use of police escort on public transport vehicles was also suggested to be made compulsory and at a fee that would be affordable to transport operators since security is a shared responsibility. Following are some of the suggestions:

There should be a law or by-law that when every bus sets off, there must be a police escort on the bus (General Manager, 54 years, Male).

Yea, the use of police escort should be compulsory. Like we were saying, road transport security is a shared responsibility. You see, when you are engaging the services of a police escort, it comes with a cost, but if we know that it is a shared responsibility, then the police department should also know that what we are engaging them for, it is part of their responsibility and so the cost should be shared. May be, if it is ten thousand cedis, because is a shared responsibility, they can reduce it so that operators will be able to afford it then we can make it mandatory that every night bus, wherever you are going, you should have a police escort (Passenger, 33 years, Male).

I think government should employ more police personnel and intensify highway patrols. If highway patrol is intensified, it will deter these robbers from carrying out their activities. Government should also provide the transport companies with police escort so that passengers

would be assured of their security (Focus Group Participant, 38 years, Male).

Other suggestions

Other suggestions made included the need for attitudinal change which was deemed to be the underlying factor to solving all the other road safety and security problems. The state was also encouraged to invest in the road transport sector since it constitutes over 80 per cent of internal movement of people and goods. It was therefore suggested that government takes steps to increase the number of state-owned transport organisations and ensure that they are run by professionals who would be held accountable for the effective and efficient running of the organisations and their sustainability. Some participants expressed their views as follows:

I think we must all make the effort to change our attitude towards road safety and transport security. I believe when we change our attitude, our behaviour on the transport system will also change and that will enhance road safety in general and public transport security in particular (Passenger, 29 years, Male).

For now that road transport is the lead form of transportation in the country, present and subsequent governments would have to make deliberate efforts to invest more financially in the road transport industry, especially provision of passenger service, as well as the safety and security aspect than it is presently. (Assistant Traffic Operations Manager, 50 years, Male).

Finally, it was suggested that policy development for road safety and road transport security should be based on evidence collected through research and other empirical studies so that there will not be the situations where issues are decoupled during policy formulation. Emphasising on policy development, it was indicated that good decisions and policies are driven by data, and that empirical evidence is obtained through research. It was therefore suggested that the gap between the industry players and the academia be bridged so that the

findings from research studies conducted by the academic institutions could be used effectively for policy formulation. A participant remarked as follows:

Well, when it comes to making use of evidence (I mean empirical data) in developing both infrastructure and policy that governs road safety and security that is the first thing I will talk about. The other aspect is that we should be able to develop technologies that are behavioural friendly to address some of our attitudinal challenges that we have in the country (Passenger, 43 years, Male)

It was observed that sometimes the media was not privy to the actual cause of road crashes and therefore rely on hearsay in their reportage and sometimes this tends to incite the public against state institutions as if those institutions do not perform any duty that is beneficial to the state. It was therefore suggested that going forward, the media should be circumspect in their reportage on road crashes and if possible, always contact the appropriate institution for the facts before it is put in the public domain.

Discussion

This chapter focused on exploring additional interventions that could enhance passenger safety and security in road travel, and both open ended questions in the survey and follow-up in-depth interviews/focus group discussion were used to explore participants' views. The suggestions made generally were related to intensifying the existing interventions in relation to both safety and security. Other suggestions included attitudinal change, data based policy development and collaboration with communities in gathering information on security situation along routes operated by transport companies. Details of the findings are discussed in the following paragraphs.

The data suggests the need for intensification of road safety education amongst all categories of stakeholders in the road transport sector. Regarding drivers, the data suggests that education must start with how they are recruited

by ensuring that only well-educated drivers are employed. Being well-educated in this context does not mean acquiring a degree but rather, being able to read and write to enhance easy understanding and interpretation of road safety rules and regulations. As indicated by Gubbins (2003), education must not be limited to teaching people to attain competence but alerting all who are involved in road transport operations to the risks inherent in poor procedures and deviating from acceptable standards. Further, education should be proactive and continuous rather than being reactive and seasonal (WHO, 2011). For this reason, the National Drivers Academy should be strengthened and well-resourced by the Ministry of Transport to ensure effectiveness in carrying out its mandate. Inclusion of road safety education in the curriculum of basic schools which was started some years ago and later abandoned must be revisited. Additionally, as suggested by the data, translating road safety regulations into various local dialects could help reach a wider audience. This however requires exploration of various channels of communication in order to reach the targeted audience. Further, road safety education could adopt some of the strategies in other fields like the behaviour change communication which has been tried and tested in the medical field (Chen, 2006). Since the objective of road safety education is to influence behaviour change, adopting communication strategies that have been used successfully in other fields such as health education therefore has the potential of influencing the desired change.

For road safety to be effective, there is the need for all road users to change their behaviour (Rudin-Brown, 2013). However, because behaviours are influenced by attitudes which is the way we perceive things, focusing on attitudinal change has the potential to change behaviours. Although education

seeks to influence behavioural change (Chen, 2006), it has to be backed up with strict enforcement of road traffic regulations (Damsere-Derry et al., 2014). Ideally, self-regulation should be the best form of enforcement, but as indicated by the accident/incident theory (Peterson, 1975), humans are prone to flouting regulations (decision to err) and if there is a breakdown in the system, then the probability of accidents occurring becomes high.

The findings also suggest that enforcement of road traffic regulations in Ghana is saddled by constant interference which stems from lack of political-will. It is in view of this that the suggestion for present and subsequent governments to develop strong political-will comes to bear. The suggestion on the use of technology to assist in conforming to behaviour is seen to be embedded in the situational crime prevention that was also suggested. As done in other jurisdictions (Kuo & Lord, 2019; Mali, 2020), using technology in road traffic enforcement helps in reducing the opportunity for people to commit traffic offences. Automation of enforcement also reduces personal contact which could influence enforcers' decision to punish offenders, and the corruption that is associated with enforcement. An observation conducted revealed that some cameras had already been installed in most parts of Accra, especially at intersections. What is left is to follow through with the other aspects of the proposed automation of enforcement. This assertion is made based on previous experiences where cameras were installed but no proper use were made of them.

As required by the safe systems approach (WHO, 2011), governments have a responsibility of providing safer roads to enhance road safety. The call for quality roads and dualisation of some of the major road is therefore laudable.

Notwithstanding, because road construction and maintenance involve huge cost, the suggestion for government to privatise the maintenance of roads is therefore a good one since public/private partnership has been used to develop a lot of infrastructure in many jurisdictions. The other side of the suggestion is that road users must also be prepared to contribute to maintaining the roads by accepting to pay tolls that would be proposed.

The other issue of engineering concern is lack of maintenance of road vehicles which has on many occasions resulted in crashes that were preventable. The call for the introduction of vicarious liability therefore could help ensure that transport operators and vehicle owners adhere to proper and effective maintenance of their fleet of vehicle. The major problem identified with maintenance is the issue of substandard spare parts and the high cost of genuine spare parts which lead to people resorting to alteration. Providing genuine spare parts at affordable cost will therefore enable vehicle owners to adhere to strict maintenance schedules, which would also ensure that vehicles that ply the roads are road worthy and safe for carrying people.

Putting all the issues together, as proposed by the conceptual framework for this study, there is the need to adopt a systemic approach to the preventive aspect of road safety which has also been emphasised by the systems approach to safety (DeCamp & Herskovitz, 2015), the epidemiologic theory (Gordon, 1949) and the three factor model (Jorgensen & Abane, 1999). The findings indicate that, dealing with the various issues individually and separately would not ensure effective road safety management in the sense that it would reduce the synergy that could be achieved through a holistic approach. The situational

crime prevention, which also adopts a holistic approach to crime prevention needs to be strengthened to ensure effective road safety management in Ghana.

On emergency or post-crash management, the findings show that, although the institutions mandated to provide emergency services are doing the best they could, they are constrained by unavailability of the required logistics to perform their mandate effectively. In view of this, the suggestion on the need to provide the institutions engaged in emergency management with adequate logistics including protective clothing needs to be strongly considered. It was also indicated that, the public was not very much informed about the mandate of these institutions, therefore in the event a crash, they always resort to calling the police first. There is therefore the need to intensify public education on the duties of the emergency service providers, and what the citizens need to do in case of a road crash or any other emergency. Public education should also focus on the effect of prank calls on emergency service provision, and the need for moving away from such attitude. As has been indicated in the literature (Mladineo, Knezic & Jajac, 2011; Steenbruggen et al., 2013; Amorim, Ferreira & Cuto, 2017), emergency management thrives on technology. As a result, it is important to invest in adequate technology to enhance effective and efficient emergency management.

Regarding security, the data suggest a comprehensive security plan for the road transport sector in Ghana, as has been done by the European Commission (European Commission, 2012). Although some common interventions (the use of police escort, highway patrol, and erection of police checkpoints on major roads) are being implemented, they seem not to be effective. This could be the reason for participants suggesting intensification of

these common interventions. Judging from the suggestions, it is clear that all the three interventions mentioned involve the police. However, it was indicated that the police to civilian ratio in Ghana is high (about 1:768), therefore government should make the effort of recruiting more police personnel to augment the current number. Further, the police must be provided with adequate logistics like patrol vehicles, modern arms and protective clothing to enhance their performance. It was indicated that, sometimes the police personnel who escort the buses are not given bullet proof vests to ensure their own personal security, and this makes them as vulnerable as the people they are trying to protect.

As proposed by the routine activities theory (Cohen & Felson, 1979), when a suitable target, a motivated offender, and the absence of a capable guardian converge in time and space, crime is bound to occur. As also indicated in chapter two, transport is a routine activity that takes people away from their capable guardians and therefore makes them vulnerable to various forms of security threats (Joewono & Kubota, 2006; Newton, 2004; 2014; Smith & Clarke, 2000). The strategies that have been adopted by some security experts, especially the US Department of Homeland Security (Edwards & Goodrich, 2013) in combating crime on the transport system are deter, detect, deny, and mitigate as indicated in the conceptual framework. The three common interventions identified in the study may fall under deterring and denying, however, detection is also key in improving passenger security. It is in view of this that the suggestion to transport operators to incorporate detection of security threats into their operation is re-emphasised. Transport operators need to invest in the security of passengers by adopting interventions like employment of

security experts into their organisation, the use of surveillance mechanisms like security cameras, and also gadgets like metal detectors for screening passengers and their luggage. Operators could also consider the suggestion on conducting background checks on drivers before they are employed since some of them are said to be connected to criminals. The same background checks could also be done on those who are recruited into the police service to ensure sanity in the service.

Another suggestion that needs urgent consideration is the situation where tickets are sold to people who do not go to the terminals to board the bus but tend to board the bus on the way. This was identified as a security threat since the intention of the one boarding the bus on the way may not be known. It is therefore incumbent on operators who engage in this form of activity to devise other means to solve the problem. In situations where passengers are consolidated at recognised locations, or people buying tickets online, the situation could be mitigated since the identities of such persons could be assured. Additionally, passengers themselves need to be security conscious when they are on the public transport system, and avoid acts that could jeopardise their security. Further, there is the need for effective passenger education to build their capacity in identifying security threats on the public transport system and how to report such threats to the appropriate authorities. The personal experience shared during the focus group discussion shows that communities where transport operators operate to can provide information that could help operators schedule their services to avoid being attacked by highway robbers. Operators therefore need to establish a good relation with such communities. Some of the suggestions that emanated from the open ended

question in the survey were found to be a bit weird and did not conform to the laws of Ghana. The suggestion for passengers to carry small arms for instance was seen as a threat rather than intervention, since it has the potential of escalating the same problem that it seeks to rectify. The adoption of security and road safety interventions need to be done within the confines of the law, in order to eliminate or reduce their negative impact on society.

Summary

This chapter explored participants' suggestions to improve passenger safety and security in road travel in Ghana. Various suggestions were made, but it was realised that most of these interventions already existed, and all that was needed is to intensify them. With regard to safety, it was observed that there was laxity in enforcement which encourage people to commit traffic offences deliberately. There is the need therefore to develop a strong political will to ensure that road traffic regulations are strictly enforced. On the issue of security, various suggestions were made, major of which included making it mandatory for transport operators to use police escort. Transport operators were also encouraged to invest in surveillance systems to enhance the security of passengers. It was, however, observed that a few of the suggestions that emanated from the survey did not conform to the laws of Ghana, and that the adoption of security and road safety interventions need to be done within the confines of the law. The next chapter will focus on conclusions draw from the study, and recommendations that seek to improve passenger safety and security in road travel in Ghana.

CHAPTER NINE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This final chapter summarises the entire study by restating the objective and the research questions that drove the study. A recap of the methods used, the target population and the sample size used for the study are also indicated. The chapter also recaps the major findings of the study and discusses their implication for the road transport industry in general and public road transport in particular. Based on the findings of the study, conclusions are drawn, and recommendations towards improving safety and security in road travel in Ghana are suggested. Finally, an attempt is made in the chapter to emphasise the contribution of the study to knowledge and practice, and also suggest further studies that could emanate from this one.

Summary

The purpose of the study was to assess passenger safety and security in road travel in Ghana. The assessment was based on secondary data on road crashes and crime on public transport, and also primary data on the perspectives of passengers, transport operators, regulatory authorities and emergency service providers. Suggestions were also taken from respondents on additional interventions that could help improve the safety and security in road travel. The research questions that guided the study were:

1. What is the state of road safety and security in Ghana?
2. How do operators, regulators and passengers perceive the current state of safety and security in road travel?
3. How effective are the existing safety and security interventions?

4. What other interventions could be put in place to improve safety and security in road travel?

Two theories (the accident/incident theory, and the routine activities theory) underpinned this research. The accident/incident theory was used in the assessment of the state of road safety in Ghana. Specifically, the decision to err and the systems breakdown aspects of the theory were emphasised because it was widely perceived that the road safety problems in Ghana are mainly related to issues emanating from attitude, and because there is laxity in enforcement, road users are encouraged to commit traffic offences with impunity. With regard to road transport security, the routine activities theory was used in the assessment because, transport is perceived to be a routine activity that takes people away from their capable guardians and so exposes them to a lot of security risks. As suggested by the theory, the convergence of a motivated offender, a suitable target, and the absence of a capable guardian in time and space has a high probability of causing crime to occur. Based on the two theories and further narratives from literature, the transport safety and security intervening model was developed as a conceptual framework which formed the basis of the study. The pragmatist approach to research was adopted as the philosophy underpinning the study, and as a result, the explanatory sequential mixed method design was used. Multi-stage sampling technique was adopted for selecting the sample size for the study. A combination of the stratified sampling and the lottery method of simple random sampling was used to select six out of 23 transport organisations identified for the study. The inclusion criteria was that an organisation needed to operate at least on one route that covered a distance of not less than 200km. Convenient sampling was then used

to select a sample of 372 passengers for a survey. The sample was drawn from the terminals of the six transport organisations which were made up of two government assisted companies and four private owned companies all in Accra, but with branches in other regions. Follow-up in-depth interviews were conducted with 21 of the surveyed passengers and representatives of five out of the six transport organisations. Additional interviews were conducted with four regulatory authorities and two emergency service providers. One focus group discussion was held with eight drivers drawn from one of the state assisted transport organisations to explore the perspectives of drivers on the issues under discussion. Further, observations were carried out to ascertain whether some of the interventions that were claimed to be in place were indeed true. Last but not least, a desktop review was conducted to identify existing documented interventions and whether they were being implemented to the core. A summary of the results is next listed.

State of road safety and security in Ghana

- Available crash data from the National Road Safety Authority indicated that from 1991 to 2020, 302,711 road crashes, involving 477,602 vehicles were recorded in Ghana. These crashes resulted in a total casualty rate of 412,514 out of which 50,311 people died, 154,629 sustained serious injuries and 207,574 also sustained minor injuries. Public transport vehicles constituted 18 per cent of the total crash rate. Additionally, public transport contributed 34.15 per cent to the casualty rate, and 19 percent to the fatality rate. Further, most of the casualties of road crashes fell between the working age group 16-45years.

- The data also indicated that, there were fluctuations in the crashes recorded over the period, with the year 2020 recording the highest crashes and casualties ever in the history of road safety in Ghana.

- Data on crime associated with public transport was not readily available.

The records on highways robberies for instance was only for 2020 although the data requested was supposed to start from 2010. The 2020 data was therefore used to extrapolate the figures for the other years using the percent of highway robbery to total robbery for 2020. The figures therefore did not paint the true picture of the state of security of public transport in Ghana. However, a projection made suggested that highway robberies could escalate by 2030.

- Institutions are mandated to ensure effective road safety management, and the mandates of these institutions are backed by appropriate legislation. However, it was observed that almost all the institutions had some constraints that prevented them from being effective and efficient in performing their mandate. Some of the constraints identified were lack of adequate logistics for both enforcement of road safety regulations and emergency management. One major constraint that affected effective enforcement was interference from political and traditional leaders. Another setback was the lack of political will to implement some of the legislations that are enacted in relation to road safety.
- The causes of road crashes identified by respondents were not different from what have been documented in the literature. Most of the causes identified were human factors, major of which related to attitude.

Poverty was also identified as a major cause of road crashes in Ghana since poverty resulted in inability of the state to provide adequate infrastructure and logistics/technology that could ensure effective road safety. Some respondents attributed the causes of road crashes to supernatural forces, and believed that praying to commit one's self to deities and God ensured their safety in road travel rather than the measures put in place by both the transport operators and the regulators. One other cause that was identified through the focus group discussion was emotional instability on the part of drivers.

- Participants in this study were able to conduct their subjective assessment of the state of safety and security in road travel in Ghana. The data however showed that, although some of the views of participants reflected available statistics, some were also in disparity with the data from the National Road Safety Authority. It was also observed that, there were disparities between the views of respondents in the survey and that of the in-depth interviews and the focus group discussion. Whereas the survey data indicated that road safety is improving, the responses from the in-depth interviews and the focus group discussion showed that road safety is deteriorating.
- With transport security, there was also a disparity between the responses from the survey and that of the in-depth interviews and the focus group discussion. Whereas the responses from the survey indicated that passenger security is assured on public transport, the responses from the in-depth interviews and the focus group discussion indicated that public transport security is very poor. It also emerged that although some

transport organisations seemed to be making some effort to ensure that their passengers are safe, most transport organisations are not interested in the security of passengers but rather all their focus is on the revenue that they would generate.

- The major security threat to public transport was highway robbery. Other security threats identified were baggage theft and pickpocketing. It was observed that only a few of the respondents had personally been involved in an incident of insecurity on the public transport system. A few others indicated that either their relative or friend had been involved in an insecurity on the public road transport system. It however emerged that most of the incidents of insecurity that were experienced by either the respondents or their relatives/friends occurred while accessing the transport terminal, and most of them involved robbery attacks. Generally, it was observed that most of the respondents who felt insecure on public transport was not borne out of personal experiences but rather from frequent media reportage.

Existing road safety and security interventions and their impact in Ghana

- Three major road safety interventions which are widely documented in the road safety literature and which are related to the preventive aspect were also identified in the study. The interventions identified covered issues regarding engineering, education, and enforcement. A fourth intervention that was identified which was of post-crash nature is emergency management.
- Participants conducted their own subjective assessment of the three interventions through both the survey, in-depth interviews and focus

group discussion. All three ways of assessment indicated that among the three interventions, education was the most effective and engineering the least. Notwithstanding, it was observed that education, although the most effective intervention, was more reactive and seasonal, instead of being proactive and continuous. Enforcement was also observed to be weak, and this resulted in road users continuously violating road traffic regulations with impunity.

- A desktop review conducted indicated that, there is documented road traffic regulations backed by law. As required in transport safety regulation, the documented regulation that was identified covered all the three elements including the operator, the vehicle and the driver. The problem identified was that the documented regulations were not being enforced to the core. No documented intervention for road transport security was available for the desktop review.
- Transport organisations also had their own interventions that sought to promote safety. One of the major interventions identified was related to the process of recruiting drivers into their organisations. It was observed that, some of the organisations, especially the government assisted ones had a rigorous process of recruitment of drivers. They also had a system of continuous education and training for their drivers even after they had been employed. Some of the companies also had standard operating procedures that were followed in their daily operations. To ensure effective maintenance of their fleet of vehicle, it was observed that some of the companies had their own established workshops.

- With security, three common interventions were identified. These were the use of police escort on public transport vehicles, police highway patrols, and mounting of police checkpoints on major highways. Other interventions that were mentioned included the screening of passengers and their luggage, the use of close circuit cameras (CCTV) for surveillance at both the transport terminal and on vehicles, and the use of security personnel at terminals.
- Participants' assessment of security interventions showed that among the three common interventions identified, the use of police escort was the most common and also the most effective. The least effective intervention was the mounting of police checkpoints on major roads. Although the use of police escort was identified as the most common security intervention, it was observed that not all the transport companies were employing this intervention because of cost. Mounting of police checkpoints was also considered the least effective intervention because, it was observed that sometimes, some of these checkpoints were abandoned by the police, and in such situations, criminals took advantage of the situation to rob unsuspecting passengers.

Participants' suggestions for improving road safety and security in Ghana

- With regard to education, it was suggested that, for it to be more effective, there should be a move away from the seasonal and reactive nature to a continuous and proactive nature. Additionally, education should not be limited to the driver, but all road users and the general public should be involved. Further, road safety education must be

developed in such a manner that it will focus on attitudinal change. In view of targeting attitudinal change, road safety managers should adopt some of the tried and tested channels of communication like the behaviour change communication model to ensure effective road safety education. It was also suggested that road safety education be incorporated into the curriculum of basic education to ensure that school children are nurtured with road safety consciousness so as to grow with it.

- On the issue of engineering, the major suggestion was the conversion of all major roads into dual or multiple carriageways so that head-on collisions for instance could be avoided. There was a call for all existing roads to be well maintained to ensure that they are vehicle worthy. It also came up that because the maintenance of roads is expensive and beyond the finances of government, the private sector should be encouraged to invest in road maintenance and be allowed to collect tolls for a period of time to recoup the money invested. It was also observed that adequate road furniture be provided on roads since that is the only communication channel between the road and the road user. Additionally, it was suggested that available technology be adopted to build road infrastructure that suit the behaviour of road users since people are impatient by nature and would always want to do things their own way. To ensure that transport operators maintain their fleet effectively, it was suggested that vicarious liability be introduced into road safety management, so that when drivers are arrested for non-maintenance of their vehicles and they are able to prove beyond reasonable doubt that

they had reported the fault to their managers or vehicle owners but no action was taken, the vehicle owners be held responsible instead of the drivers.

- For enforcement to be effective, it was emphasized that there is the need for current and subsequent governments to nurture a strong political will, so that interference from both political and traditional leaders will stop. Further, it was suggested that, to ensure that road safety enforcement is devoid of interference and favouritism, enforcement should be automated so that regardless of the political, social, economic, and educational status, all road traffic offenders will be treated the same.
- Although there are provisions in the Road Traffic Regulation relating to issuance of operator's license to commercial transport operators, and the arrangement of seats on vehicles that are converted from goods carrying to passenger carrying, they are not being enforced. These situations have resulted in non-regulation of commercial transport business, which has often affected safety negatively, and the potential to exacerbate the casualty and fatality rates in the event of a crash.
- Regarding the general management of road safety, it was suggested that some of the ministries and the institutions under them as well, be merged to ensure easy coordination of activities. For instance, the Ministry of Transport and Ministry of Roads and Highways should be merged into one ministry, and the National Road Safety Authority, Driver and Vehicle Licensing Authority, and the Motor Transport and Traffic Department be also merged into one body. It is also suggested that policy formulation must be based on empirical evidence from road safety

studies. For this reason, effort should be made to bridge the gap between the policy makers and the academia to ensure that the findings and recommendations from academic researches are considered in policy formulation.

- With emergency management, it was suggested that the institutions involved with the provision of emergency services be adequately resourced to ensure effective and quick response to emergency calls. It was also suggested that technology for easy identification of locations during emergency calls be incorporated into the provision of emergency service so that the response time to emergency calls will be swift. Public education must also be intensified in order to reduce the incidence of prang calls which are affecting quick response.
- Generally, it was suggested that some existing interventions like the use of police escort on long-distance buses, mounting of police barriers on highways, and police highway patrol be intensified. It was suggested that police escort be made mandatory on all long-distance buses, but at a fee that will be affordable for all transport operators to patronise
- It was also suggested that passengers take keen interest in their personal security on the public road transport system, since transport security is a shared responsibility. In view of this, it was suggested that passengers desist from activities that could expose them to robbery attacks. Some of the activities identified include carrying so much cash in transit, and engaging in business-related conversations on-board public vehicles.
- Another suggestion was on transport operators who allow tickets to be bought for people who board the bus on the way. It was suggested that

passengers be consolidated at only approved designated places that are considered secured, and not places that passengers themselves decide

- It was further suggested that transport organisations collaborate with communities along their operational routes that are considered robbery prone to solicit real-time information on the security situation in those communities at any point in time. This could help transport operators to schedule their services on those route such that they can avert potential highway robbery attacks
- One of the findings also indicated that, road transport security is not only about providing police escort for public transport vehicles. Rather, it starts from conducting rigorous security risk assessment to identify all the potential threats, and developing strategies to mitigate such threats. Transport organisations are therefore advised to incorporate into their daily operations comprehensive security plans by employing people with expertise in security issues as their security advisers who would help with the development of the security plans.

Conclusion

Road traffic crashes and fatalities continue to record an increasing trend, despite the interventions that have been put in place for the past three decades. Further, the objective of the first United Nation's Decade of Action on Road Safety which was to stabilise and reduce road crash fatalities by 50 percent could not be achieved. Notwithstanding, public transport made some gains in reducing both crashes and fatalities, although the percentage decrease was below the target set by the Decade of Action. Regarding transport security, it has not been given much attention as has been given road safety. Data collection

on crime that relate to public transport is not as rigorous as should have been the case. This makes it difficult for drawing the right conclusion on the state of security in road travel.

Passenger respondents surveyed consider public transport to be safe and secured. However, their consideration is not based on the effectiveness of interventions that are in place, but rather their belief in a deity, especially God for protection during their travels. On the part of transport operators, they believe that although they are doing their best to make public transport safe and secured, there is still more to be done. Generally, both the regulatory authorities and the emergency service providers think that road safety and security are in poor state.

There are road safety interventions in place (both documented and undocumented). On the other hand, there is no documented road transport security intervention in place. However, there are existing undocumented interventions that both the transport operators and police provide for travellers. Participants consider some of the road safety and security interventions effective, whereas others are considered not effective. Notwithstanding, these interventions have not yielded the desired results.

Automating road safety enforcement is the way to go since it has the potential to reduce personal contact between road users and the enforcement agencies which has proved to breed corruption. Automation would also help to reduce interference by politicians and traditional leaders as well. Further, negative attitude by both road users and road safety enforcers is at the core of the road safety problem in Ghana. In view of this, strengthening the existing road safety interventions to make them more effective is what is needed.

Developing a standard regulation for road transport security is required to give it the needed attention by both regulators and the transport operators. Finally, road safety in Ghana is a public health issue that needs immediate attention because it is killing a lot of people more than other diseases.

Recommendations

Drawing from the conclusions arrived at in this study, the following recommendations are made to all stakeholders who are engaged in ensuring the safety and security of the public road transport industry in Ghana. This includes transport operators, passengers, regulatory authorities and all the government institutions as well.

- Present and successive governments should make a conscientious effort to nurture a strong political will, devoid of favouritism and nepotism, to allow for strict implementation and enforcement of the road traffic regulations. This would ensure that government performs its part in providing adequate infrastructure, while road users would also be compelled to ensure that they strictly adhere to the rules and regulations. Government must also ensure that the institutions mandated to carry out effective road safety management are adequately resourced to enable them perform their mandate to acceptable standards.
- Government and relevant agencies should ensure that the existing roads are maintained on regular bases to ensure that they are always in good shape. In addition, adequate road furniture should be provided and also protected on all the roads in Ghana. In view of this, the suggestion on partnering with the private sector for the maintenance of roads should be considered by government, and a comprehensive analysis be done to

see if it would be feasible for implementation. Further, the major accident prone areas should be re-engineered as has been done at Madina Zongo Junction to reduce the number of crashes that are recorded at those places.

- The process for automating road traffic enforcement that has started should be followed through to ensure that the objective for which the process started is achieved. This recommendation is on the premise that speed cameras have been installed on many occasions but the process always truncated at a point in time without inuring the expected benefits. Automation should also be extended to emergency (post-crash) management to ensure swift response to emergency calls.
- To ensure synergy and proper coordination in the performance of road safety management activities, it is imperative, as suggested in the findings to merge some of the Ministries as well as some of the regulatory agencies.
- Road safety education must be a continuous and proactive endeavour to ensure that all road users are well informed about what they are expected to do on the road to reduce the risk of them being involved in crashes. The decision by the NRSA, in collaboration with the Ghana Education Service to include road safety education in the curriculum of basic schools in Ghana, but which did not see implementation must be revisited to ensure that the mentality of safety consciousness is inculcated in school children from their infancy, so they would grow with it. This has proven worthwhile in other jurisdictions. The idea could

also be extended to the secondary and even the tertiary institutions to improve safety consciousness.

- There is the need for road safety actors, led by NRSA to adopt a systemic approach to road safety management, where the various issues (education, engineering, enforcement) would be looked at in totality rather than dealing with them individually. For this to be achieved, there is the need for the Ministry of Transport to strengthen the various institutions for them to be effective in executing their mandate.
- Transport operators should also strengthen their process of recruitment of drivers, in order to ensure that drivers who are safety conscious are those that would be employed. The system for continuous education and training should be mandatory for all transport organisations. All transport organisations should be made to develop safety operational standards that would be strictly followed in their daily operations. There must also be strong internal systems for reward and punishment to influence driver behaviour. Further, there should be systems to ensure that maintenance of fleet is strictly adhered to so that vehicles will always be road worthy and safe.
- With road transport security, government, through the Ghana Police Service should make available police escort at a fee that would be affordable to all commercial passenger transport operators who provide long distance services so that it could be made mandatory for every operator to use an escort on their long distance buses. The mounting of police checkpoint on roads that have been identified to be robbery prone should be intensified. The situation where police checkpoints are

abandoned for criminals to take over for their robbery activities must be curtailed. Additionally, police highway patrols should be intensified by increasing the regularity and frequency of the patrols. All these suggested interventions could be achieved by increasing the personnel strength of the police and also resourcing them adequately. Further, a thorough background checks should be conducted before people are recruited into the police service. This will prevent the situation where criminals could find their way into the service

- The transport organisations should not only depend on the police for providing security for their passengers, but must develop internal systems for identifying potential risk and developing strategies to prevent or mitigate those risks. There is the need to provide surveillance systems both at the terminus and on vehicles to enhance the detection of potential risks in real time. Besides, transport organisations must ensure that both their personnel and the travelling public are educated on security issues on the public transport system so they can make informed decisions when on the system. Where terminals are situated far from the road side where passengers would have easy access, transport operators must ensure that adequate security is provided for passengers to be safe.
- Passengers must also be interested in their personal security and avoid activities that would jeopardize their security when they are on the public transport system. In their effort to connect with the public transport system, passengers must ensure that the time they leave their homes is safe for their movement. Otherwise, they should ensure that they have people who would accompany them to the point of connecting

to a public transport. This could help reduce the risk of being attacked while accessing public transport.

Contribution to knowledge

Although several studies have looked at the road crash problem from different perspectives, and one other study focused on both safety and security of public road transport vehicles, this study is the first to have looked at both safety and security in road travel from the perspectives of all the players in the road transport industry in Ghana. Not only did the study look at the safety and security situation from the perspectives of industry players, but it also used available statistics on crash as well as crime to assess the state of safety and security in road travel. The views of participants of the study was also compared with available statistics to ascertain if the views reflect what the statistics portray. The study thus has contributed to the road safety and security literature in Ghana.

Secondly, the study has provided a framework (Transport safety and security intervening model [Figure 2, p53]) which may form the basis for assessing, holistically, both safety and security of transport by focusing on the thematic areas in the model. As explained in chapter two, this model starts by identifying what the problem is. If the problem is safety, then three issues which are education, enforcement, and engineering come to mind. The next thing is to put in regulations, which focuses on three elements, the operator, the driver, and the vehicle. Each of these elements needs to be licensed in order to operate, ensuring that the operator and driver have the requisite skills and education, and that the vehicle meets the required safety standards set by the regulator. Of

utmost importance is that all the issues and the elements discussed above should be given equal attention in order to achieve an enhanced safety.

On the other hand, if the problem is security, then the first thing is to conduct a risk assessment to identify all potential risks and hazards. Having identified the potential risks and hazards, four strategies (deter, detect, deny, mitigate) can be adopted to counter the situation. Of the four strategies, the first three are preventive in nature, whereas the fourth is non-preventive, but is used to reduce the impact that the aftermath of an attack on the transport system could have on the public. In using the model to assess safety and security, there is the need to ensure that all the things discussed are present and are being implemented effectively. This model however cannot be said to be a perfect model for assessing transport safety and security, but it could be further developed and refined to suit the purpose for which it was created.

Apart from the conceptual framework, emphasis is also laid on the need for automating traffic enforcement to reduce to the barest minimum human interference that undermines effective enforcement of road traffic regulations. The study therefore contributes to the development of an architecture that is required for effective and efficient management of road traffic enforcement (Figure 26). As indicated in the diagram, there is the need for collaboration between the DVLA, National Identification Authority, National Insurance Commission, Telecommunication Companies, and MTTD to make automation effective. Further, the study indicates that the existing structure (Figure 27) of the road transport industry players does not promote synergy in performance of road safety management. The segregation of some of the ministries and institutions leads to bureaucracy, which affects effective performance. For this

reason, there is the need to merge the Ministry of Roads and Highways with the Ministry of Transport, and also some of the institutions under the two ministries in order to improve efficiency, effectiveness, and easy coordination of activities of all the various institutions (Figure 28). It is believed that the proposed change in structure has the potential of improving the synergy that is much needed in ensuring effective road safety management.



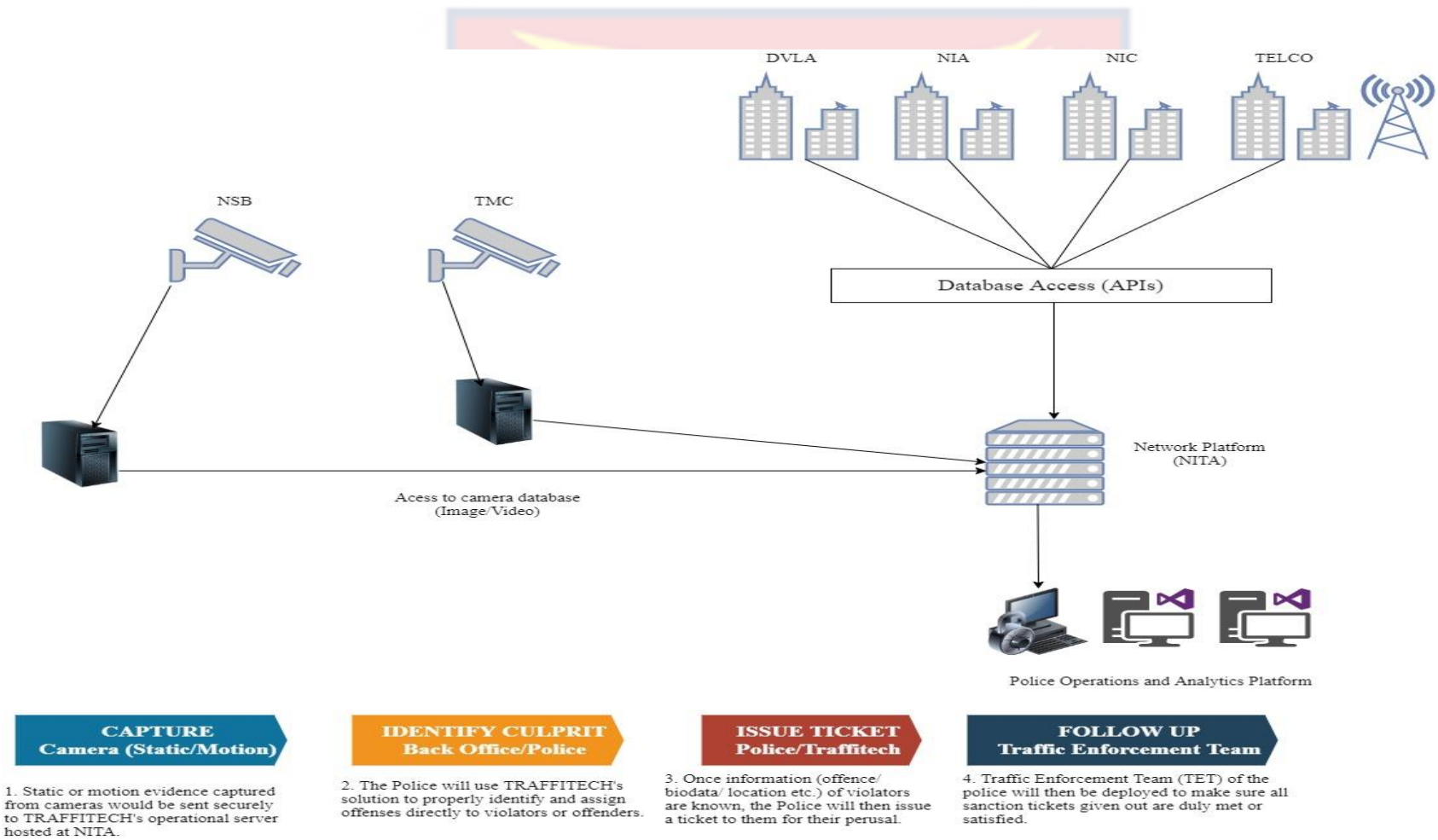


Figure 26: A schematic diagram of proposed Architecture of Traffitech GH Integration and process flow by Police using Traffitech GH for traffic enforcement

Source: Reproduced with permission from the Motor Transport and Traffic Directorate of the Ghana Police Service

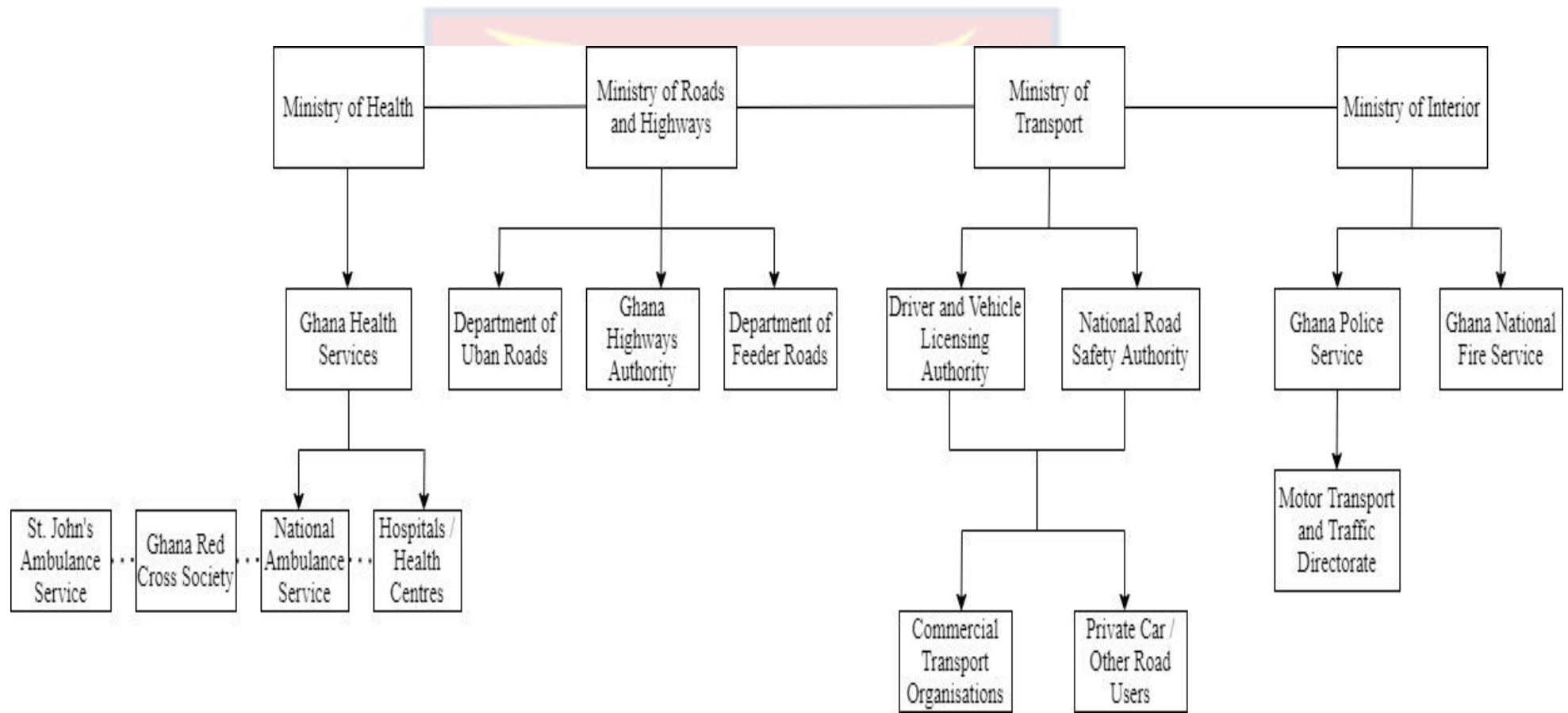


Figure 27: A schematic diagram of existing structure of stakeholders in road safety management in Ghana
 Source: Developed based on existing structure

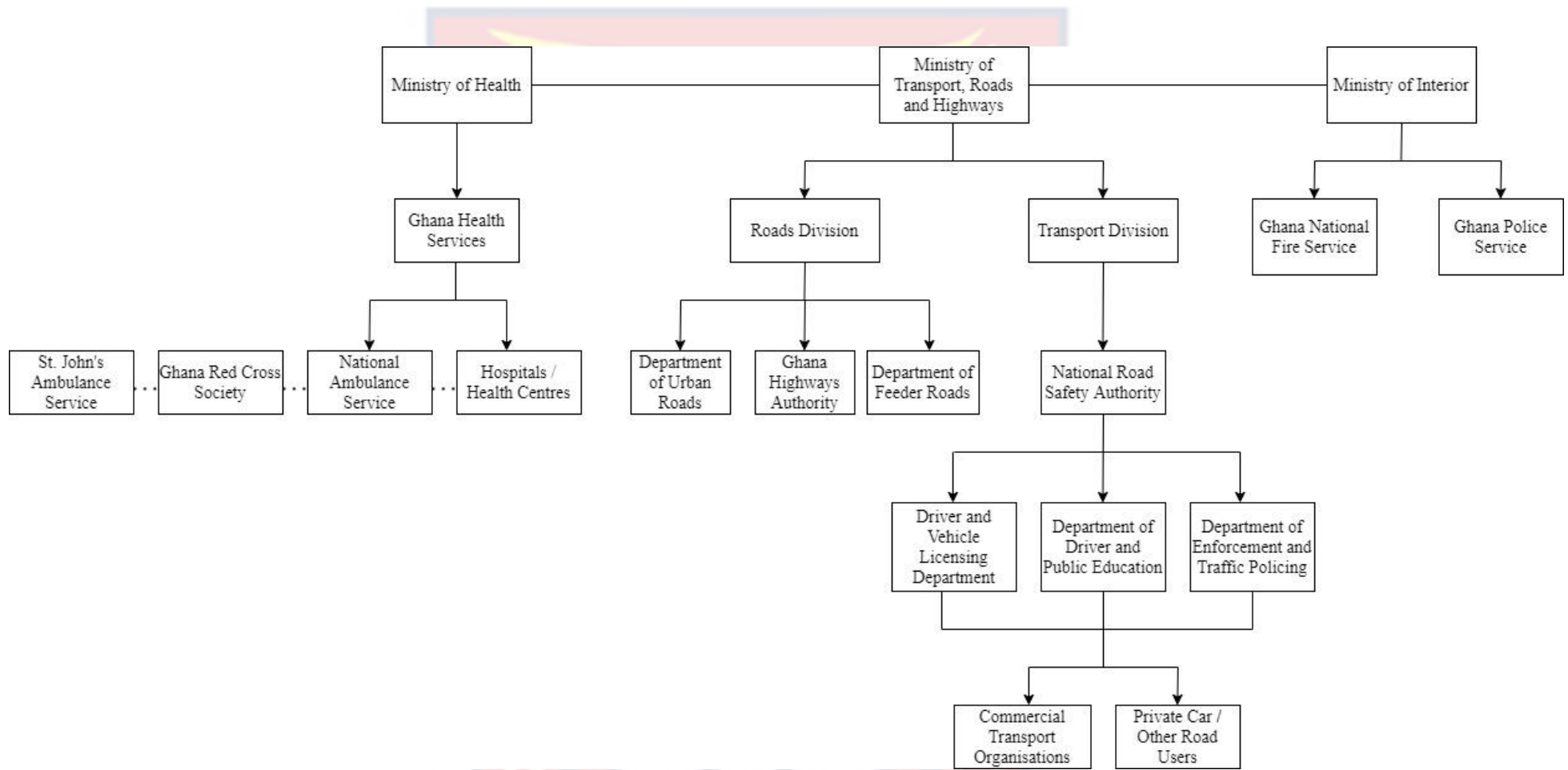


Figure 28: A schematic diagram of proposed structure for stakeholders involved in road safety management in Ghana
 Source: Fieldwork, February 2021

Implication for policy and practice

This study provides a wakeup call to all stakeholders in the road transport industry in Ghana. For public transport operators, especially those who already have some internal processes for ensuring safety and security, the study reveals the need to strengthen or review some of those processes to enhance their effect. For those who don't have, the study provides an opportunity for them to develop some internal processes and enforce them to ensure the safety and security of their services. During the interviews for instance, it was realised that some of the transport organisation were not aware of the existence of the National Drivers Academy, and the findings of the study provides an avenue for those companies to engage the services of the NDA for continuous training of their drivers.

For the regulatory authorities, the study re-emphasises the need for reviewing some of the policies and regulations, and also ensure that those regulations are strictly enforced. Government is also reminded to provide adequate infrastructure and logistics to enhance the effectiveness of the regulatory authorities and the emergency service providers. Further, the study re-emphasises the need to strictly enforce the provision in the Road Traffic Regulation (2012) Act 2180 which requires that all commercial transport organisations should be issued with an operator's license before they can commence operations. This has the potential to regulate the industry and ensure sanity in the system. Additionally, the findings of the study indicate the need to review and strictly enforce the arrangement of seats on vehicles that are converted from goods carrying to passenger carrying, in order to reduce the casualty rate in the event of those vehicles crashing.

Finally, the findings of the study provide an opportunity for passengers themselves to begin to be safety and security conscious, so they can plan how they travel on long journeys and when they travel. They could also strengthen their knowledge in security issues to help them identify potential security threats when they are on the public transport system.

Avenues for future research

Although the findings of this study paint some picture about the safety and security in road travel in Ghana, data collection was undertaken only in Accra and the sampling method, including the sample size may not support generalisation of the findings. These limitations give room for further studies on the phenomenon where the study area could be extended to other regions in the country. Extending the study area could also warrant the use of a larger sample size and a more robust probability sampling method for selection of survey respondents. One of the causes of road accidents that emerged from the data but which is not discussed extensively in the road safety literature in Ghana is the issue of emotional stability. This results therefore provides an avenue for research in which those in the road safety fraternity could collaborate with psychologists to explore the effect of emotional instability on road crashes in Ghana.

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APPENDICES

APPENDIX A

FORMAL REQUEST TO INSTITUTIONS FOR SECONDARY DATA

Faculty of Social Sciences
Department of Geography and Regional Planning
University of Cape Coast

22nd July, 2020

The Director of Criminal Investigation Department
Ghana Police Service
National Headquarters
Accra

REQUEST FOR DATA AND PERMISSION TO CONDUCT INTERVIEW

I am a Ph.D. candidate at the Department of Geography and Regional Planning, University of Cape Coast, majoring in Transport Geography. As part of the award of the degree, I am conducting a study titled '**Passenger safety and security in road travel: An assessment of current situation and interventions in Ghana**'. In view of this, I would need data on criminal activities on the road transport system, especially on public transport vehicles. The data needed include: highway robbery attacks on public transport vehicles that have been reported to the police over the past ten years, and where they occur; other crimes like sexual harassment, assault and petty stealing on the public transport system that have also been reported to the police.

I also wish to request for your permission to conduct a follow-up in-depth interview with a representative from your department on the above issue, between 1st November and 31st December 2020, but at your convenience. The interview, if granted will be tape-recorded for later transcription and analysis, but I assure you that the data is strictly for academic purpose and the only people who will have access are my supervisors and I. I also wish to assure you of confidentiality and anonymity of the data that would be collected.

Attached is a letter of introduction from my head of department for your perusal. For further correspondence you may please contact me on 0243165208. Thank you very much for your kind co-operation and assistance.

Yours sincerely,

Signed

Akoto Otupiri Darko

Faculty of Social Sciences
Department of Geography and Regional Planning
University of Cape Coast

22nd July, 2020

The Director of Research
National Road Safety Authority
National Headquarters
Accra

**REQUEST FOR DATA AND PERMISSION TO CONDUCT
INTERVIEW**

I am a Ph.D. candidate at the Department of Geography and Regional Planning, University of Cape Coast, majoring in Transport Geography. As part of the award of the degree, I am conducting a study titled '**Passenger safety and security in road travel: An assessment of current situation and interventions in Ghana**'. In view of this, I would need data on road crashes from 1991 to 2019 if available. If not, then up to 2018.

I also wish to request for your permission to conduct a follow-up in-depth interview with a representative from your department on the above issue, between 1st November and 31st December 2020, but at your convenience. The interview, if granted will be tape-recorded for later transcription and analysis, but I assure you that the data is strictly for academic purpose and the only people who will have access are my supervisors and I. I also wish to assure you of confidentiality and anonymity of the data that would be collected.

Attached is a letter of introduction from my head of department for your perusal. For further correspondence you may please contact me on 0243165208. Thank you very much for your kind co-operation and assistance.

Yours sincerely,

Signed

Akoto Otupiri Darko

APPENDIX B

UNIVERSITY OF CAPE COAST
 COLLEGE OF HUMANITIES AND LEGAL STUDIES
 FACULTY OF SOCIAL SCIENCES
 DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

QUESTIONNAIRE FOR PASSENGERS

This questionnaire is intended to facilitate an academic project on the topic “**Passenger safety and security in road travel: An assessment of current situation and interventions in Ghana**”. You are at liberty to decide which questions you will answer and which ones you will ignore. At any point in the interaction process, if you wish to discontinue, you may freely say so. You are also assured that anything you say during the interaction will be treated with confidentiality and anonymity. Please feel free to ask the field assistant any question that beats your mind.

Caution to the Field Assistant

Please note that respondents must willingly accept to be part of the study. Should any respondent decide to discontinue with the interaction at a point in time, he/she is at liberty to do so and must be allowed. Please go strictly by the questions in the questionnaire.

SECTION A: DEMOGRAPHIC CHARACTERISTICS

1. What is your sex? i). Male [] ii). Female []
2. What is your age? i) 15-24 [] ii) 25-34 [] iii) 35- 44 [] iv) 45- 54 [] v) 55-64 [] vi) 65+
3. What is your occupation? i). Student [] ii) Civil/Public Servant [] iii) Trader [] iv) Businessman [] v) other, please specify.....
4. What is your highest level of educational? i) No formal education [] ii) Basic [] iii) Secondary [] iv) Vocational or technical [] v)Tertiary[] vi) Other (Please Specify).....
5. What is your marital status? i) Single [] ii) Married [] iii) Divorced [] iv) Separated [] v) Widow/ Widower []
6. What is your religious affiliation? i) None [] ii) Christian[] iii) Muslim[] iv) Traditionalist[] v) Other (Please Specify).....

SECTION B: PERCEPTIONS ON CURRENT STATE OF SAFETY AND SECURITY OF PUBLIC TRANSPORT

1. How often do you travel in a week? (long distance)
 - once a week
 - twice a week
 - thrice a week
 - more than thrice a week
 - other (please specify).....

2. What means of transport do you mostly use for your long distance journeys?
 - private car
 - public transport
 - other (please specify).....

3. Have you personally been ever involved in a road accident on public transport?
 - yes
 - no

4. If yes to question 3 above, please indicate whether there was personal injury or not. If no skip 4
 - no injury
 - minor injury (e.g. bruise, minor cuts that require first aid only)
 - serious injury (e.g. injuries that require hospitalisation for more than 24hours)

5. Has any of your relatives or friends ever been involved in a road accident on public transport?
 - yes (relative or friend)
 - no

6. If yes to question five, please indicate if the person sustained any injury, no injury or died. If no skip 6
 - no injury
 - minor injury (bruises, minor wounds that require first aid only)
 - major injury (injuries that require hospitalisation for more than 24hours)
 - death

7. How often do you hear about road accidents?
 - never
 - everyday
 - every week

once a month

once a year

8. How do you hear about road accidents? [TICK ALL THAT APPLY]

personal experience

through experiences of relatives and friends

through the print media

through electronic media

through social media

other (please specify)

9. In your view, what are some of the causes of road accidents? [TICK ALL THAT APPLY]

drunk driving

driving under the influence of other substances

fatigue (tired) driving

speeding

overtaking at wrong places (curves, hills, pedestrian walkways etc.)

the use of mobile phone whiles driving

leaving disabled vehicles in the middle of the road

other (please

specify).....

10. In your view, which category of people die or are injured most through road accidents?

male (adult)

female (adult)

children

can't tell

11. Which category of road users do you think are most affected by road accidents?

pedestrians

cyclist and motor cyclist

private car occupants

public transport occupants

other (please specify)

12. In your estimation, which age group are the most affected victims of road accidents?

less than 20

20-29

30-39

40-49

50-59

60 and above

can't tell

13. How would you assess the current state of road accidents generally in Ghana?

accidents are declining rapidly

accidents are declining steadily

don't know

accidents are increasing steadily

accidents are increasing rapidly

14. How would you assess the safety of public transport vehicles?

passengers safety is assured

don't know

passengers safety is not assured

15. Do you personally feel safe on public transport vehicles?

yes

no

16. If no to question 15 above, what are the reasons for feeling unsafe? If yes skip 16

personal involvement in a road crash

road crash involving a relative or friend

media reportage of an increased public transport vehicles involved in road crashes

careless driving by public transport drivers

poor maintenance of vehicles

other (please specify).....

17. Have you ever had an encounter with any incident of insecurity on public transport?

yes

no

18. If yes to question 17, what was the nature of insecurity encountered? If no skip 18 and 19

assault

highway robbery attack

baggage theft

sexual harassment

other (please specify).....

19. Where exactly did the incident of insecurity occur?

between the point of access and the terminal

at the terminal

- in transit
- other (please specify).....

20. Has any of your relatives or friends ever had an experience with a security threat on the public transport system?

- yes (relative or friend)
- no

21. If yes to question 20, what was the nature of the security threat? If no, skip 21 and 22

- assault
- highway robbery
- baggage theft
- other (please specify).....

22. Where exactly did this incident of insecurity occur?

- between the point of access and the transport terminal
- at the terminal
- in transit
- other (please specify).....

23. How would you assess the current state of security on the public transport system?

- passengers are secured
- don't know
- passengers are not secured

24. Do you personally feel secure on the public transport system?

- yes
- no

25. If no to question 24, what are the reasons for feeling insecure?

- personal experience
- encounter by a relative or friend
- media reportage of highway robbery on public transport vehicles
- no security personnel at terminals and on vehicles
- Other (please specify).....

SECTION C: CURRENT INTERVENTIONS AND THEIR IMPACT

26. Are you aware of any road safety intervention in place presently?

- yes
- no

27. If yes to question 20, please tick as many of the interventions listed that you are aware of.

- public education on road safety in the media
- public education on road safety in schools
- public education on road safety in churches and mosques
- training of drivers by the National Driver Academy
- strict enforcement of road traffic regulations
- erection of appropriate road furniture (road signs and markings) at identified places
- national road safety awards
- implementation of road safety protocols by individual transport organisation
- others (please specify).....

28. Generally, how effective have the interventions been in promoting road safety?

- very effective
- effective
- don't know
- ineffective
- very ineffective

29. Who, in your view is responsible for ensuring safety on the roads in Ghana? [TICK ALL THAT APPLY]

- pedestrians
- cyclist and motor cyclist
- passengers
- transport operators
- police
- DVLA
- National Road Safety Commission

30. To what extent do you agree that road safety is a shared responsibility?

- strongly agree
- agree
- neutral
- disagree
- strongly disagree

31. Which of the following do you consider most effective intervention in ensuring road safety in Ghana?

- education
- engineering
- enforcement

32. Which of the following do you consider least effective intervention in ensuring road safety in Ghana?

- education
- engineering

enforcement

33. Are you aware of any security intervention in place on the public transport system?

yes

no

34. If yes to question 33, please select the interventions that you are aware of.

installation of CCTV cameras at terminals and on buses

the use of private security personnel between the point of access to the terminals and at the terminals

the use of police escort by transport organisations

frequent highway patrol by the police and other state security organisations

installation of adequate police check points on highways

restriction on the use of communication gadgets on public transport

proper screening of luggage by transport operators

35. Generally, how effective are those interventions in improving passenger security?

very effective

effective

don't know

ineffective

very ineffective

36. Do passengers have a responsibility for ensuring personal security on public transport?

yes

no

37. Who in your view is responsible for ensuring security on public transport? You may choose more than one

passengers

drivers

transport operators

police

government

other (please specify)

.....

38. To what extent do you agree that security on the road is a shared responsibility?

strongly agree

agree

- neutral
- disagree
- strongly disagree

39. Which of the following do you consider most effective intervention in ensuring security on the road in Ghana?

- the use of police escort
- highway patrol
- mounting of police checkpoints on highways

40. Which of the following do you consider least effective in ensuring security on the roads in Ghana?

- the use of police escort
- highway patrol
- mounting of police checkpoints on highways

SECTION D: SUGGESTED ADDITIONAL INTERVENTIONS

41. What additional interventions will you recommend to improve road safety?

42. What additional interventions will you recommend to improve passenger security on the public transport system?

43. What do you think should be the role of stakeholders in achieving your suggested additional interventions?

NOTE:

Please kindly leave your name and telephone number if you accept to participate in a follow-up in-depth interview. Thank you for making time to complete this questionnaire.

APPENDIX C

SURVEY DATA COLLECTION CHECKLIST

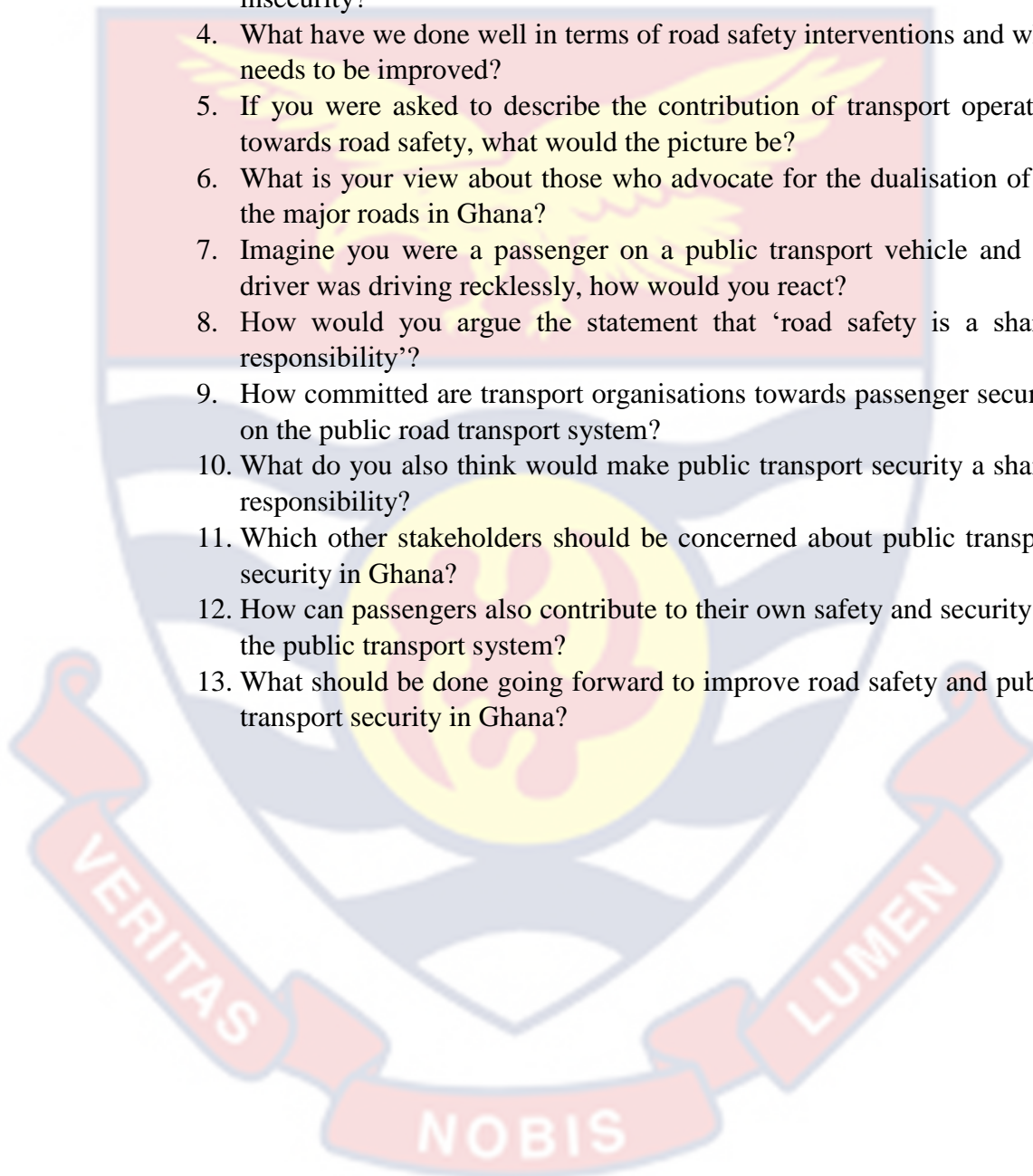
Station	Sample Size																																																	
Intercity STC (Main Yard)	40	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30																			
		31	32	33	34	35	36	37	38	39	40																																							
Intercity STC (Circle Terminal)	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30																			
MMT (Avenor)	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																																		
MMT (Opera Square)	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																																		
MM (Circle)	15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																																		
MMT (Kaneshie)	25	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25																								
Vision Transport Company Limited	50	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30																			
		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50																													
OA Travels & Tours	60	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30																			
		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60																			
Sungtaaba VVIP	40	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30																			
		31	32	33	34	35	36	37	38	39	40																																							
GPRTU (Neoplan Station)	58	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30																			
		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58																					
GPRTU (Tudu Main Station,)	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24																									
Total	372																																																	

APPENDIX D**UNIVERSITY OF CAPE COAST
DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING****INTERVIEW GUIDE FOR PhD THESIS DATA COLLECTION****(PHASE THREE)****TRANSPORT OPERATORS**

1. What is the size of your organisation in terms of manpower, fleet size, and coverage area?
2. What are the type of buses you use for your operations and how do you ensure regular maintenance of the fleet?
3. How do you recruit your drivers, and what additional training and development do you provide for them to ensure that they are abreast with the changing trends in transport operations?
4. What systems are in place to monitor the activities of drivers and other operational crew?
5. What operational guidelines do you have for your operational crew?
6. How many crashes on the average do you record in a month, and what is the nature of those crashes?
7. To what extent do such road crashes affect the patronage of your services?
8. What are the procedures you take your drivers through in the event of a crash occurring?
9. Generally, how would you assess the state of road safety in Ghana, in terms of enforcement, education, and engineering?
10. What are the things we have been doing right, and what other things have we done wrongly?
11. What are some of the security threats you encounter in your daily operations?
12. How have you responded to such threats, and how effective have your response been?
13. How would you assess the security of public transport in Ghana?
14. How can we improve upon the current road safety and public road transport security interventions, and what should be the role of each stakeholder?
15. What would be your concluding remarks?

PASSENGERS

1. What do you think are some of the causes of road crashes and which one would you identify as the major cause?
2. How would you describe the state of road safety in Ghana?
3. Would you like to share your personal experience or that of a relative/friend if any, with regards to a road crash or transport insecurity?
4. What have we done well in terms of road safety interventions and what needs to be improved?
5. If you were asked to describe the contribution of transport operators towards road safety, what would the picture be?
6. What is your view about those who advocate for the dualisation of all the major roads in Ghana?
7. Imagine you were a passenger on a public transport vehicle and the driver was driving recklessly, how would you react?
8. How would you argue the statement that 'road safety is a shared responsibility'?
9. How committed are transport organisations towards passenger security on the public road transport system?
10. What do you also think would make public transport security a shared responsibility?
11. Which other stakeholders should be concerned about public transport security in Ghana?
12. How can passengers also contribute to their own safety and security on the public transport system?
13. What should be done going forward to improve road safety and public transport security in Ghana?

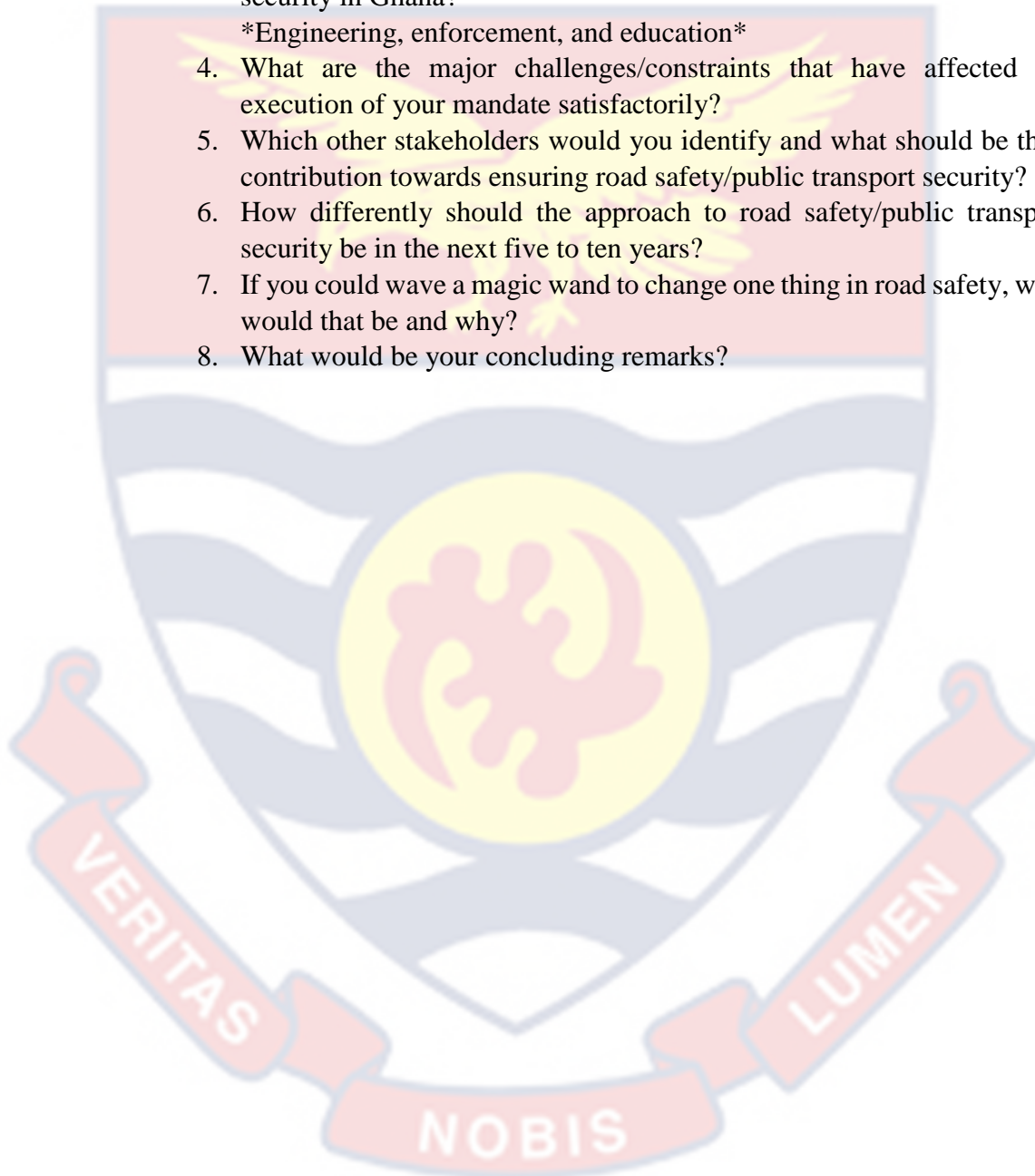


REGULATORY AUTHORITIES

1. What is the core mandate of your institution and how are you able to carry out your mandate?
2. What are the interventions that you have put in place so far and how have they impacted on your main objective?
3. How would you describe the state of road safety/public transport security in Ghana?

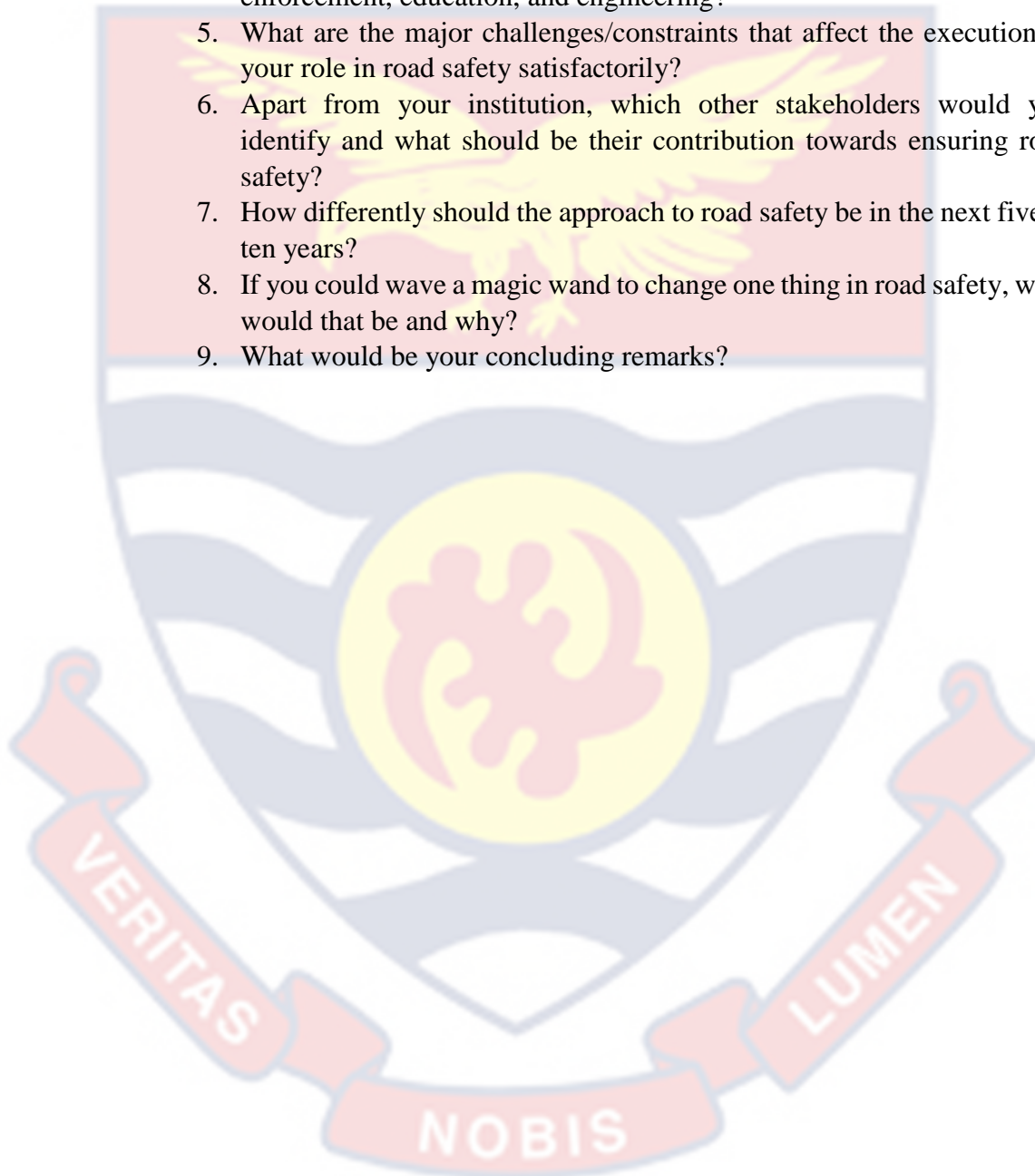
Engineering, enforcement, and education

4. What are the major challenges/constraints that have affected the execution of your mandate satisfactorily?
5. Which other stakeholders would you identify and what should be their contribution towards ensuring road safety/public transport security?
6. How differently should the approach to road safety/public transport security be in the next five to ten years?
7. If you could wave a magic wand to change one thing in road safety, what would that be and why?
8. What would be your concluding remarks?



EMERGENCY SERVICE PROVIDERS

1. What is the core mandate of your institution and how are you able to carry out your mandate?
2. What role do you play in road safety?
3. What in your view are the major causes of road crashes?
4. How would you describe the state of road safety in Ghana in terms of enforcement, education, and engineering?
5. What are the major challenges/constraints that affect the execution of your role in road safety satisfactorily?
6. Apart from your institution, which other stakeholders would you identify and what should be their contribution towards ensuring road safety?
7. How differently should the approach to road safety be in the next five to ten years?
8. If you could wave a magic wand to change one thing in road safety, what would that be and why?
9. What would be your concluding remarks?

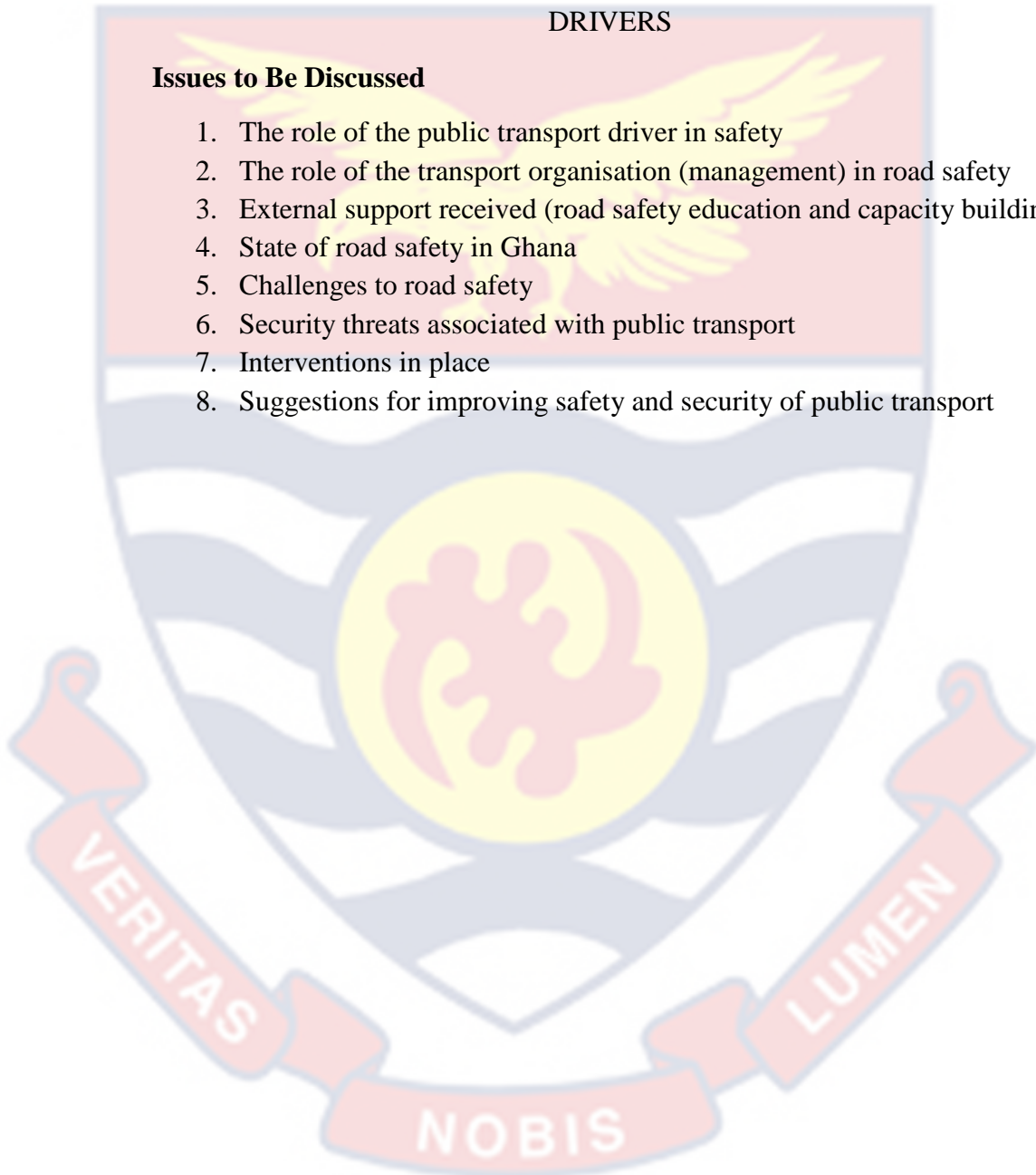


APPENDIX E

UNIVERSITY OF CAPE COAST
COLLEGE OF HUMANITIES AND LEGAL STUDIES
FACULTY OF SOCIAL SCIENCES
DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING
DISCUSSION GUIDE FOR FOCUS GROUP DISCUSSION WITH
DRIVERS

Issues to Be Discussed

1. The role of the public transport driver in safety
2. The role of the transport organisation (management) in road safety
3. External support received (road safety education and capacity building)
4. State of road safety in Ghana
5. Challenges to road safety
6. Security threats associated with public transport
7. Interventions in place
8. Suggestions for improving safety and security of public transport



APPENDIX F

UNIVERSITY OF CAPE COAST
COLLEGE OF HUMANITIES AND LEGAL STUDIES
FACULTY OF SOCIAL SCIENCES
DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

OBSERVATION GUIDE FOR PhD THESIS DATA COLLECTION

Things to Be Observed

Transport Organisations

1. Nature of fleet (type of bus, seat arrangement, roadworthiness)
2. Operational guidelines (whether they are strictly followed)
3. Systems for vehicle maintenance
4. Evidence for internal reward and punishment systems
5. Nature of security at terminals
6. Security systems on buses

Regulatory Authorities

1. Cameras fitted in the city
2. Presence of road safety inspectors at transport terminals
3. Situational crime traffic intervention at Madina Zongo Junction

Emergency Service Providers

- Equipment used for extrication and rescue

APPENDIX G

MULTIPLE COMPARISONS (TUKEY HSD) OF CRASH-TYPE TREND

Dependent Variable	(I) Year category	(J) Year category	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
All Crashes	1991-1995	1996-2000	-2519.200*	674.64	0.012	-4605.14	-433.26
		2001-2005	-3877.800*	674.64	0	-5963.74	-1791.86
		2006-2010	-4413.800*	674.64	0	-6499.74	-2327.86
		2011-2015	-2892.400*	674.64	0.003	-4978.34	-806.46
		2016-2020	-2852.000*	674.64	0.004	-4937.94	-766.06
	1996-2000	1991-1995	2519.200*	674.64	0.012	433.26	4605.14
		2001-2005	-1358.6	674.64	0.364	-3444.54	727.34
		2006-2010	-1894.6	674.64	0.09	-3980.54	191.34
		2011-2015	-373.2	674.64	0.993	-2459.14	1712.74
		2016-2020	-332.8	674.64	0.996	-2418.74	1753.14
	2001-2005	1991-1995	3877.800*	674.64	0	1791.86	5963.74
		1996-2000	1358.6	674.64	0.364	-727.34	3444.54
		2006-2010	-536	674.64	0.966	-2621.94	1549.94
		2011-2015	985.4	674.64	0.691	-1100.54	3071.34
		2016-2020	1025.8	674.64	0.655	-1060.14	3111.74
	2006-2010	1991-1995	4413.800*	674.64	0	2327.86	6499.74
		1996-2000	1894.6	674.64	0.09	-191.34	3980.54
		2001-2005	536	674.64	0.966	-1549.94	2621.94
		2011-2015	1521.4	674.64	0.251	-564.54	3607.34
		2016-2020	1561.8	674.64	0.227	-524.14	3647.74
	2011-2015	1991-1995	2892.400*	674.64	0.003	806.46	4978.34
		1996-2000	373.2	674.64	0.993	-1712.74	2459.14
		2001-2005	-985.4	674.64	0.691	-3071.34	1100.54
		2006-2010	-1521.4	674.64	0.251	-3607.34	564.54
		2016-2020	40.4	674.64	1	-2045.54	2126.34
	2016-2020	1991-1995	2852.000*	674.64	0.004	766.06	4937.94
		1996-2000	332.8	674.64	0.996	-1753.14	2418.74
		2001-2005	-1025.8	674.64	0.655	-3111.74	1060.14
2006-2010		-1561.8	674.64	0.227	-3647.74	524.14	
2011-2015		-40.4	674.64	1	-2126.34	2045.54	
Fatal crashes	1991-1995	1996-2000	-260.4	93.4	0.094	-549.19	28.39
		2001-2005	-645.400*	93.4	0	-934.19	-356.61
		2006-2010	-914.800*	93.4	0	-1203.59	-626.01
		2011-2015	-946.400*	93.4	0	-1235.19	-657.61
		2016-2020	-1065.000*	93.4	0	-1353.79	-776.21
	1996-2000	1991-1995	260.4	93.4	0.094	-28.39	549.19
		2001-2005	-385.000*	93.4	0.005	-673.79	-96.21
		2006-2010	-654.400*	93.4	0	-943.19	-365.61
		2011-2015	-686.000*	93.4	0	-974.79	-397.21
		2016-2020	-804.600*	93.4	0	-1093.39	-515.81

	2001-2005	1991-1995	645.400*	93.4	0	356.61	934.19
		1996-2000	385.000*	93.4	0.005	96.21	673.79
		2006-2010	-269.4	93.4	0.077	-558.19	19.39
		2011-2015	-301.000*	93.4	0.038	-589.79	-12.21
		2016-2020	-419.600*	93.4	0.002	-708.39	-130.81
	2006-2010	1991-1995	914.800*	93.4	0	626.01	1203.59
		1996-2000	654.400*	93.4	0	365.61	943.19
		2001-2005	269.4	93.4	0.077	-19.39	558.19
		2011-2015	-31.6	93.4	0.999	-320.39	257.19
		2016-2020	-150.2	93.4	0.601	-438.99	138.59
	2011-2015	1991-1995	946.400*	93.4	0	657.61	1235.19
		1996-2000	686.000*	93.4	0	397.21	974.79
		2001-2005	301.000*	93.4	0.038	12.21	589.79
		2006-2010	31.6	93.4	0.999	-257.19	320.39
		2016-2020	-118.6	93.4	0.798	-407.39	170.19
	2016-2020	1991-1995	1065.000*	93.4	0	776.21	1353.79
		1996-2000	804.600*	93.4	0	515.81	1093.39
		2001-2005	419.600*	93.4	0.002	130.81	708.39
		2006-2010	150.2	93.4	0.601	-138.59	438.99
		2011-2015	118.6	93.4	0.798	-170.19	407.39
Injury crashes	1991-1995	1996-2000	-1243.000*	348.238	0.017	-2319.73	-166.27
		2001-2005	-2553.000*	348.238	0	-3629.73	-1476.27
		2006-2010	-3063.200*	348.238	0	-4139.93	-1986.47
		2011-2015	-2324.200*	348.238	0	-3400.93	-1247.47
		2016-2020	-1515.200*	348.238	0.003	-2591.93	-438.47
	1996-2000	1991-1995	1243.000*	348.238	0.017	166.27	2319.73
		2001-2005	-1310.000*	348.238	0.011	-2386.73	-233.27
		2006-2010	-1820.200*	348.238	0	-2896.93	-743.47
		2011-2015	-1081.200*	348.238	0.049	-2157.93	-4.47
		2016-2020	-272.2	348.238	0.968	-1348.93	804.53
	2001-2005	1991-1995	2553.000*	348.238	0	1476.27	3629.73
		1996-2000	1310.000*	348.238	0.011	233.27	2386.73
		2006-2010	-510.2	348.238	0.688	-1586.93	566.53
		2011-2015	228.8	348.238	0.985	-847.93	1305.53
		2016-2020	1037.8	348.238	0.063	-38.93	2114.53
	2006-2010	1991-1995	3063.200*	348.238	0	1986.47	4139.93
		1996-2000	1820.200*	348.238	0	743.47	2896.93
		2001-2005	510.2	348.238	0.688	-566.53	1586.93
		2011-2015	739	348.238	0.31	-337.73	1815.73
		2016-2020	1548.000*	348.238	0.002	471.27	2624.73
2011-2015	1991-1995	2324.200*	348.238	0	1247.47	3400.93	
	1996-2000	1081.200*	348.238	0.049	4.47	2157.93	
	2001-2005	-228.8	348.238	0.985	-1305.53	847.93	
	2006-2010	-739	348.238	0.31	-1815.73	337.73	
	2016-2020	809	348.238	0.224	-267.73	1885.73	
2016-2020	1991-1995	1515.200*	348.238	0.003	438.47	2591.93	

		1996-2000	272.2	348.238	0.968	-804.53	1348.93
		2001-2005	-1037.8	348.238	0.063	-2114.53	38.93
		2006-2010	-1548.000*	348.238	0.002	-2624.73	-471.27
		2011-2015	-809	348.238	0.224	-1885.73	267.73
Damage only crashes	1991-1995	1996-2000	-1276.200*	301.654	0.004	-2208.89	-343.51
		2001-2005	-1324.800*	301.654	0.002	-2257.49	-392.11
		2006-2010	-1350.600*	301.654	0.002	-2283.29	-417.91
		2011-2015	-568	301.654	0.436	-1500.69	364.69
		2016-2020	-212	301.654	0.98	-1144.69	720.69
	1996-2000	1991-1995	1276.200*	301.654	0.004	343.51	2208.89
		2001-2005	-48.6	301.654	1	-981.29	884.09
		2006-2010	-74.4	301.654	1	-1007.09	858.29
		2011-2015	708.2	301.654	0.215	-224.49	1640.89
		2016-2020	1064.200*	301.654	0.019	131.51	1996.89
	2001-2005	1991-1995	1324.800*	301.654	0.002	392.11	2257.49
		1996-2000	48.6	301.654	1	-884.09	981.29
		2006-2010	-25.8	301.654	1	-958.49	906.89
		2011-2015	756.8	301.654	0.161	-175.89	1689.49
		2016-2020	1112.800*	301.654	0.013	180.11	2045.49
	2006-2010	1991-1995	1350.600*	301.654	0.002	417.91	2283.29
		1996-2000	74.4	301.654	1	-858.29	1007.09
		2001-2005	25.8	301.654	1	-906.89	958.49
		2011-2015	782.6	301.654	0.137	-150.09	1715.29
		2016-2020	1138.600*	301.654	0.011	205.91	2071.29
	2011-2015	1991-1995	568	301.654	0.436	-364.69	1500.69
		1996-2000	-708.2	301.654	0.215	-1640.89	224.49
		2001-2005	-756.8	301.654	0.161	-1689.49	175.89
		2006-2010	-782.6	301.654	0.137	-1715.29	150.09
		2016-2020	356	301.654	0.842	-576.69	1288.69
	2016-2020	1991-1995	212	301.654	0.98	-720.69	1144.69
		1996-2000	-1064.200*	301.654	0.019	-1996.89	-131.51
		2001-2005	-1112.800*	301.654	0.013	-2045.49	-180.11
2006-2010		-1138.600*	301.654	0.011	-2071.29	-205.91	
2011-2015		-356	301.654	0.842	-1288.69	576.69	
* The mean difference is significant at the 0.05 level.							

APPENDIX H

MULTIPLE COMPARISONS TUKEY HSD ON TREND OF CASUALTIES

Dependent Variable	(I) Year category	(J) Year category	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Fatalities	1991-1995	1996-2000	-314.4	122.168	0.143	-692.14	63.34
		2001-2005	-884.200*	122.168	0	-1261.94	-506.46
		2006-2010	-1095.000*	122.168	0	-1472.74	-717.26
		2011-2015	-1078.000*	122.168	0	-1455.74	-700.26
		2016-2020	-1188.600*	122.168	0	-1566.34	-810.86
	1996-2000	1991-1995	314.4	122.168	0.143	-63.34	692.14
		2001-2005	-569.800*	122.168	0.001	-947.54	-192.06
		2006-2010	-780.600*	122.168	0	-1158.34	-402.86
		2011-2015	-763.600*	122.168	0	-1141.34	-385.86
		2016-2020	-874.200*	122.168	0	-1251.94	-496.46
	2001-2005	1991-1995	884.200*	122.168	0	506.46	1261.94
		1996-2000	569.800*	122.168	0.001	192.06	947.54
		2006-2010	-210.8	122.168	0.529	-588.54	166.94
		2011-2015	-193.8	122.168	0.615	-571.54	183.94
		2016-2020	-304.4	122.168	0.166	-682.14	73.34
	2006-2010	1991-1995	1095.000*	122.168	0	717.26	1472.74
		1996-2000	780.600*	122.168	0	402.86	1158.34
		2001-2005	210.8	122.168	0.529	-166.94	588.54
		2011-2015	17	122.168	1	-360.74	394.74
		2016-2020	-93.6	122.168	0.971	-471.34	284.14
	2011-2015	1991-1995	1078.000*	122.168	0	700.26	1455.74
		1996-2000	763.600*	122.168	0	385.86	1141.34
		2001-2005	193.8	122.168	0.615	-183.94	571.54
		2006-2010	-17	122.168	1	-394.74	360.74
		2016-2020	-110.6	122.168	0.941	-488.34	267.14
	2016-2020	1991-1995	1188.600*	122.168	0	810.86	1566.34
		1996-2000	874.200*	122.168	0	496.46	1251.94
		2001-2005	304.4	122.168	0.166	-73.34	682.14
2006-2010		93.6	122.168	0.971	-284.14	471.34	
2011-2015		110.6	122.168	0.941	-267.14	488.34	
Serious Injury	1991-1995	1996-2000	-972.2	352.727	0.1	-2062.81	118.41
		2001-2005	-2271.600*	352.727	0	-3362.21	-1180.99
		2006-2010	-2604.000*	352.727	0	-3694.61	-1513.39
		2011-2015	-1833.400*	352.727	0	-2924.01	-742.79
		2016-2020	-2949.000*	352.727	0	-4039.61	-1858.39
	1996-2000	1991-1995	972.2	352.727	0.1	-118.41	2062.81
		2001-2005	-1299.400*	352.727	0.013	-2390.01	-208.79
		2006-2010	-1631.800*	352.727	0.001	-2722.41	-541.19
		2011-2015	-861.2	352.727	0.182	-1951.81	229.41
		2016-2020	-1976.800*	352.727	0	-3067.41	-886.19

	2001-2005	1991-1995	2271.600*	352.727	0	1180.99	3362.21	
		1996-2000	1299.400*	352.727	0.013	208.79	2390.01	
		2006-2010	-332.4	352.727	0.931	-1423.01	758.21	
		2011-2015	438.2	352.727	0.812	-652.41	1528.81	
		2016-2020	-677.4	352.727	0.415	-1768.01	413.21	
	2006-2010	1991-1995	2604.000*	352.727	0	1513.39	3694.61	
		1996-2000	1631.800*	352.727	0.001	541.19	2722.41	
		2001-2005	332.4	352.727	0.931	-758.21	1423.01	
		2011-2015	770.6	352.727	0.281	-320.01	1861.21	
		2016-2020	-345	352.727	0.92	-1435.61	745.61	
	2011-2015	1991-1995	1833.400*	352.727	0	742.79	2924.01	
		1996-2000	861.2	352.727	0.182	-229.41	1951.81	
		2001-2005	-438.2	352.727	0.812	-1528.81	652.41	
		2006-2010	-770.6	352.727	0.281	-1861.21	320.01	
		2016-2020	-1115.600*	352.727	0.043	-2206.21	-24.99	
	2016-2020	1991-1995	2949.000*	352.727	0	1858.39	4039.61	
		1996-2000	1976.800*	352.727	0	886.19	3067.41	
		2001-2005	677.4	352.727	0.415	-413.21	1768.01	
		2006-2010	345	352.727	0.92	-745.61	1435.61	
		2011-2015	1115.600*	352.727	0.043	24.99	2206.21	
	Slight Injury	1991-1995	1996-2000	-1487.4	499.452	0.064	-3031.67	56.87
			2001-2005	-3531.600*	499.452	0	-5075.87	-1987.33
			2006-2010	-3843.400*	499.452	0	-5387.67	-2299.13
			2011-2015	-1544.2	499.452	0.05	-3088.47	0.07
			2016-2020	-600.6	499.452	0.831	-2144.87	943.67
1996-2000		1991-1995	1487.4	499.452	0.064	-56.87	3031.67	
		2001-2005	-2044.200*	499.452	0.005	-3588.47	-499.93	
		2006-2010	-2356.000*	499.452	0.001	-3900.27	-811.73	
		2011-2015	-56.8	499.452	1	-1601.07	1487.47	
		2016-2020	886.8	499.452	0.499	-657.47	2431.07	
2001-2005		1991-1995	3531.600*	499.452	0	1987.33	5075.87	
		1996-2000	2044.200*	499.452	0.005	499.93	3588.47	
		2006-2010	-311.8	499.452	0.988	-1856.07	1232.47	
		2011-2015	1987.400*	499.452	0.007	443.13	3531.67	
		2016-2020	2931.000*	499.452	0	1386.73	4475.27	
2006-2010		1991-1995	3843.400*	499.452	0	2299.13	5387.67	
		1996-2000	2356.000*	499.452	0.001	811.73	3900.27	
		2001-2005	311.8	499.452	0.988	-1232.47	1856.07	
		2011-2015	2299.200*	499.452	0.001	754.93	3843.47	
		2016-2020	3242.800*	499.452	0	1698.53	4787.07	
2011-2015		1991-1995	1544.2	499.452	0.05	-0.07	3088.47	
		1996-2000	56.8	499.452	1	-1487.47	1601.07	
		2001-2005	-1987.400*	499.452	0.007	-3531.67	-443.13	
		2006-2010	-2299.200*	499.452	0.001	-3843.47	-754.93	
		2016-2020	943.6	499.452	0.432	-600.67	2487.87	
2016-2020	1991-1995	600.6	499.452	0.831	-943.67	2144.87		

		1996-2000	-886.8	499.452	0.499	-2431.07	657.47
		2001-2005	-2931.000*	499.452	0	-4475.27	-1386.73
		2006-2010	-3242.800*	499.452	0	-4787.07	-1698.53
		2011-2015	-943.6	499.452	0.432	-2487.87	600.67
* The mean difference is significant at the 0.05 level.							



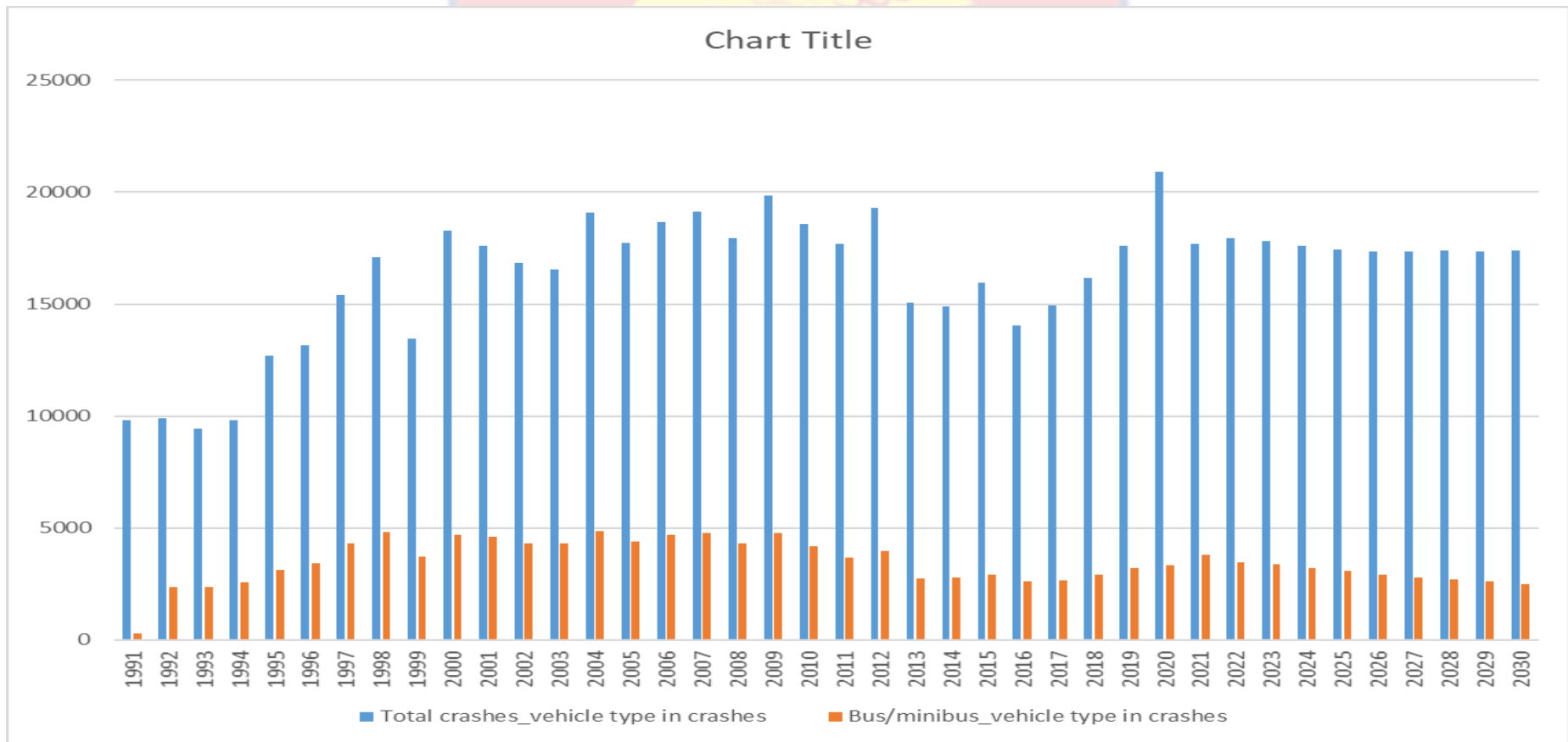
APPENDIX I

MULTIPLE COMPARISONS (TUKEY HSD) OF MEAN NUMBER OF PUBLIC VEHICLE ACCIDENTS ACROSS SIX-YEAR GROUPS

Dependent Variable: Bus/mini bus crash						
(I) Year category	(J) Year category	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1991-1995	1996-2000	-2041.400*	376.013	0	-3204.01	-878.79
	2001-2005	-2349.800*	376.013	0	-3512.41	-1187.19
	2006-2010	-2397.400*	376.013	0	-3560.01	-1234.79
	2011-2015	-1076.2	376.013	0.081	-2238.81	86.41
	2016-2020	-799.4	376.013	0.308	-1962.01	363.21
1996-2000	1991-1995	2041.400*	376.013	0	878.79	3204.01
	2001-2005	-308.4	376.013	0.961	-1471.01	854.21
	2006-2010	-356	376.013	0.93	-1518.61	806.61
	2011-2015	965.2	376.013	0.145	-197.41	2127.81
	2016-2020	1242.000*	376.013	0.031	79.39	2404.61
2001-2005	1991-1995	2349.800*	376.013	0	1187.19	3512.41
	1996-2000	308.4	376.013	0.961	-854.21	1471.01
	2006-2010	-47.6	376.013	1	-1210.21	1115.01
	2011-2015	1273.600*	376.013	0.026	110.99	2436.21
	2016-2020	1550.400*	376.013	0.005	387.79	2713.01
2006-2010	1991-1995	2397.400*	376.013	0	1234.79	3560.01
	1996-2000	356	376.013	0.93	-806.61	1518.61
	2001-2005	47.6	376.013	1	-1115.01	1210.21
	2011-2015	1321.200*	376.013	0.02	158.59	2483.81
	2016-2020	1598.000*	376.013	0.003	435.39	2760.61
2011-2015	1991-1995	1076.2	376.013	0.081	-86.41	2238.81
	1996-2000	-965.2	376.013	0.145	-2127.81	197.41
	2001-2005	-1273.600*	376.013	0.026	-2436.21	-110.99
	2006-2010	-1321.200*	376.013	0.02	-2483.81	-158.59
	2016-2020	276.8	376.013	0.975	-885.81	1439.41
2016-2020	1991-1995	799.4	376.013	0.308	-363.21	1962.01
	1996-2000	-1242.000*	376.013	0.031	-2404.61	-79.39
	2001-2005	-1550.400*	376.013	0.005	-2713.01	-387.79
	2006-2010	-1598.000*	376.013	0.003	-2760.61	-435.39
	2011-2015	-276.8	376.013	0.975	-1439.41	885.81

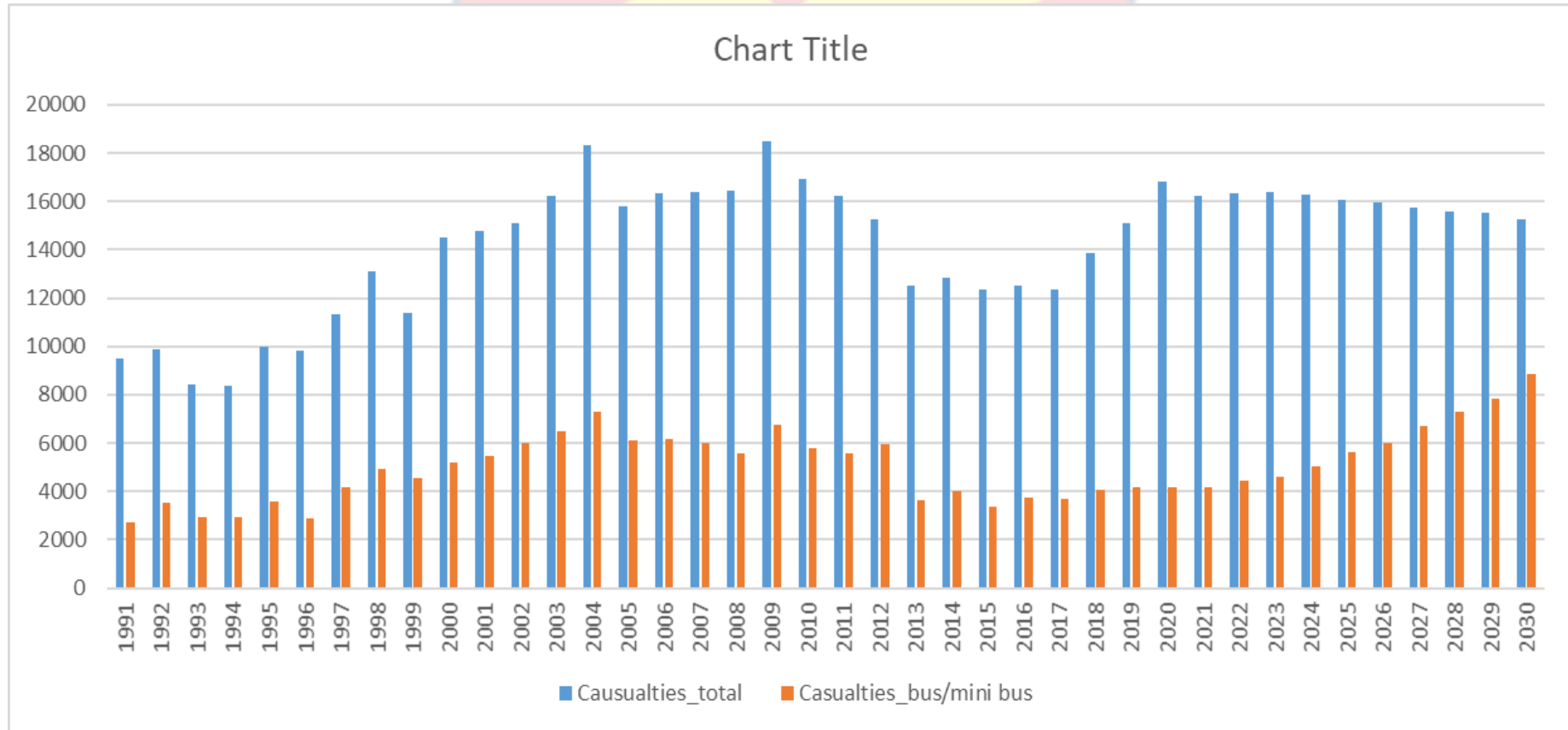
* The mean difference is significant at the 0.05 level.

APPENDIX J
PROJECTED CRASHES BY VEHICLE TYPE FOR 2021-2030



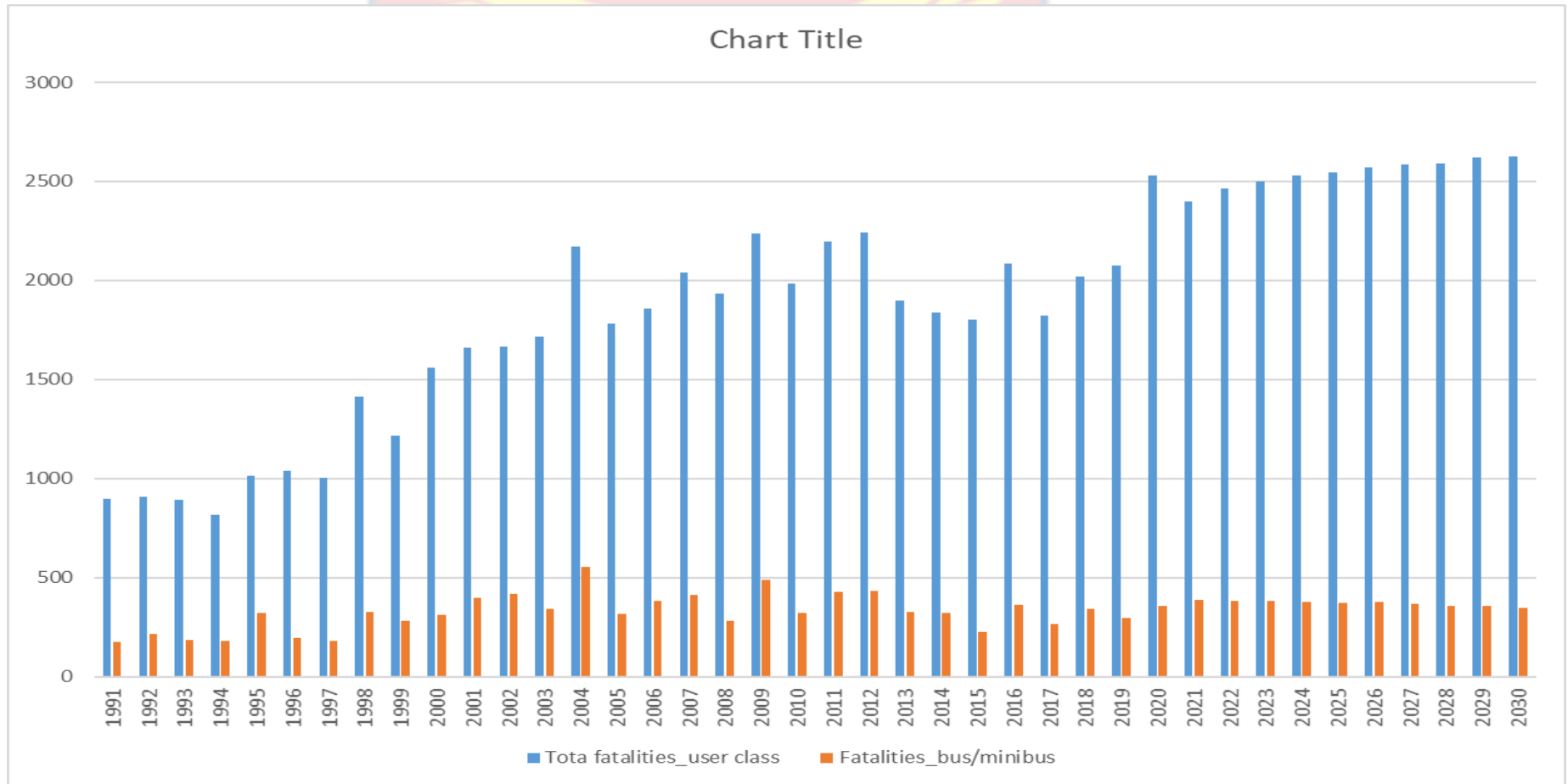
APPENDIX K

PROJECTED TOTAL CASUALTIES AND CASUALTIES INVOLVING PUBLIC TRANSPORT FOR 2021-2030



APPENDIX L

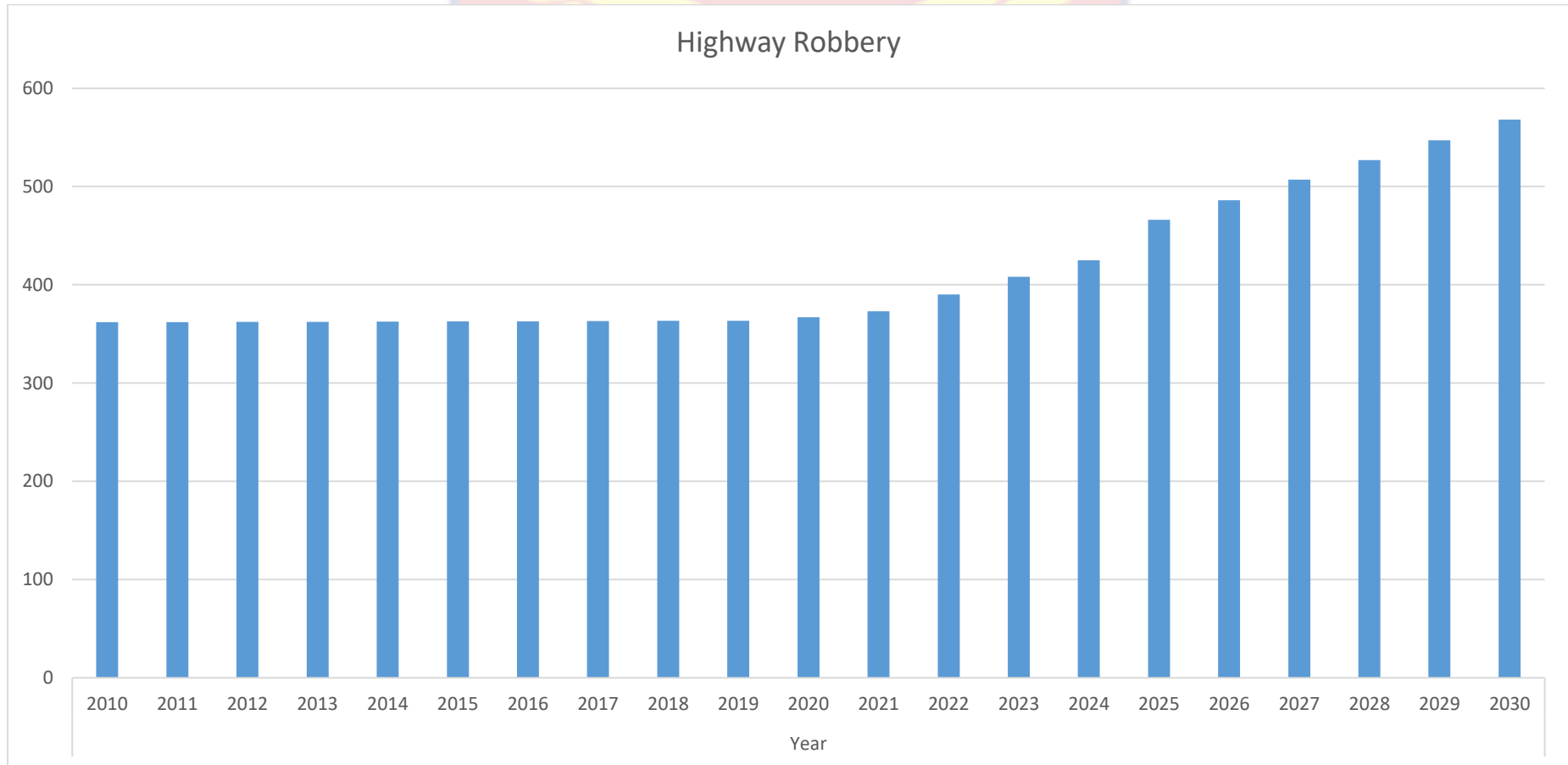
PROJECTED TOTAL FATALITIES AND FATALITIES INVOLVING PUBLIC TRANSPORT



NOBIS

APPENDIX M

PROJECTED HIGHWAY ROBBERIES FOR 2021-2030



APPENDIX N: Road Traffic Offences that Attract Spot Fines

No	Reg. No	Offence	Fines
1	7	Refusal to renew road use certificate Regulation 7	5-25 penalty units
2	11	Refusal to register number plates Regulation 11	5-25 penalty units
3	12	Renewal of registration number plates Regulation 12	10-25 penalty units
4	24	False entry in Trade License log book Regulation 24 (6)	10 penalty units
5	26	Learner driver to be accompanied by an experienced driver Regulation 26(20)	5 penalty units
6	33	Failure to renew driving license Regulation 33	10-25 penalty units
7	37	Disqualification of Under Aged Persons Regulation 37	10 penalty units
8	50	Non-conformity to restrictions on Width and Length of vehicle Regulation 50	25 penalty units
9	51	Non-conformity to restrictions on vehicle Height Regulation 51	25 penalty units
10	52	Non-conformity to restrictions on carriage of loads Regulation 52	10 penalty units
11	60	Offences and penalties for LPG fitted vehicles Regulation 60	10-25 penalty units
12	66	Mirror, Windscreen & glass Regulation 66	5 penalty units
13	67 68	Use of unspecified tinted glass Regulation 67 and 68	25-50, 10-50 penalty units
14	69	Failure to carry Fire Extinguisher Regulation 69	10-25 penalty units
15	74	Non-conformity with restrictions on Horns and Sirens Regulation 74	25 penalty units
16	79	Driving motor vehicle without reflectors (front and back) Regulation 79	5 penalty units
17	83	Failure to carry Advance Warning Devices Regulation 83	25-50 penalty units
18	84	Failure to wear reflective Clothing and protective Helmet Regulation 84	25-50 penalty units
19	100	Non-compliance with regulation on carriage of persons and goods Regulation 100	50 penalty units
20	106	Driving on a shoulder of a road Regulation 106	10-50 penalty units

No	Reg. No.	Offence	Fines
21	107	Prohibition on use of Communication Device Regulation 107	50 penalty units
22	118	Non-compliance with maximum driving periods Regulation 118	25 penalty units
23	119	Failure to use seat belts Regulation 119	10-50 penalty units
24	123	Operating commercial vehicle without commercial vehicle driving permit Regulation 123	25 penalty units
25	128	Prohibition of use of motorcycle or tricycle for commercial passenger services Regulation 128	25 penalty units
26	135	Non-compliance with regulation on speed limiters, logbooks and tachographs Regulation 135	25 penalty units
27	137	Exceeding the prescribed number of persons to be carried Regulation 137	10-25 penalty units
28	138	Particulars to be written on Commercial Vehicles Regulation 138	5 penalty units
29	147	Failure to comply with Regulation on visitors Driving Permit Regulation 147	20-25 penalty units
30	148	Use of Foreign Driver's License Regulation 148	25-50 penalty units
31		Non-compliance with the rules of the road Regulation 150	10-25 penalty units
32		A person being an excess passenger on a vehicle Regulation 156	5 penalty units
33		Non-compliance with regulations on speed limits Regulation 165	5 penalty units
34		Obedience to police and fire service officials Regulation 168	10 penalty units
35		Obstructing Intersections and Pedestrians Crossings Regulation 170	10-25 penalty units
36		Disregarding Signs and Barricades Regulation 171	5 penalty units
37		Stopping and Parking of buses and taxis regulated Regulation 183	10-25 penalty units
38		Parking on Highway and Town Road Regulation 187	10-25 penalty units