UNIVERSITY OF GHANA

ROAD TRAFFIC ACCIDENTS ON THE ACCRA–KUMASI–TAMALE ROAD CORRIDOR

BY

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DECLARATION

With the exception of references to other works which I have duly acknowledged, I hereby declare that this piece is as a result of my own research and that neither in whole nor in part has this work been presented for the award of any degree elsewhere.

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DEDICATION

This thesis is dedicated to my late father, Kwasi Sasu-Mensah.

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LIST OF ACRONYMS AND ABBREVIATIONS

ABS	Anti-Lock Braking System
AKATA	Accra–Kumasi–Tamale Road Corridor
ANOVA	Analysis of Variance
BRRI	Building and Road Research Institute
CSIR	Centre for Scientific and Industrial Research
DALYS	Disability Adjusted Lost Years
DFR	Department of Feeder Roads
DUR	Department of Urban Roads
DVLA	Driver Vehicle and Licensing Authority
FGD	Focus Group Discussion
GCAA	Ghana Civil Aviation Authority
GDP	Gross Domestic Product
GHA	Ghana Highway Authority
GOG	Government of Ghana
GPHA	Ghana Ports and Harbours Authority
GPRTU	Ghana Private Road Transport Union
GRC	Ghana Railway Corporation
GRCS	Ghana Red Cross Society
GRF	Ghana Road Fund
GRSP	Ghana Road Safety Project
GTTC	Government Technical Training Centre
ICAO	International Civil Aviation Organisation
IDW	Index Distance Weighting
IPSS	Infrastructure Planning and Systems Software
KIA	Kotoka International Airport
LI	Legislative Instrument
MMDA	Metropolitan, Municipal and District Assembly
MMWR	Morbidity and Mortality Week Report
MOH	Ministry of Health
MOT	Ministry of Transport
MOTC	Ministry of Transport and Communications
MRH	Ministry of Roads and Highways

MRT	Ministry of Road Transport
MTTD	Motor Traffic and Transport Department
MTTU	Motor Traffic and Transport Unit
NAS	National Ambulance Service
NGOS	Non-Governmental Organizations
NRSC	National Road Safety Commission
NRSS I	National Road Safety Strategy One
NRSS II	National Road Safety Strategy Two
NRSS III	National Road safety Strategy Three
NVTI	National Vocational Training Institute
OECF	Overseas Economic Cooperation Fund
PMMP	Pavement Maintenance Management Programme
RTAs	Road Traffic Accidents
RTCs	Road Traffic Crashes
SPSSS	Statistical Package for Social Sciences
SSATP	Sub-Saharan African Transport Programme
TEU	Twenty Foot Equipment Unit
UTP	Urban Transport Project
VELD	Vehicle and Licensing Division
VLTC	Volta Lake and Transport Authority
VMT	Vehicle Mass Transit
VRA	Volta River Authority
WHO	World Health Organization

ABSTRACT

Ordinarily, the growth of the road transport industry and its relationship with development should not be antithetical to development, if such growth is in tandem with the adequate transportation infrastructure services, which are perceived as part of the daily rhythm of the development process. A reliable transport network is essential to public safety, economic vitality and the overall quality of life. Unfortunately, the Accra–Kumasi–Tamale highway, the busiest trans-national corridor in Ghana linking the three Salelian Countries, is fraught with traffic accidents, albeit at different spatial levels and magnitudes, a situation which threatens both national development and public health.

Using the systems theory as a theoretical framework, this study investigates the factors contributing to road traffic accidents on the said corridor. To achieve the set objectives, data were drawn from a questionnaire survey of 245 respondents and 3 focus group discussions. This data was complemented with official reports and archival data extract from Ghana's *Daily Graphic newspaper*, between 1980 and 2010.

The results revealed that road traffic accidents normally occurred during the evening peak rush hours of 16:00–18:00 hours, possibly due to visibility problems. In terms of contributions, the results showed ineffective institutional arrangements at the district levels and inadequate financing of road safety activities. Aside the lack of commitment at the district levels, other human factors such as recklessness of drivers also featured prominently. The study opines that for effective road safety management such activities shall be structured and implemented at the regional and district levels instead of the current broad-based "National Safety Committee" approach.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

The importance of effective transport to socio-economic and political development has long been established (Addo, 1979; 2012; Abane, 2010; 2012; Abane et al., 2010). The provision of road networks and transportation systems connect settlements and open them up to investment opportunities. Significantly, available transport literature is replete with examples of how socio-economic activities in countries have been positively impacted and transformed due to the provision of a transport infrastructure (Hurst, 1974; Addo, 1979). Indeed, contemporary economic activities have been accompanied by a significant increase in mobility as a result of higher levels of accessibility. However, in most developing countries, transport systems have posed a continuous challenge to satisfying mobility needs to support economic development (Leinbach, 1986).

While acclaiming the importance of transport development, it is necessary to bear in mind that as with all human activities, providing transportation is not a panacea to solving all development problems. In one respect, the role of transportation in socio-economic development is neither direct nor automatic (Abane, 2012). Relatedly, Wilson (1996) notes that transportation does not actually possess the supposedly magic wand people attribute to it. He also posits that we consider investments in transportation just as we consider investments in other areas, bearing in mind that deliberate policies are the key.

Abane (2012) further refers to the fact that investment in transportation has the potential to spell doom and often compels beneficiaries to complain, wishing such a component had

not been included in the system. This component, he says, includes various disasters, which he listed as follows:

i. air pollution in our cities;
ii. severe traffic congestion, which makes travelling personally and financially inconvenient and time-consuming;
iii. oil spillage, which sometimes results in devastating environmental challenges, including damage to flora and fauna; and
iv. vehicular crashes that maim and kill both young and old, and an increase in the world's Disability Adjusted Life Years (DALYs).

Broadly, Abane's postulations indicate that road traffic crashes (RTCs), otherwise referred to as road traffic accidents (RTAs), are generally unintended and preventable. This is in accord with the assertion of the World Health Organisation (WHO) in 2009 that RTCs are increasingly becoming a threat to public health and national development in many developing countries (WHO, 2009). Principally, RTCs contribute to poverty by causing deaths, injuries, disabilities, grief, and loss of productivity and material damage (WHO, 2002).

According to Krug (1999), many people are oblivious of the fact that accidents are preventable. This is reinforced by the WHO Strategy Report of 2002, which indicated that road traffic injuries are the 10th leading cause of all deaths, based on DALYs. The organization projects that the number of deaths from RTCs could reach 8.4 million in the year 2020 (WHO, 2009). According to the WHO and the World Bank Report on the Global Burden of Disease Project, deaths from non-communicable diseases are expected to rise from 28.1 million per year in 1990 to 49.7 million by 2020 (an increase in absolute

numbers of 77%), and RTCs will contribute significantly to this rise. In conclusion, the WHO report suggests that road traffic injuries are expected to move from ninth to third place in the rank of disease burden by the year 2020 (See Table 1.1).

Table 1.1 Projected rank of order of disease burden for 10 leading causes of death from 1990–2020 in developing countries

1998	**2020**
Lower respiratory infections	Ischemic heart disease
HIV/AIDS	Unipolar major depression
Perinatal conditions	***Road traffic injuries***
Diarrhoeal diseases	Cerebrovascular disease
Unipolar major depression	Chronic obstructive pulmonary disease
Ischemic heart disease	Lower respiratory infections
Cerebrovascular disease	Tuberculosis
Malaria	War
Road traffic injuries	Diarrhoeal disease
Chronic obstructive pulmonary disease	HIV/AIDS

Source: WHO (2009)

Table 1.1 indicates that RTAs are projected to be the third leading cause of death in developing countries by the year 2020. High growth rates in vehicle population, poor road conditions, reckless driving, and non-adherence to traffic regulations (due to corruption) are the reasons the WHO adduced for the increase in RTAs (Pierce & Maunder, 1998). The WHO (2009) concluded that the majority of people in developing countries are

dependent on public transport for their daily movement; and because the public transport system is not so well developed in developing countries, its corresponding accident rates tend to be higher than those of private transport systems. This accounts for the high incidence of traffic accidents in developing countries. It has also been noted that the proportions of victims of RTAs seriously injured or killed are higher in developing countries than in developed countries (Sonderland & Zwi, 1995). Evidence from these earlier studies shows that many industrialized countries appear to have introduced interventions that have reduced the incidence of road traffic injuries and improved survival rates of the injured, but this cannot be said in the case of developing countries.

The RTA scenario in Ghana is no different from that of other developing countries (Asogwa, 1992). According to the Ministry of Transport (MOT, 2007), Ghana has considerable problems with road safety. These range from legislative, to administrative, institutional, and procedural inadequacies. Some of the specific challenges referred to include high fatality rates; poor knowledge and skills in driving; poor maintenance of vehicles; inadequate institutional capacity for vehicle inspections; inadequate capacity for traffic safety and engineering; and poor traffic enforcement capacity and tactics. In addition, the vehicle fleet on the roads appear to be old and poorly maintained. Vehicle examination, driver licensing, and driver training systems were also found to be poor. The extent and magnitude of the challenges pose a threat not only to road safety management but more importantly to the overall economic development agenda of the country.

1.2. Statement of the problem

The importance of road networks to the socio-economic development of any economy has never been disputed (Adu, 2009). Writing on road infrastructure development, Lingaitiene

(2006) states: A well run and effective transport development does not depend on its service creating value, but it is also a necessary precondition for the successful fields of the economy and the quality of well-being? By implication, Lingaitiene suggests that road infrastructure is one of the fundamental determinants of a successful sustainable development agenda. The statement amplifies the fact that an efficient road network is a necessary requirement for accelerated economic growth and human well-being, the ultimate goal of development.

The Government of Ghana (GOG) has over the years made strenuous efforts to finance and develop the road network countrywide. A review of the country's past budgets shows that road construction and maintenance are allocated large percentage of the annual expenditure. In both the 2007 and 2008 financial years, the road transport sector alone was allocated 35% of the country's investment budget (MOT/NRSC, 2008), which clearly exemplifies the government's commitment to improving the road sector. Even the budget prepared in 2013 show clearly an increase in budget expenditure on road infrastructure. For example, in 2013 the budget allocation on road infrastructure was increased to 333,976,881 Ghana Cedis in 2015 (MRH, 2015).

Despite the huge investment in road infrastructure development in the country, the country is yet to reap the benefits of its investments, largely due to the increasing death toll on the roads. The situation has become so worrisome that the road environment is now described as a 'death trap' and increasingly perceived as a major development and public-health issue, causing pain and hardship to most Ghanaians (NRSC, 2002).

According to annual road safety report by the NRSC, 9,152 RTCs were recorded in Ghana between January and December 2014, involving 14,895 vehicles (Republic of Ghana 2014. The total number of casualties was 1,836 deaths and 11,027 injuries, as against the casualties recorded the same period in 2013, which shows a decrease by 0.25%. There was, however, an increase of 3.92% in the number of injuries. The high injury rate is very disturbing. The report concludes that the road environment provided a crucial backdrop to the increased crash rates and that the crash rates did not follow the decreasing trend projected by the National Road Safety Strategy II, (Republic of Ghana. 2014).

Like most developed countries, RTA is of great concern to the Ghanaian government because of the huge loss of national resources, both capital and human (WHO, 2009). The adverse effect on society is incalculable. Working parents are killed or injured in traffic accidents, leaving behind children to be catered for by others. Casualties from traffic accidents impose a heavy burden on specialized healthcare facilities (Asogwa, 1992). In addition, the cost of repair and replacement of damaged vehicles is a drain on resources that otherwise could be allocated to other priority sectors, such as improving education, agriculture, and health. The country pays dearly for modernizing its transportation systems and increasing mobility in the absence of compensatory mechanisms to aid road safety.

Prior studies on the causality of road accidents, particularly in developing countries, indicate that crashes are influenced by an interface between the road, the user, and the vehicle, particularly when the conditions on the road are very poor (Afukaar, 2001). One would have expected that the massive investment in Ghana's road infrastructure, as evidenced by annual budgetary allocations, therefore should have led to a commensurate decrease in RTAs and fatalities. Yet according to NRSC, the Accra–Kumasi–Tamale

(AKATA) Corridor remains one of the most accident-prone roads in Ghana linking the three Sahelian land-locked countries of Burkina Faso, Mali and Niger. Due to the corridor economic important, the government has over the years made conscious effort to address some of the challenge comforting that road. These include asphalting large sectors of the corridor. How the corridor still remains 'accident-prone' and a 'death trap' is a question to explore in this study.

Academic work on the AKATA Corridor is scanty in spite of the fact that the corridor remains one of the busiest international highways, traversing five different regions in Ghana. There is therefore a large knowledge gap in literature on the subject, as the few earlier studies focused only on behaviour as the factor in influencing traffic accident casualties. This study therefore attempts to bridge this knowledge gap by exploring a comprehensive the set of factors that contribute to the high rate of RTAs on the corridor. The study intended to contribute to the literature on transport geography in Ghana as it attempts to analyse the relationship between traffic accidents and their impact on national development processes.

1.3. Research questions

Research questions that emerged as a result of the statement of the problem are the following:

i. Is the physical factor important in influencing the rate of traffic accidents on the AKATA Corridor?
ii. What institutional factors affect the rate of traffic accidents on the corridor?
iii. Are behavioural factors responsible for the high RTA rates on the corridor?

1.4. Objectives of the study

The main objective of this research is to investigate and identify the factors that contribute to the increasing RTAs on the AKATA Corridor. Following from this broad objective, the study was undertaken with several specific objectives:

i. to examine the environmental (physical) factors that influence the number of traffic accidents;
ii. to evaluate the institutional arrangement in maintaining road safety in the country;
iii. to assess the potential behavioural factors responsible for RTAs, and
iv. based on the findings of the study, to draw up recommendations for policy consideration aimed at reducing the number of RTAs.

1.5. Research propositions

Several studies have demonstrated the role of negative behaviour in causing RTCs. It is widely reported in Ghana and across the globe that 80–90% of all traffic crashes result from the negative attitudes, behaviour, and perceptions of road users, including drivers, motorcycle riders, and pedestrians (Amegashie, 1989; Abane, 1994, 1995, 2004, 2010; Jørgensen & Abane, 1999; Obeng-Odoom, 2010). Attitudes consist of three basic components: perception (emotional impression), cognition (thought), and behaviour. Perception is largely an enduring predisposing factor towards a particular aspect of service or the environment (Asogwa, 1992; Assum, 1997). Attitude influences behaviour, and so actions arising from people's behaviour are likely to have positive or negative implications for what a person is doing—including driving. On the basis of this, it is proposed that:

i. The rate of traffic accidents on the AKATA Corridor could be attributable to environmental (physical) factors.
ii. The prevalence of the accidents may be influenced by negative behavioural factors.

iii. Weak enforcement of traffic rules may be an institutional factor contributing to these accidents.

1.6. Justification of the thesis

Ghana's central problem in road safety has been identified as indiscipline, especially among motorists/drivers (MTTU, 2011). Indiscipline results in recklessness and other unacceptable behaviours that lead to total disregard for traffic rules and regulations. Indeed, within the past decade a global census has revealed that Ghana's road safety institutions need to be strengthened in the legal, administrative, and financial spheres to enable them to deliver positively. The reason is that such institutional capacity-building has thus far been inadequate. This study therefore seeks to contribute to a deeper understanding of the factors responsible for RTAs and related injuries on the AKATA Corridor. For road transport policy makers, the findings of this study can prove valuable in the process of planning and evaluating road safety measures and strengthening the capacity of appropriate institutions in ways that could be replicated elsewhere in the country. Aspects of the findings can prove helpful to health authorities and traffic law enforcement agencies. In addition, the results and findings can form the basis for future research.

1.7. Organization of the study

This thesis is organized into six chapters. Chapter One introduces the study by providing a background to the study. It captures the problem statement, research objectives, research propositions, justification for, and structure of the study. Chapter Two reviews the literature and conceptual issues and focuses on RTAs in the Ghanaian situation. It continues with the theoretical perspectives and models underpinning the study. It also

profiles Ghana's transport system. The third chapter deals with the research methodology. The analysis of field data (both quantitative and qualitative) forms the basis for discussion in Chapters Four and Five. Chapter Four examines the transport and development nexus with a view to outlining major engineering and historical antecedents of reported traffic accidents on the AKATA Corridor. It ends with a discussion on institutional arrangements for RTAs on the corridor and appraises the work of agencies in the road safety management chain. Chapter Five discusses behavioural factors responsible for RTAs on the corridor. Risk perception and gender dynamics are all analysed. Finally, Chapter Six summarizes and provides recommendations for policy consideration and outlines new areas for further research.

1.8 Definition of terms

This study makes use of the following relevant definitions:

1.8.1 Behavioural factors

Behavioural factors include negative attitudes and perceptions of road users: drivers, motorcyclists, and pedestrians. Behavioural or human factors are described as the background factors (event, circumstance, action, fact, etc.) that increase the probability for a specific outcome, especially accidents.

1.8.2 Blood-alcohol concentration (BAC)

This is the amount of alcohol in a driver's bloodstream, usually expressed in the form of grammes per decilitre. A legal BAC limit refers to the maximum amount of alcohol permitted by law in a driver's bloodstream.

1.8.3 Breathalyser

An instrument that measures the relative quantity of alcohol in a person's breath (as he exhales).

1.8.4 Crash severity

This measures the state of the most seriously injured victim.

1.8.5 Casualty

Casualty refers to a person injured or killed in a traffic crash. Thus, the crash is the event, whereas the casualty is the individual victim.

1.8.6 Demographic factors

These relate to the personal characteristics of a population. In the context of this study, these factors refer to the socio-economic characteristics of the population expressed statistically, and they include factors such as age, sex, and education.

1.8.7 Environmental/physical factors

These are classified in terms of

(i) the component of the traffic system:

a. environment; b. vehicle; c. human

(ii) level in the causation process:

a. background; b. trip-related driving task

By this classification, different domains of factors apply to the role the factors play during traffic interaction with the driver. The environment refers to the physical body of the human being and the vehicle. It includes the roadway system (transport and traffic modes, infrastructure and road types), natural surroundings, defined geology, nature, air, light,

weather, road types, and all information that can be perceived by humans via their senses (light, sound, smell, vibration, temperature).

1.8.8 Fatal crash

A fatal crash is an accident in which there is at least one casualty that dies from their injuries within 30 days of occurrence of the crash.

1.8.9 Fatality

This refers to the death of a crash victim within 30 days of the occurrence of the crash.

1.8.10 Fatality rate

Number of persons killed in accidents involving 10,000 registered vehicles.

1.8.11 Junction

Any place at which two or more roads meet, regardless of the angle of the intersection, and parts of such roads lying within 25 metres of that place.

1.8.12 Non-urban

This refers to areas not falling under the definition of *urban*.

1.8.13 Pedestrian

This refers to a person travelling on foot, whether walking or running on a road (beside/in the vicinity of the road).

1.8.14 Population risk

Number of persons killed per 100,000 human population.

1.8.15 Risk

This factor refers to exposure to the possibilities of loss, harm, or damage (to people or property or both).

1.8.16 Risk perception

This factor is the subjective judgement that people make about the characteristics and severity of a risk—for instance, traffic accidents. In other words, it is the assessment of danger or lack of danger associated with an action or an activity.

1.8.17 Road infrastructure

This refers to road facilities and related space, including the network, parking spaces, drainage systems, bridges, and pedestrian walkways.

1.8.18 Road traffic accidents/crash

This refers to a collision between two vehicles, a vehicle and an object, or a vehicle running into a ditch. Such accidents are those that cause damage, injury, or death on a public road, with at least one person injured or killed.

1.8.19 Road-user

A non-motorized person using any part of the road system.

1.8.20 Roadside furniture

This refers to functional objects by the side of the road, such as lamp-posts, telephone poles, and road signs.

1.8.21 Seatbelt

This is a vehicle occupant restraint worn to protect an occupant from injury, ejection, or forward movement in the event of a crash or sudden deceleration.

1.8.22 Traffic management

Traffic management refers to planning, coordinating, controlling, and organizing traffic to achieve efficiency and effectiveness of the existing road capacity.

1.8.23 Urban

Urban refers to city or municipal areas, characterized by a concentration of residential, commercial, and industrial buildings and activities.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL ISSUES

2.1. Introduction

Many factors contribute to RTAs on major roads worldwide. An account of the salient factors is critical in comprehending the magnitude and scale of the accident problem. This is against the background that a traffic accident problem needs to be clearly defined, properly analysed, and contextualized while seeking its solutions. This chapter reviews the relevant theories and concepts related to the causes of RTAs. The study takes a longitudinal view of RTAs and the Ghanaian context and identifies general causal factors of traffic accidents. As part of the review, the chapter also outlines the theoretical perspectives and the conceptual framework underpinning the study.

2.2. History of road traffic accidents in the world

RTAs have become a serious global challenge. Long before cars were invented, RTAs and injuries occurred involving carriages, carts, animals, and people. The numbers grew exponentially as cars, buses, trucks, and other motor vehicles were introduced and became common. On 30 May 1896, a cyclist in New York was the first recorded case of injury involving a motor vehicle, and on 17 August in the same year a London pedestrian was the first recorded motor vehicle death (Peden, 2004).

According to the WHO (2015) in its third global status report, road traffic injuries claim more than 1.2 million lives each year and have a huge impact on health and development. The report showed that lower- and middle-income countries are the hardest hit, with double the fatality rates of high-income countries and 90% of global road traffic deaths. Thus RTAs are not a new problem only in industrialized countries but in developing

countries as well (Zwi, 1995). Researchers believe that road traffic death rates in many high-income countries have stabilized or declined in recent decades, while they are getting worse in developing countries (WHO, 2009). These observations give credence to the supposition that low- and middle-income countries are the most affected by the burden of the world's injuries and fatalities attributable to RTAs (WHO, 2009).

Although middle-income and low-income countries operate less than 50% of the world's vehicles, they account for over 90% of reported RTC fatalities. Middle- and low-income country RTC rates are estimated at 19.5 and 21.5 per 100,000 population, respectively, compared with 103 per 100,000 population for high-income countries (WHO, 2009). The WHO further reports that a substantial proportion of those who die through RTCs are pedestrians, cyclists, and users of motorized two-wheelers; these are generally considered the 'vulnerable' road users. Most of the deaths affect persons aged between 5 and 44 years (WHO, 2009). The figures show that developing countries are losing substantial proportions of children and working persons through RTCs, and this has obvious implications for sustainable development.

2.3. Road traffic accidents in Africa

Africa and the Eastern Mediterranean region share the unenviable top spot in records of road traffic injury fatality rates (WHO & World Bank, 2009). Nigeria, Egypt, and Ethiopia are among the top ten countries reporting the highest number of fatalities (WHO, 2000). Such growth in premature deaths is yet another example of the widening gap between developed and developing countries.

According to WHO (2000), African countries have demonstrated very high fatality rates compared with other continents. The analysis indicates that RTCs and injuries constitute major health, economic, and developmental challenges to developing countries, especially those in Africa. Of the estimated 1.2 million people killed in RTCs, 90% occurred in Africa (Peden, 2004). Although the number of vehicles in African countries is very low, the fatality rate attributable to traffic accidents is extremely high. Africa has the highest fatality rate in relation to population (28.3 per 100,000), after adjusting for under-reporting. This is substantially higher than other motorized countries in the world, such as those in the Americas (12.1–16.2 per 100.000) (Peden et al., 2004). With increasing motorization in African countries, road crashes and injuries are expected to grow at a faster rate, threatening the economic and human development of this poor yet promising continent (Nantulya & Reich, 2003; Lagarde, 2007). It is therefore necessary to reduce the number of accidents in most African countries.

Another striking feature of RTCs and injuries in Africa is its high involvement in and impact on the most vulnerable road users: pedestrians and passengers in public transport. The literature review shows that pedestrians account for more than 40% of casualties in most African countries. For example, between 1993 and 2000, pedestrians accounted for 55% of road traffic deaths in Mozambique (Romao et al., 2003). Pedestrian casualties also accounted for 46% of road deaths in Ghana between 1994 and 1998 (Afukaar, 2003). Pedestrian and passenger crashes represented 80% of all traffic casualties in Kenya in 1990 (Odero, Melchizedeck & Heda, 2003). The situation is an overwhelming burden on the most vulnerable road users and their families, especially the poor and the less-educated. This development has become a health as well as an economic issue facing African nations.

Afukaar (2003) asserted that RTCs and injuries have slowly improved in the past decade in higher-income countries; on the other hand, he cites traffic safety in developing countries, including South Africa, as worsening in general. He posited that the number of reported crashes increased by 62.8% (from 6,850 to 10,715) in developing countries. Again, the number of reported traffic crashes increased by 48.8% (from 7,663 to11, 405), while the number of traffic fatalities increased by 65.3% (from 824 to 1,362) in Ghana between 1994 and 1998, his report concluded. Also, between 1965 and 1998, traffic crashes increased by over 300% (from 3,562 to 14,342), while the number of people killed also increased over 500 % (from 552 to 2,972) in Kenya (Odero et al., 2003). In South Africa, the rate of increase slowed down somewhat in 1990 after a dramatic increase in traffic casualties along with economic expansion and motorization in the previous decade.

During that 10-year period between 1985/6 and 1995/6, road fatalities in South Africa increased by 5% (over the whole ten-year period). This development was a remarkable improvement from the 120% increase reported in the 2009 period. The reverse was the case in Nigeria in the 1980–1990s (Nantulya & Reich, 2003). The conclusion here is that road traffic fatality rates in Africa are anticipated to increase by 80% between 2000 and 2020, if major changes in policies and strategies do not take place within the foreseeable future (Peden, 2004.)

Poor traffic safety has a corresponding effect on economic growth in Africa (Kopits & Cropper, 2005). A booming economy with rising motor vehicle ownership is often accompanied by increased traffic collisions and injuries. However, crashes can increase even during economic stagnation or downturn, given certain conditions. In the last couple of decades in the 20th century, the economies of most developing countries experienced

strong growth, but not those in Africa—and especially not those in Sub-Saharan Africa. Some countries are even poorer today than they were 30 years ago. Sub-Saharan African countries have had the lowest Gross Domestic Product (GDP) for decades (Ikejiaku, 2009). Inadequate economic activities and financial resources mean individuals cannot afford to buy new and safe vehicles, while governments are more likely to retain old vehicles and defer maintenance. It can also mean that governments postpone funding the maintenance of existing infrastructure, let alone building new infrastructure.

The conclusion is that road fatalities continue to increase. Over the period from 1987 to 1995, the Ghana Road Safety policy states that deaths in Africa, excluding South Africa, went up by about 26%. Interestingly, although the reports show rapid increases in road fatalities throughout the 1970s and early 1980s in Africa, there is evidence that it is now slowing down somewhat; nevertheless, the problem is still a cause for concern.

2.4. Road traffic accidents in Ghana

According to NRSC (2012) data on reported RTCs in Ghana, the number of traffic accidents is characterized by severe inconsistency, as it declines in some periods and then rises again, sometimes even more steeply than before (see Table 2.1). For example, the period 2001–2003 saw a steady decline from the 14,650 crashes recorded in 2000. This changed in 2004, however, when a 13% increase was reported. There was a slight intermittent reduction in the numbers reported after 2004, but the total number of RTCs for 2007 and 2009 exceeded those for 2006, 2008, 2010, and 2011. The failure to reduce the frequency of crashes, together with the rather large number of people killed or injured annually, makes Ghana one of the leading contenders for the title of the most crash-prone country in West Africa, after Nigeria and the Republic of Benin.

Table 2.1 Ghana's road traffic crash returns (2000–2010)

YEAR	CASES REPORTED	NUMBER OF VEHICLE INVOLVED
2000	14654	21,152
2001	11,853	17807
2002	11872	18337
2003	13039	18961
2004	14734	20353
2005	12903	19122
2006	11668	17877
2007	12038	17496
2008	11214	17608
2009	12229	17404
2010	11506	18584
2011	13572	19530

Source: NRSC, 2011: MTTU Quarterly Reports, 2010

The annual report on RTCs in Ghana by the NRSC (2009) reports crashes and casualty statistics from 1991–2009, in which a cumulative total of 189,172 crashes involving 292,491 vehicles were recorded over the 19-year period. Injury crashes constituted 61% of all crashes and produced a casualty toll of 255,799. Over the period (1991–2009), the estimated national population grew by 63%, while the estimated population of registered vehicles increased by 680%, taking into account annual vehicle write-offs.

The report also indicated that the number of RTCs in 2009 (12,299) represented an increase of 9.7% and 8.9% over the 2008 and 2001 figures, respectively. The number of fatal

crashes and their resulting fatalities in the previous year were the highest ever registered in the country. Compared with the 2008 figures, fatal crashes increased in 2009 by 8.7% and fatalities by 15.4%. Again, there was a significant increase of 12.3% in the overall number of casualties. Relative to the year 2001, the 2009 figures for fatal crashes, fatalities, and overall casualties recorded corresponding increases of 42.4%, 34.8%, and 24.7%, respectively (NRSC, 2012).

The increase in the road traffic fatalities in 2009 over 2008 is very significant and poses a great challenge to the realization of the objectives of the road safety strategy in the country. In general, the changing number of RTCs in Ghana does not adhere to the decline forecast by the Road Safety Strategy objective in the National Road Safety Strategy II (NRSS II), which aims at reducing fatalities on a year-on-year year basis to achieve a total of less than 1,000 per year countrywide by the year 2015. Rather, there has been a consistent average rise of 80 fatalities per annum since 1991. From the fatality trend observed over the years, it is obvious the NRSC II target of 1,280 fatalities by the year 2010, which means reducing the 2009 figure by almost 40%, was not achieved. There is thus a need to review the current Road Safety Strategy to set more realistic targets. This should be considered against the background of the fact that more traffic accidents are occurring on the highways than on other roads (NRSC, 2012).

Fatalities on roads in urban or built-up areas in Ghana have continued to follow a gradual and upward linear trend since 1991. An increase of 12.6% in fatalities was experienced from year 2008 to year 2009 on urban roads. In non-urban areas in Ghana, primarily on trunk roads, fatalities have undergone a rather steep climb, which began in 1997. Though a considerable drop was experienced in 2005, the figures are on the rise again. The

regression line for non-urban areas showed that the 2009 level of fatalities (1,556) was higher than the projected fatalities of 1,491. This gives an indication that fatalities on non-urban roads have risen sharply lately. There was a rise in fatalities of 16.7% from 2008 to 2009 on non-urban roads, contributing significantly to the worsening road safety situation in the country. Overall, the split of fatalities between urban and non-urban areas is in the ratio 1:2. It is also evident that in the last two years, the rise in fatalities in the non-urban road sections has been very steep.

With the implementation of NRSS I (2001–2005) and NRSS II (2006–2010), the trend in RTCs indicates that the annual growth in fatalities (1991–2000) was an average of 60 deaths, while that of 2000–2010 showed an average of 46 deaths. This is a 29% reduction of fatalities in Ghana over the two decades.

2.4.1 Causes of road traffic accidents in Ghana

Research on the causes of RTCs and on general safety issues in Ghana is steadily growing. The information available suggests quite strongly that trends are not too different from those reported elsewhere in Africa, Europe, Asia, and the Americas. It is perhaps the degree and the intensity with which governments in these geographical locations approach the issue, in terms of reducing its occurrence and impact, which however differ substantially.

Specific theories and conceptual frameworks that have a bearing on the causes of RTAs and the extent to which they are relevant in Ghana are incorporated in the discussion that follows. It is widely reported that in Ghana, as is the case worldwide, 80–90% of all RTCs result from the negative attitudes, behaviour, and perceptions of road users (drivers,

motorcycle riders, and pedestrians) (see for example Amegashie, 1989; Abane, 1994, 1995, 2004, 2010; Chilaoutakis et al., 1999; Jørgensen & Abane, 1999; Afukaar, 2001, 2003; Horswill & Coster, 2002; Elvik & Bjørnskau, 2005; Obeng-Odoom, 2010).

Given this clarification, it is possible to identify various aspects of the behaviour of drivers/riders responsible for the reported RTCs in the country. Two of these aspects are drunk-driving and substance abuse. Data from the MTTU suggests that driving under the influence of alcohol and hard drugs contributes 10–15% of crashes (MTTU, 2011). The problem is not necessarily peculiar to Ghana. In 1995, for instance, 32% of reported RTC fatalities worldwide were attributed to drunk-driving (Burgess & Lindsay, 1997). Many recent micro-studies have also confirmed this relationship in several countries. Abdel-Aty and Abdelwahab (2000), in a survey of drivers involved in traffic crashes in the State of Florida (USA), discovered a significant relationship between driver characteristics and alcohol involvement. Horwood and Fergusson (2000), who investigated drunk-driving and traffic crashes among 90 young New Zealanders, also found alcohol consumption to be significantly related to traffic crashes. According to these authors, drivers found to be engaged in high rates of drunk-driving recorded rates of active crashes as much as 1.5 times higher than those who did not drive while drunk. Miller and Blewden (2001) also observed that alcohol-related vehicle crashes cost New Zealanders 1.2 billion New Zealand dollars in 1996 and that one in 90 drunk-driving trips ended in a crash.

Speeding is another aspect of deviant driving behaviour that exposes people to the risk of a crash. This issue has been widely discussed on the airwaves and reported in the local media. Worldwide there is much literature on it. In a publication on road safety in the United States, Peltzman (1975) sought to explain how the improvement of safety devices

in vehicles and road infrastructure ended up encouraging speeding and causing even higher numbers of deaths on the road than before. Labelling it the 'risk compensation hypothesis', Peltzman argued that manufacturers, in their desire to improve road safety, provide vehicles with in-built devices such as airbags, seatbelts, dual braking systems, anti-lock braking systems (ABS), and laminated windscreens. Governments and local authorities also improve road conditions by straightening out intersections, providing signs and markings, and tarring roads. Unfortunately, roads users interpret the improved conditions differently. Perceiving themselves to be well protected in the vehicles as well as on the upgraded roads, the incentive to speed increases (risk-taking). This puts the vehicles at the risk of fatal crashes since speeding replaces the previous risks (e.g. poor road conditions) as a cause of crashes. In statistical terms, RTCs are a function of the availability of vehicle safety devices (VSD), road improvements (RI), and speed (S):

$$\mathbf{A=C + b\ (VSD) + b\ (RI) + b\ (S) + E}$$

Where,

C represents the number of crashes;

VSD represents vehicle safety devices;

RI relates to road improvements undertaken;

S represents speed;

b is a constant, and;

E is an error term;

Recent studies have either directly or indirectly sought to test this hypothesis using various methods. For example, it has been found in Norway that modern vehicles, especially cars that have more sophisticated safety features than older vehicles, have higher probabilities

of both damage-only and injury accidents, when driver mileage, age, gender, and region have been controlled (Fosser & Christensen, 1998: 86). The explanation offered for this offsets the kind of benefits expected from the improved features installed in the vehicles.

Related to this is the argument that different types of vehicles have different associated crash risks (see for example Evans, 1991; Horswill & McKenna, 1999; Horswill & Coster, 2002), a situation attributed partly to the way drivers underestimate speed when behind the wheels of some vehicles and partly to the fact that certain types of vehicles engender driving styles that influence crash risk. For instance, it has been found that certain in-vehicle engineering safety devices tend to be associated with quantifiable human behaviour feedback (Dulisse, 2007; Narvaez & Hyman, 2010). Drivers with anti-lock braking systems (ABS) have been observed to drive very close to vehicles in front, fuelling the speculation that ABS brakes do not lead to an overall reduction in crash risks. This is unlike seatbelts, which researches consider to be a more useful device, where human behaviour feedback is close to zero to the extent that 'expected safety increases match actual safety increases' (Horswill & Coster, 2002: 86).

Derry et al. (2007) isolated speed as a major cause of vehicle crashes on some highways in Ghana, while Sam (2011) found a significant relationship between speeding and road crashes on the Accra–Cape Coast–Takoradi Highway. The upsurge of traffic accident fatalities on the N1 (George Walker Bush Highway) on the Accra–Cape Coast–Takoradi Highway is directly attributable to speeding by drivers and the unwillingness of pedestrians to use the foot bridge (NRSC, 2012). In a bid to halt this trend, the NRSC and the MTTU embarked on a massive education programme and enforcement of speed

regulations along this stretch of the road. This strategy—to target speeding in an attempt to reduce the number of road accidents—represents a sound priority.

There is sufficient evidence in the literature on Ghana and elsewhere to show that many of the attitudes and forms of behaviour that result in RTCs are those that ignore road signs and markings. Indeed, many crash reports have shown that most road users lack proper education on the road signs/markings and therefore put their lives at risk on the roads and highways. In a study on knowledge of the road traffic code and safety in the Cape Coast Municipality, Abane (1994) reported serious inadequacies in the ability of a substantial number of drivers to interpret traffic signs and markings, irrespective of the drivers' age, level of education, and sex. None of the respondents scored above 60% in a 20-question test on existing road signs and markings. Road traffic situation in the country also reported similar findings with one in three persons unable also to correctly identify ten randomly selected signs/markings (Abane et al., 2010). But the situation is not peculiar to Ghanaian road users.

Another aspect of the human behaviour responsible for RTCs is the use of mobile telephones while driving/riding (NRSC, 2012). This is a development that is likely to further derail the modest gains made in reducing RTCs in Ghana. Inconclusive statements have been made elsewhere about the relationship between receiving/making telephone calls and RTCs (see for example, MOT/NRSC, 2008; Abane, 2010: 83). The speculation is that this is gradually becoming a major risk factor in the country as the use of mobile telephones expands and becomes a common feature among drivers/riders. What remains unclear is whether one should rule out mobile telephones' association with other actions (e.g. drivers' personal characteristics, inattention and distractions by other events in the

environment) in determining the actual level of risk. Nevertheless, it needs to be understood that using a telephone while driving/riding presents a new challenge in road traffic safety and should be addressed sooner rather than later. Aside from these factors, there are also numerous reports of vehicle crashes resulting from various other actions of drivers, including sleeping and being tired while driving (Maycock, 1997; Connor, 2001) and visual defects (McGwin et al., 2000; Ocansey, 2012).

Since the introduction of motorized forms of transport, manufacturers have tried hard to improve upon the type of vehicles they put on the market. Owing to different tastes and preferences of consumers, vehicle manufacturers find it necessary to specialize in what they perceive will sell faster. It is for this reason that some manufacturers place emphasis on speed, some on the durability of a vehicle, and some on beauty and/or splendour, while others focus on efficiency. The only commonality among vehicles of all types is the element of safety. All vehicle manufacturers are prepared to go to extra lengths to ensure that what they release onto the roads is safe. Thus, they will provide in-built safety devices to assure the user of perceived safety—a kind of insurance against either injury or death through crashes. Defects in these elements will lead to malfunctioning of the vehicle and create conditions that can put the user at risk. This is why some RTCs have been attributed partly to technical problems such as burst tyres, broken steering rods, defective engines, and malfunctioning electrical systems (Ackaah & Afukaar, 2010).

Studies in the Republic of South Africa, Kenya, Ghana, Nigeria, and other African countries have shown that the contribution of mechanical defects to RTCs in Africa ranges between 2% and 2.4% of the total number of RTCs (van Schoor et al., 2001). It is only when these mechanical defects are combined with environmental factors that the

proportions increase substantially, to between 6.2% and 16.0% in Africa. For Ghana, the significant thing about these estimates is that they are among the highest contribution to accidents in Ghana relative to other countries, suggesting that, together, these factors pose road safety concerns for drivers and pedestrians in Ghana.

Table 2.2 Contribution of Mechanical Defects to RTAs

Source	Location	Mechanical defect-related (accident) percent
Sabey & Staughton (1975)	United Kingdom	Alone — 2.0
		Combined — 8.0
Treat (1980)	USA	Alone — 2.0
Jacobs & Sayer (1983)	Ghana	Alone — 16.0
	Botswana	Combined — 12.0
	Jamaica	Alone — 1.0
CSIR (1986)	South Africa	Alone — 2.0
		Combined — 6.2

Source: Extracted from van Schoor et al. (2001: 714)

Another mechanical issue that has been of concern to road safety analysts is the open nature of some of the vehicles on the road, especially wooden trucks and pick-ups, as well as mini-buses, originally designed for luggage only but now officially or unofficially converted into commercial vehicles (Abane, 1995). These vehicles are responsible for some of the most lethal accidents on roads. Owing to the fact that they are not enclosed, occupants are easily thrown off when the driver negotiates sharp turns. Some are enclosed,

but the seats are make-shift ones, locally-designed, to allow passengers to be seated, and so the occupants easily get dislodged when there is a crash, leading to serious fatalities. Anecdotal evidence suggests that some 5–8% of all road crashes recorded on rural roads in Ghana are attributable to this factor (Abane et al., 2010).

The environment in which transport systems operate is both a blessing and a liability, as far as road safety is concerned. It is a blessing when what it guarantees is potential safety, and drivers adapt to the road environment with safety in mind. On the other hand, the infrastructure is a liability if it fails to facilitate safe driving. Numerous studies have identified aspects of the environment that pose risks to road users (van Schoor, 2001; Millot, 2004). One such aspect is the poor condition of many roads used by drivers and other motorists. For example, only 40% of the total road length in Ghana is described as 'good' by international standards, compared with 30% classified as 'poor' (MRH, 2005/2006). Driving on poor roads presents major risks to drivers/riders; they have to contend not only with the problems of human behaviour but also the problems of the physical environment.

2.5. Theoretical perspectives and concepts

RTAs are believed to have various causes. The ultimate aim of all road traffic research and interventions is to help identify and reduce these causes as much as possible. These causes may be complex in nature and are often perceived to be impacted by science and politics (Elvik & Vaa, 2004). In attempting to understand why road accidents occur and proposing guidelines for researching their underlying causes, several theoretical frameworks and models have been proposed. Much of these have to do more with drivers than any other

categories of road users. While some have placed emphasis on individual characteristics, others have focused on institutional as well as socio-ecological factors.

These theories and models have their strengths and weaknesses and none can claim complete scientific coverage of the range of factors implicated in traffic crashes. Though some single theory or model may have gained universal acceptance among the traffic crash research community, they have not shaped our understanding of the road safety problem in any significant way.

This study applied various theories in social and behavioural science, including the systems theory, the risk theory, and the institutional theory in the literature review. The geographical approach concerning the time factor, spatial variation, and regional distribution is also applied in this study. These approaches were used with the understanding that theories are vital in stating research problems and are also effective in choosing the right methodologies that help in carrying out an empirical study.

2.5.1. The geographical theory

According to Rune (2002), most research on road safety does not have a strong theoretical basis to guide the design of the studies and interpretation of the findings. For Rune, this means the lack of a strong theoretical basis for research, which also means that some results of road safety evaluation studies can be ruled out on a theoretical basis. In a geographical context, in order to conduct adequate research, theories or models used should be accompanied by concepts of geography plus a literature review to support knowledge.

Examination of the second research problem is founded on the view of Hol-Jensen (2001: 5) that geography exists, among other reasons, to study the evaluation of a phenomenon from place to place; and its value as an academic discipline depends on the extent to which it can clarify the spatial relations and processes that might explain the features of an area or a place. Geographical curiosity starts with the question: 'Why is this here?' To study these variations, various concepts and models are used by geographers.

The geographical approach based on Geographical Matters: Place, Time, Environment and Road Traffic Accidents, which analyses the spatio-temporal relationships of Road Accidents on the Corridor is used as an additional conceptual approach in understanding the occurrence of RTAs in Ghana in relation to land use, road elements, and width of roads, bends in roads, hilly areas, topography, and regional distribution

According to Cutter (1993), a geographic scale is important in understanding technological hazards, their distribution, impacts, and reduction. The dictionary of human geography provides the definition of medical geography as the application of geographical perspective and methods to the study of health, disease, and health care (Johnston, 2000: 374). The import of this statement is that RTAs can be studied in this context. According to Curtis and Taket (1996), the application of geography to road traffic accidents alerts us immediately to two components or domains of study. The first of these is the study of health and disease (which can be extended to include RTAs), which encompasses the analysis of spatial variations in human health or, more often, the lack of health—that is, death/mortality, disease/morbidity, and the search for environmental and social conditions which may be causally related to health or ill health and health behaviour (risk-taking), based on cultures, activities, and economic conditions. Land use patterns, types of road

networks, local business and activity patterns will all influence the system risk in an area, as well as the health risk to the population. There is also a rural–urban differences factor. In urban areas there are more accidents but a lower level of injuries, while in rural areas there are fewer accidents but higher levels of serious injuries and fatalities (Astrom et al., 2006).

The time factor is also vital in the analysis of road accident patterns, because it is relevant to know how trends in RTA patterns are related to hours of the day, days of the month, and seasons of the year. In Tanzania, for instance, it has been observed that traffic accidents increase during festive occasions, especially during the Christmas season, which is also a rainy season.

According to Odero et al. (1997), there is evidence in support of a high incidence of daytime causalities in developing countries. In their view, this can be explained by a greater traffic volume during the day, resulting in greater risk of traffic accidents as people travel to work, children go to school, and commercial enterprises are opening for business. They also found in their study that more than 50% of the weekly traffic injuries occur on Friday, Saturday, and Sunday, with a high peak on Saturdays. Odero (1997) also noted that in Papua New Guinea, reports showed 60% of the weekly traffic injuries were reported in the early mornings.

2.5.1.1. Environment

Both the physical and social environments are key risk factors in RTAs, because they influence road users' behaviour and the condition and movement of vehicles. For instance, pot-holed roads affect driver behaviour and the condition of vehicles. Poor lighting affects

visibility for both drivers and pedestrians. Adverse weather conditions, such as rainy seasons, can make road use particularly challenging. The values and cultural and religious beliefs within the social environment, such as fatalism or beliefs that accidents are just punishments from the gods for wrongdoers, indirectly have a strong influence on road user behaviour.

2.5.1.2 Environmental factor approaches

According to Bener et al. (1992), it is impossible to understand social systems independently of their environments, because society's institutional, structural, and behavioural qualities are all contingent upon environmental parameters. The environment not only provides necessary subsistence materials on which humans depend, but it also restricts such things as movements and organizations' complexity; it is simultaneously permissive and regulatory. The environment can be the social, economic, cultural, physical, or psychological setting, but in this context, it is the physical and economic setting that matters (Rune, 2002:490).

Concerning the physical environment, various climatic threats and geo-hazards such as heat, fog, high winds, snow, rain, ice, flooding, tornadoes, hurricanes, and avalanches do have effects on roads and consequently on traffic accidents (Moen & Rundmo, 2004). The weather (for example, heavy tropical rainfall) also threatens surface transportation and impacts roadway safety, mobility, and productivity. The issue here is that the weather impacts roadway mobility by increasing travel time and delays, reducing traffic volumes and speed, and decreasing roadway capacity. Odero (1997) emphasized that weather and road conditions in terms of road quality, therefore, have a role in the causes of traffic accidents.

The built-up physical and social environment with regard to road networks, the types of roads, and the quality of roads—in terms of 'black spots', road junction layouts, potholes—also have a strong influence on road safety at any particular location (Oluwasanmi, 1993). The area planning and land use patterns also have an impact on traffic accidents. Squatter buildings (which are generally poorly regulated), traffic calming schemes in residential areas, and restricted driving areas as well as traffic separation in a place all impact road safety, because they have a strong bearing on traffic-generating activities as well as problems and solutions to traffic safety efforts (Shibata & Fukuda, 1994). Environmental factors including the design of a road, its geographic location, season, weather, visibility, time of day and traffic regulations, all contribute to a clear understanding of the causal factors in any attempt to design a road safety promotion or preventive programme (Sarungi, 1981:18). For example, well-designed roads with separate lines for pedestrians and cyclists are much safer than those without such facilities.

The super elevation of highway roads such as tilting the road surface downward towards the inside curve has shown a positive effect in reducing motor accidents. The mechanism behind is that the slope produces a force tending to push a car inwards and this interacts with some or all of the centrifugal force, which in turn acts outwards on any object moving in a curve path (Leeming, 1969:26). It has also been observed that accidents occur more frequently on broader roads than on narrower ones (Majumder, 1996). In Nigeria it has regrettably been reported that better roads have resulted in excessive speed and reckless driving, resulting in an increase rather than a decrease in the death toll on national roads (Asogwa, 1992).

There is a relationship between seasonality, weather, and time factors in road traffic accident occurrence. In temperate regions, fatal accidents primarily occur during winter (CSA, 1983). A study conducted by Kong et al. (1996) revealed that most of the accidents occur during the night, weekends, and during the months of October, November, and December.

A study undertaken by Barreto et al. (1997) observed that exposure to high intensity noise at the work place tends to be associated with occupationally acquired hearing defects. These defects increase the risk of motor vehicle injury to pedestrian workers. Travelling long distances to obtain alcohol is associated with increased risk of pedestrian motor vehicle accidents if the pedestrian has to cross roads when going back home (Gallaher et al., 1992). Activities along the roadside, such as petty trading, increase exposure to traffic accidents (Shibata & Sugiyama, 1994). At the same time, improved road quality may lead to behavioural adjustments in terms of risk-prone driving (Jørgensen & Abane, 1999).

2.6. Risk theory

An agreed definition of risk has yet to be articulated. Risk can be defined, for instance, as a subjective assessment of the probability for a specific occurrence of a negative event, and how concerned an individual is with the consequences of this event (Sjørberg, 1983:8 Rundmo & Iversen, 2004). Thus, the combination of perceived probability and severity of consequences relates to how an individual perceives risk. According to Dejoy (1989), road traffic, risk is a function of four elements. The first is the exposure – the amount of movement or travel within the system by different users or a given population density. The second is the underlying probability of a crash, given a particular exposure. The third is the probability of injury, given a crash. The fourth element is the outcome of injury.

Another definition is that risk can also be explained by human error… kinetic energy, tolerance of human body and post-crash care (Bustide et al, 1989).

The second theoretical approach used in RTA research is the risk theory. A variety of factors has been suggested to predict risk perception. Rundmo and Iversen (2004) identified that poverty and poor countries exhibit a higher risk of tolerance culture. People may neglect risk because they are influenced by other existing risks, and in a high-risk society such as a poor country, people experience more severe risks generally. In reviewing existing literature on traffic accidents, Zuckerman (1979) points to the fact that while rates of accidents have fallen in industrialized countries, it is rather on the increase in developing countries. He explains that as developing countries are characterized by poverty, the majority of the people living in these countries are exposed to various risk situations every day.

Risk is also associated with personality traits and attitudes. Some people prefer a higher risk level; they are the so-called sensation-seekers and are found in all societies and cultures (Sjørberg, 1983).

Several variables are thought to influence risk perceptions among the public. Information about risk from various social relations and the media, for example, are thought to shape how individuals and societies approach potential risks (Slovic, 1987). A consequence is that the public does not always associate risk objectively with more dangerous activities (Moen et al., 2005). For instance, during a vacation in Egypt, the statistical probability of being injured in traffic is greater than being struck by a terrorist attack. Nevertheless, many Western tourists tend to worry more about terrorism than traffic accidents. This example

demonstrates that human perception of risk should be regarded as a multidimensional concept, and perception of risk is not always congruent with objective statistical calculations.

When people perceive risk, several factors warrant consideration. The first is the probability of a negative event and the severity of consequences of such an event. In addition, processing theories and appraisal theories account for how relevant theories influence such judgments. The results of research carried out previously on RTAs have shown that the greater the consequences of the negative event, the more the effect will be present when thinking about the risk source, and the more the precautionary action necessary to avoid accidents (Rundmo & Iversen, 2004). According to Thompson et al. (2002), risk compensation is the name given to a theory which states that [an] individual provided with a protective device such as automobile seatbelts will act or behave in a more risky manner because of the increased sense of protection from the seatbelt and thereby nullifies the protection afforded by the seatbelt.

According to Adams (1995) and Wilde (1998), an individual's risk-taking decisions represent a balancing act in which perceptions of risk are weighed against the propensity to take a risk. The propensity to take a risk is influenced by expected rewards, while as perceived threats or danger increase, people respond by being more careful. There is therefore a balancing behaviour influenced by perceived danger and the propensity to take risk, which in turn influences accidents and rewards. If the perceived risk of a situation exceeds our target level, we will act to reduce it; and if the perceived risk is lower than the target level, we will tend to raise our risk back to our target level (risk optimization) through engaging in more dangerous actions. Wilde's term for this process is risk

compensation, a theory which suggests that people typically adjust their behaviour in response to a perceived level of risk and become more careful when they sense greater risk and less careful if they feel more protected. In his view, risk homeostasis is therefore an extreme form of behavioural adaptation.

Dejoy (1989) notes that the target level of accident risk is determined by four categories of motivating factors. The first category comprises factors related to the expected advantages of comparative risks behaviour alternatives. This is expressed by gaining time by speeding when roads are good (risk compensation) (Adams, 1999). The second category comprises factors related to the expected cost of a comparatively risky behaviour alternative; for instance, automobile repair expenses or insurance surcharges for being at fault will fuel the cost of a road accident (Wilde, 1998). The third category comprises factors related to the expected benefit of comparatively safe behaviour alternatives, which Rundmo (1999), for instance, cites as the psychology of insurance discount for accident-free driving. The fourth category comprises factors related to the expected cost of comparatively safe behaviour alternatives—using an uncomfortable seatbelt is cited as an example of positive behaviour that reduces RTAs (Wilde, 1998).

2.7. Institutional theory

The institutional theory was found relevant to this study. This theory emphasizes rational myths and legitimacy, and it helps us focus on the deeper and more resilient aspects of social structure. It emphasizes structures including schemas, norms, and routines established as authoritative guidelines for social behaviour (Powell & DiMaggio, 1991). The constraints are rules, laws, constitutions, self-imposed conducts, and norms of behaviour. Hodgson (2006) defines institutions broadly as durable systems of established

and embedded social rules that structure social interactions. Other proponents of the theory include Veblen (1909) and Becker (1962). There is acknowledgement of the role of institutions in social life, which involves the recognition that most of human interaction and activity are structured in terms of often unstated and implicit rules. Institutions both constrain and enable behaviour. The existence of rules implies constraints. However, such constraints can open up possibilities: they may enable choices and actions that otherwise would not exist. For example, traffic rules help traffic to flow more easily and safely.

In Ghana the public transport industry is an example of an institution governed by various rules and regulations (constraints). The rules and regulations guide the interaction of various industry stakeholders and help shape institutional revolution in general. It is important to evaluate the ways in which traffic rules are enacted and how they affect the individual's behaviour and the existence of operators, commuters, and law enforcers. Rules are associated with both incentives and sanctions. However, it is necessary to explain why an individual or group might or might not take these incentives or sanctions seriously. The institutional theory guides us to do that. Hodgson (2006) prefers a broader conception of institutions that accommodates the informal basis of all structured and durable behaviour. He defines institutions as durable systems, established or embedded social rules that structure social interactions rather than purely as rules.

In contrast, however, laws that restrict behaviour that are perceived to have substantial net advantages when transgressed are the ones that require most policing. Without some policing activity, the law itself is likely to be infringed upon and rendered inactive. Therefore, some external authority to enforce rules is a must (Latzer & Schmitz, 2012). In such circumstances, the intervention of the state may be necessary to maintain the integrity

of the institution. However, it remains an open question whether it is possible and in what circumstances the state or other powerful organizations can facilitate the emergence and stability of other institutions (Menger, 1936).

2.7.1. System of traffic laws, controls and regulations

Ineffective traffic laws and regulations cause chaos on the roadways. One consequence is RTAs. From the three-factor behavioural model by Jørgensen and Abane (1999), the promulgation of traffic laws and policy and their enforcement (or otherwise) play a fundamental role in reducing crash causation. This is because they influence all the three remaining factors: behaviour, vehicles, and environment. Passing traffic laws and enforcing them are important to traffic safety research, for these laws guide behaviour and regulate the conduct of road users. For example, a system of rules prescribing pedestrians' right of way, such as a zebra crossing, obliges motorists to yield to pedestrians. Another traffic policy is the 'vision zero' as applied in Sweden emphasizes zero tolerance for RTAs by providing effective preventive tools and is vital for accident reduction. Vision zero has had a far-reaching, positive impact on traffic safety management, as witnessed in Sweden.

The aim of traffic regulation systems and enforcement is to regulate the traffic environment and ensure system maintenance. Regulation by traffic signalling systems, speed limits, and speed controls, as well as the existence of police patrols and checkpoints can reduce accidents by influencing road-user behaviour. In their study on Norway and Ghana, Jørgensen and Abane (1999) argue that traffic regulation schemes are not systematically implemented in Ghana, and the police service is generally not well-trained, is ill-equipped, and is ill-motivated to enforce regulations; these shortcomings are not features of cities in developed countries. Rivara reported the effectiveness of helmets in pedal cyclists and

motor cyclists (Rivara, 1986). Mandatory use of helmets in Sweden showed the same good effects (Astrom et al., 2006). The effectiveness of helmet use is dependent on the speed of the motorcyclist. According to Astrom et al. (1986), it is more protective at low speeds of 50 km per hour or less, but less effective at higher speeds.

Broughton in England observed that compulsory seatbelt-wearing was beneficial (Broughton, 1991). Seatbelts for both children and adults prevented approximately 50–60% of all fatalities that could have resulted from motor traffic accidents (Rivara, 1986). It is a well-documented fact that the use of child restraints, specifically child safety seats, can reduce mortality in young victims of RTCs (CSA, 1983). Restraints prevent approximately 90% of fatalities in the 0 to 4-year-old-age group (Rivara, 1986). Behavioural intervention and tighter regulations are also important measures (Jayasuria, 1991; Graham, 1993). However, legislative and other counter measures proved effective in Nigeria (Asogwa, 1992). Promotion of road safety through the use of targeted media campaigns at community levels can effectively reduce motor traffic accidents (Tripop, 1994).

2.8 The systems theory

The main theoretical approach of this study is the systems theory, also known as the systems approach (Rasmussen, 1997). This dates back to a ground-breaking study in the 1940s on aviation safety and plane crashes that found that ‘pilot error’ was essentially ‘designer error’. Since then, the theory has engaged the attention of safety researchers, and it has had a tremendous application in management as well as traffic domains. (Johnson, 2000)

The systems model is all-encompassing, because it has gone beyond the domains of behaviour, vehicle, and environment to include systems in general as a separate construct.

The relevance of this model in understanding the topic under consideration can be seen at three different levels. First, the theory helps us to identify the system of traffic laws and regulations and the mode of enforcement designed to ensure traffic safety in Ghana. Second, the model helps us to identify the multiple causes, the interplay of risk factors, and the prevention of traffic accidents that occur in the study area. Third, the model assists us in identifying/understanding the three major contributory factors to RTAs: human, mechanical (vehicle), and road environment factors. Finally, apart from such categorization, it enables us to isolate key variables for the purposes of planning and of policy; it also indicates how the factors interact in general, allowing us to understand that most crashes are a combination of various factors.

The explanation of the systems theory is based on man–environment adjustments and maladjustments (Muhlrad, 2005) and the fact that traffic crashes result from interactional malfunction of the component systems. The components of the theory are the environment, the means of transport (vehicles), and the behaviour of man (Krug et al., 2000). The environment component comprises the natural and the built environments and transport networks. The means of transport component comprises the volume and quality of vehicles and the modes of transport. The behaviour of man component comprises demographic characteristic of road users (age, sex, education, socio-economic status, stage in life cycle), people's perceptions of risk, and people's general behaviour on the streets. Integrated in the systems theory is a system of highway codes and enforcement mechanisms, which are designed to ensure that road users adhere to the controls and regulations of traffic flow for maintaining road traffic safety. Comprehensive traffic management should be sufficient to maintain road traffic safety (Button, 1993: 80).

The underlying position of the system theory is that human factors and vehicle factors conspire with physical and socio-environmental factors to cause RTCs. The interdependence of these factors suggests that all three deserve attention during any investigation of the cause of accidents. The system theory does not explain accident causation, but rather it points out key issues to be considered in planning accident countermeasures. In other words, blaming the victim, such as the pedestrian, for pedestrian–vehicle crashes and suggesting behaviour modification goes hand in hand with technical modifications to road infrastructure and equipment. This also means that modification of motor vehicle design will become a crucial component of the system to consider. Put another way, perhaps drivers of passenger-carrying commercial vehicles are over-represented in RTAs not because of person factors only, but perhaps because the poor nature of road furniture combines with defective and over-used vehicles.

The strength of this theory is in its holistic approach to RTA problems. It can provide an intervention blueprint for accident management. It is also comprehensive, because its tenets cover all road users: drivers, pedestrians, cyclists, and passengers. Inherent in this theory is the need for commitment at different levels, political and otherwise; it deems important the roles of policy makers, road engineers, vehicle manufacturers, road users, and safety professionals' action and inaction. However, as is the case with other theories, the systems theory does not account for all aspects of the accident toll on roads. For instance, it does not pay attention to traffic law enforcement, even though the latter is a key factor in accident causation and prevention. In this regard, researchers consider the systems theory to be too generic in scope and lacking in specificity when it comes to particular accident situations. These weaknesses notwithstanding, it is preferred over other

theories for its universal appeal and interdisciplinary orientation and application. The application of the models used in the study is discussed below.

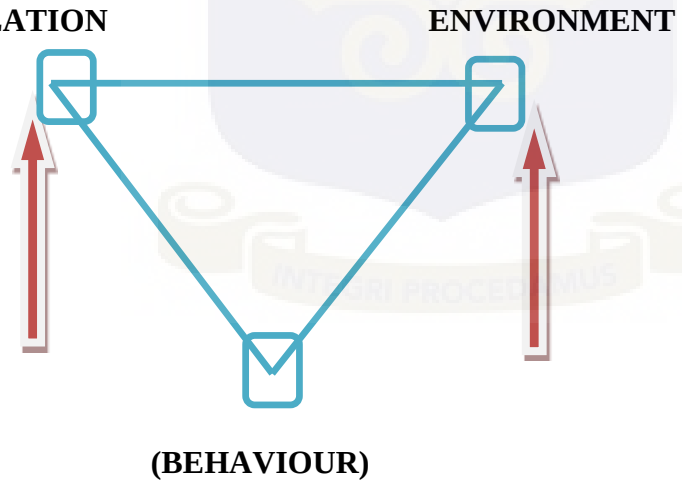
2.8.1. System-based models

System-based models are models inspired by the system theories.

2.8.1.1. Three-factor behavioural model by Jørgenson and Abane (1999)

Meade, Florin and Gesler (1988) have proposed a three-factor typology that posits that a known disease is caused mainly by the population inhabiting an area, the behaviour of the population, and the habitat (i.e. the environment). The interaction effects among these factors are represented graphically in the form of a triangle (Figure 2.1).

Figure 2.1 Causes of diseases



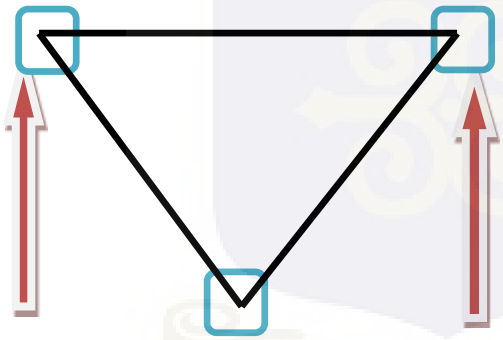
Source: Meade et al. (1988)

The import of Figure 2.1 is that traffic accidents bear strong elements of man–environment adjustment and maladjustment, a well-known approach in geography (Muhlrad, 2005). Based on this, the logic of a modified human ecological model of the approach to disease

can be transferred to studies of RTAs. Jørgensen and Abane (1999: 122) adopted the model in their study to suit RTA analysis, by making a heuristic adjustment: the vehicle corresponds to the vector in disease ecology; the road system and the wider physical and built-up environment corresponds to the environment; and the socio-demographic characteristics of the population—including attitudes, perceptions and behaviour displayed on the road—represent the behaviour of the population (Figure 2.2). This model is a framework for understanding the multiple causes and possible prevention of traffic accidents in developing cities.

Figure 2.2 Main factors causing road traffic crashes

VEHICLE **ENVIRONMENT**



System of traffic laws, regulations and traffic signals (Socio-demographic variables)

HUMAN (Behaviour)

Source: Jørgenson and Abane (1999)

The model of Jørgenson and Abane is characterized by three main components. The vehicle factor (corresponding to the vector in disease ecology) is subdivided into vehicle type, make, age, technical condition, and safety equipment (e.g. seatbelts in a car). The environment comprises the road system and the wider physical and built-up environment. The physical environment is further subdivided into different aspects, such as daylight and

climate (weather conditions and road conditions), spatial conditions (signal arrangements and macro structures), settlement patterns (urban or rural, sparsely or densely populated area), the location of residential and working areas, traffic separation scheme (a traffic management route system where the navigation of ships is highly regulated to create lanes in the water and ships in these lanes all going in roughly the same direction), topography, and road construction qualities. Behaviour of the population—including characteristics such as age, sex ratio, and general and specifically traffic-related attitudes—is also considered. This third factor in the model goes further, to look into driving behaviour, driving experience, driving style, risk compensation, and risk driving (under the influence of alcohol and/or drugs). The available literature on RTAs identifies accidents as being caused by the vehicle, behavioural factors, and physical factors in the road system (environment), and it considers how these interact with regulation enforcement in particular settings. Therefore, superimposed on the three-factor model is the system of traffic laws, regulations, and mode of enforcement designed to ensure that a population adheres controls and regulations so as to maintain a required level of road safety.

2.8.1.2. Behaviour

The system of laws and regulations directly affects road-user behaviour, such as the behaviour of drivers, pedestrians, cyclists, and passengers. Also, the characteristics of the vehicle and the environment influence pedestrians and driver behaviour in ways that can lead to accidents. Road-user behaviour equally impacts the environment and the vehicle. For instance, a fatigued or distracted driver can become involved in a RTA because his mental state is challenged, and the probability of a crash is increased when distracted driving combines with bad conditions on the road and non-enforcement of traffic laws. In other words, a driver with a propensity for risk-taking is more likely to use a road in a

manner that poses a danger to fellow road users if the other conditions interact to facilitate higher risk-taking.

2.8.1.3 Vehicle

The condition of vehicles on the road can be responsible for accidents. Examples of such vehicle conditions include used (old) vehicles, the conversion of cargo vehicles into passenger ones by tampering with the original make of the vehicle, poor maintenance of vehicles, or maintenance with used-car parts. The path lines in the above framework show that a vehicle is not only affected by behaviour and the environment, but also by the system of laws, controls, and regulations. A clear case in point is the law in Ghana that permits the use of imported used spare parts; this can aggravate the accident problem.

Both the physical and social environments are key risk factors in motor vehicle crashes. These influence road-user behaviour and motor vehicles. The systems model is all-encompassing because it goes beyond the domain of behaviour, vehicles, and environment to include the systems in general as a separate construct. Thus, the relevance of the model in understanding the topic under consideration can be seen at three different levels. First, the theory helps us to identify the system of traffic laws, regulations, and the mode of enforcement designed to ensure traffic safety in Ghana. Second, the model helps us to identify the multiple causes and the interplay of risk factors and the prevention of traffic accidents that occur in the study area. Third, the model assists us in identifying or understanding the three major factors that contribute to RTAs. This model makes it possible for us to isolate key variables for the purposes of planning and policy, and it indicates how the factors interact in general, thus allowing us to understand that most RTCs are caused by a combination of various circumstances.

2.8.1.4. Behaviour factor approaches

Specific behaviour is an intrinsic aspect of people living in specific locations (Rundmo & Iversen, 2004). Individuals in a unique environment, such as Dar-Es-Salaam or Nairobi or Delhi, possess different population characteristics, such as age, sex, education, and training (Shibata & Sugiyama, 1994). Likewise, their risk-taking behaviour differs and may be attributed to the population's specific characteristics, their cultural perceptions, the economic situation they find themselves in, the social norms in the environment they live in, and, furthermore, their individual psychology, cultural practices, roles, and mobility may differ (Rundmo & Iversen, 2004). These characteristics will affect people's perception and attitudes and driver behaviour in relation to RTA risk. The same characteristics will also affect individual vulnerability to traffic accidents. In general, the existing literature has revealed that the level of an individual's traffic risk has nothing to do with his or her physical make-up and concludes that RTAs are primarily influenced by behavioural factors.

Maintaining good control of a vehicle on the road depends very much on the behaviour (which is very complex) and skill of the driver (CSA, 1983). Driving is a complex process, in which a large number of variables interact with each other, and with varying degrees of interdependence. Accidents may be due to judgment errors, ignorance, incompetence, rule violations, lapses or carelessness—all of which are human errors (Leeming, 1969)—and such human factors contribute to the majority of RTAs. A study conducted by Odero et al. (1997) in Kenya reported that human factors were responsible for 85% of all causes of accidents.

Jørgensen and Abane (1999) note that, concerning road traffic behaviour, one can distinguish between driving skills (knowledge and training) and driving style, the latter reflecting attitudes and traffic risk perception. Training of drivers increases their driving skills. A study by Asogwa (1992) in Nigeria has revealed that a sizeable proportion of drivers who possesses driving licenses never showed up in any driving school or went through any driving test, but simply bought their licenses. Studies done on drivers after they had been involved in motor accidents reported that although alcohol is the most prevalent cause of driver impairment, drugs and other substances also contribute to the problem (Broughton, 1991; Shibata & Sugiyama, 1994; Kayombo, 1995; Leon, 1996; Violanti & Marshall, 1996). Driving under the influence of alcohol or drugs is known to impair the driver's ability to judge risk and to control a vehicle (CSA, 1983).

Furthermore, fatigue-related crashes occur more frequently on weekends than on week days and typically occur in the early morning. Most of the crashes are also attributed to less-experienced and non-professional drivers (Asogwa, 1978). Fatigue due to long-distance driving increases the risk of road accidents. Fatigue, according to the available literature, is also caused by hard work during the day before beginning a driving journey (Zhang et al., 1998). Excessive speed is reported as a major contributing factor in road crashes and subsequent severity of injury. Similarly, severity of property damage is linked to a vehicle's speed on impact (Shibata & Fukuda, 1994).

Some medical conditions are also mentioned as risk factors for drivers. Diabetes and epilepsy, for example, are associated with increased risk while driving (Odero, 1997). Violanti and Marshall (1996) reported that the frequency of road accidents involving drivers who drive using mobile phones fuels the accident problem. Evidence shows that

the risk for a heart patient is 60% higher (Zhang et al., 1998). Conversely, a study conducted by Gilbert failed to reveal a significant association between the above medical conditions with motor vehicle crashes (Violanti & Marshall, 1996).

A driver's age has been cited as an important factor in the occurrence of accidents. The available literature reports that adolescents or young drivers are more frequently involved in traffic accidents than other age groups (Bjørnskau & Gafni, 2000). Leon (1996) has also shown through various studies that young drivers are more frequently involved in accidents caused by inappropriate speed and loss of control of vehicles. A study by Graham (1993) reported that motor accidents are prevalent in certain age groups and they occur at certain hours of the day and week and at certain locations. Some people are more susceptible to being involved in crashes than others, and this susceptibility is increased by the level of alcohol and drug use as well as other physiological states, such as fatigue (Graham, 1993).

Leon (1996) observed that reckless driving in adolescents has been associated with increased risk of crashes. The problem with young drivers is that they like risk-taking behaviour, and they lack driving skills (Zhang et al., 1998; Vasconcellos, 1999). The problem of young drivers is also reported by Hakim et al. (1991) as contributing to high fatalities or injuries. In their study, Massie et al. (1995) reported that old drivers (70 years and over) have the highest rates of injury crashes.

With regard to gender, it appears that males are more often involved in motor accidents than females (CSA, 1983). Rivara (1986) has also reported that 60% of the victims of crashes were male, while 31% were female. It appears that for all age groups males are

more at risk than females in accidents. Odero, Garner and Zwi (1997) found that in developing countries men are more at risk of being injured in crashes than women. This gender difference has long being recognized, and it is the male contribution to accidents that has attracted more attention. This is partly because driving as a profession is largely dominated by men.

2.8.1.5. Vehicle factor approaches

This section discusses the technical quality of vehicles followed by the composition of the vehicle fleet in an area. Vehicles with seatbelts, a lighting system, brakes, steering, tyres, and indicators, among other items, that are in good condition can help reduce traffic accidents. It has been established by Dowing and Coleman (1999) and Abane (1994) that the number of road-worthy vehicles operating in developing countries is lower than in developed countries. Such worn-out vehicles are more likely to be involved in traffic accidents.

Under vehicle factors, the design, the lighting system, the brake system, and their use are significant contributors to RTAs (Odero, 1997). According to Jørgensen and Abane (1999), a mixture of different types of vehicles, including motorcycles and bicycles, operating at different speeds is more common in urban areas. This influences the system risk owing to the risk of crashes or collisions between various vehicle types.

Increase in income per capita is associated with an increased number of vehicles purchased, which in turn may lead to increased accidents (Hakims et al., 1991; Leon, 1996). Vehicle Miles Travelled (VMT) and periodic vehicle inspections are also variables that affect the number of accidents (Jegede, 1998). There is some evidence from

motorways that vehicle characteristics and vehicle use are frequently cited in the literature as potentially important factors contributing to high fatality rates. Design of a vehicle, its braking system, better tyres and extended visibility due to improved lighting reduce the risk of accidents. Defects in design or manufacture of a vehicle can threaten occupants' safety. Improvement of the interior of the vehicle tends to increase the safety of its occupants (Graham, 1993). A clear understanding of the causal factors is relevant to the design of road safety promotion or preventive programmes (Sarungi, 1981).

Well-designed roads with separate lines for pedestrians and cyclists are much safer than those without such facilities. Sometimes barriers to discourage needless pedestrian–vehicle interaction reduce the rate of injuries. Modern roads are safe because they are well designed with all important signs (Graham, 1993; Bjørnskau & Gafni, 2000). The road signs should be clear by themselves and should convey an unmistakable message to the driver. There is a relationship between seasonal weather and the time factor in RTA occurrences (CSA, 1983; Jegede, 1998; Zhang et al., 1998). A study done by Kong et al. (1996) has revealed that most of traffic accidents occur during the night, at weekends, and during the months of October, November, and December.

The interdependence of factors that cause accidents suggests that in trying to investigate these causes, all the relevant factors within the system ought to be given equal attention. The model does not explain accident causation but points out key issues to be considered in planning any accident countermeasures. In other words, blaming the victim such as the pedestrian for pedestrian–vehicle crashes and suggesting behaviour modification goes hand in hand with the technical modification of road infrastructure and equipment. This also means the modification of motor vehicle designs will become a crucial component of

the system to consider. Put another way, perhaps drivers of passenger-carrying commercial vehicles are over-represented in RTAs not because of person factors only, but because of the poor nature of road furniture, which combines with defective and over-used vehicles for motorized transport in the country.

The strengths of this theory are in its holistic approach to solving the road traffic accident problem. It is both a method about an intervention blueprint for accident management and also comprehensive, because its tenets cover all road users such as drivers, pedestrians, cyclists, and passengers. Inherent in this theory is the need for political commitment, in that the action or inaction of policy makers, road engineers, vehicle manufacturers, road users and safety professionals' are all perceived to be important and complementary.

Research indicates that not only has the theory aided the understanding of most risk factors implicated in accidents, but it has also informed various safety interventions in many countries such as the vision zero in Sweden, Norway (Johansson, 2009). The relevance of the model to understanding the topic under consideration can be seen at three different levels. First, the theory helps us to identify the system of traffic laws, regulations and mode of enforcement designed to ensure traffic safety in Ghana. Second, it helps us to identify the multiple causes and interplay of risk factors and preventions of traffic accidents that occur in the study area. Third, the model assists us in identifying and understanding the three major contributory factors of road traffic accident, including human, mechanical (vehicle) and road environment factors on the AKATA Corridor.

Like other theories, the model does not fully account for all aspects of the accident tool on the roads. For instance, traffic law enforcement has not been given much attention.

Researchers consider this theory too generic in scope and thus say it lacks specificity when it comes to particular accident situations. These weaknesses notwithstanding, it stands out among its counterparts for its universal appeal and interdisciplinary orientation and its application.

The systems approach was used in a bid to develop a road transport system that is able to accommodate human error and take into consideration the vulnerability of the human body. The goal is to ensure that RTAs do not result in serious human injury. The systems approach means shifting a major share of the responsibility from road users to planners, engineers, road managers, politicians, legislators, and other stakeholders. This approach was used based on three major domains of road traffic accident causal factors: pre-accident, accident, and post-accident interventions. This is based on road safety management, safer roads and mobility, and safer vehicles, safer road users and post-crash response. The approach was taken with a view to designing policies in order to reduce the road safety problem.

Using the systems theory, the safety issues were diagnosed in a form of a problem tree. This was done to ensure an integrated and logical approach in dealing with the safety challenges. With this as a background, an overview of the transportation system is discussed next with the view to explaining the theories.

2.9. Overview of transportation system in Ghana

Ghana has a developing transportation system consisting of two large deep-water ports that handle approximately 6.8 million tons of import and export traffic. Towards the end of the 1970s, the country had a 944-km-long railway-line system that served the most

productive areas in Ghana, but owing to the later political economy of Ghana, the railway system has almost collapsed. During the same period, the country had a road network over 40,000 km long, comprising 13,245 km of trunk roads, 24,313 km of feeder roads, and 4,063 km of urban roads. In addition, transportation services on the large inland Volta Lake are provided by a parastatal company carrying passengers, vehicles, and cargo on routes up to 400 km, supplemented by informal private operators serving mostly passengers on short routes. Ghana has one international airport in Accra, for wide-bodied aircraft serving routes to African, Asian, European, and North American cities. Domestic aviation services are provided by the military services and by private airlines. Roads are the predominant mode of transportation, currently accounting for about 94% of freight and 97% of traffic movements. There are no viable alternatives to roads for the movement of bulk commodities, such as timber, cocoa, bauxite, and manganese ore, to the ports.

2.9.1. Transport systems in Ghana

2.9.1.2. The railway network

Addo (2006) notes that railway building in Ghana began from Sekondi in 1898, reached Tarkwa in 1901, Obuasi in 1902, and Kumasi in 1903, covering a total distance of 268.8 km. Another line was built linking Tarkwa with Prestea between 1908 and 1911. All these were in response to demands from the mining sector. Also, the Accra–Kumasi line was started in 1909 but stopped at Tafo before the end of the second decade of the 20th century.

Ghana's railway network is mostly single-track rail of 1.067 m gauge and located in the southern part of the country. In 1965, it carried 2.3 million tons of freight and 8 million passengers, and at the time the Ghana Railway Company (GRC) was financially viable. By 1985, however, due to a number of factors, including ineffective management of the

rail system, the changing world economy, a sharp drop in commodity prices, and the encroaching competition from the road sector, the position of rail as one of the prominent modes of transport diminished. With lower revenues and increasing labour costs, rail operations could not support modernization and maintenance programmes. The worsening financial situation of the railway sector resulted in a vicious cycle of problems: defaults in payment, poor maintenance, drops in service quality, loss of customers, more drops in revenue, and so on.

The railway system in Ghana has historically been confined to the plains south of the barrier range of the mountains north of the city of Kumasi. The network is presently undergoing major rehabilitation and making in-roads to the interior. In Ghana, most of the lines are single-tracked, and in 1997 it was estimated that only 32 km were double-tracked. The railway network has limited coverage, consisting of a triangular network connecting Accra, Kumasi, and Takoradi, and the internal water transport is limited to Lake Volta. The most important section is the Western Line running from Takoradi Port, through a distance of 266.8 km to Kumasi. This line contains two rail spurs. The first spur leaves the Western Line at Tarkwa and continues north-westerly 29.4 km to Prestea. The second spur leaves the Western Line at Dunkwa and branches off eastwards 73.2 km to Awaso. The Western Line also contains a double-track section from Takoradi to Manso, a distance of 30.6 km.

The Eastern Line runs 303.9 km from Accra and joins the Western Line at Kumasi. The Eastern Line contains one rail spur to the port of Tema, a distance of 23.7 km. However, it has not been used since 1993. A study has been completed by a French consultant to utilize it for commuter services. The Central Line commences on the Western Line at Huni

Valley and runs easterly to the Eastern Line, joining it at Kotoku Junction, a distance of 198.8 km. The Central Line contains a single-track rail spur to Kade, a distance of 40.3 km. The rail system has the potential to become a vital part of Ghana's transport system, carrying a larger portion of travellers and freight on the busiest transport corridors. As the economy grows, there will be increased demand on the transport system and the railway will become an alternative to road transport, provided cost is kept under control, efficiency and reliability are improved, and investments are secured for development of the system. Presently, the Eastern and Central lines are no longer in operation. The Western Line is presently functioning because it conveys minerals such as bauxite to the Takoradi Port. The Government of Ghana is therefore actively considering private sector participation as a means for supporting rail development. Against this background, a Ghana railways concession process actually began in August 2002, but collapsed in August 2005 when arrangements for divestiture were unsuccessful. At present, attempts are being made to enter into a public–private partnership with current and potential users.

2.9.2. The Ghana road network

Road transport is by far the predominant means of transport in Ghana. It carries about 98% of freight and 95% of passenger movement in the country (MOT, 2007). In Ghana the Ministry of Roads and Highways (MRH) is the principal institution in charge of formulating policies and monitoring and evaluating programmes and projects on roads. Four departments and agencies—Ghana Highway Authority (GHA), Department of Urban Roads (DUR), Department of Feeder Roads (DFR), and the Ghana Road Fund (GRF) Secretariat—are under the ministry. With the exception of the GRF Secretariat, which essentially provides funding for road projects, the other three departments are responsible for the physical road infrastructure at various levels. The GHA is in charge of trunk roads

and major roads linking major cities and other places in the country. The DUR is responsible for the provision and management of urban road networks in support of quality transport systems in metropolitan, municipal, and district assemblies, while the DFR is the agency responsible for the provision of safe, all-weather accessible feeder roads at economical cost to promote socio-economic development in rural areas. These departments are in charge of compiling information on roads statistics.

Roads in Ghana are classified based on the covering of the surface—surface classification (paved and unpaved)—and on the function played by the road—functional classification. There are other sub-classifications under the paved and unpaved roads headings, but for the purposes of this study, roads are classified only into paved and unpaved. A functional classification of roads is based on the functions of roads provided in the road network system of each department (GHA, DUR, and DFR), and therefore each different department has a different functional classification of their road networks. The GHA has three main functional classifications: namely, national roads, inter-regional roads, and regional roads. National roads are roads that link the national capital with the various regional capitals and neighbouring countries which are of strategic importance. Inter-regional roads are roads of inter-regional importance. Regional roads, on the other hand, link district capitals to their respective regional capitals. Regional roads also link district capitals to the nearest district capital as well as to major industrial, trade, or tourist centres.

The DUR classifies its roads functionally into three main categories: arterials, collectors/distributors, and local/access roads. Arterial roads are high-capacity urban roads whose main function is to deliver traffic from collector roads. The collectors are moderate-

capacity roads that move traffic from local roads to the arterial roads. Collectors, also known as distributors, are mainly designed to provide access to residential areas. The DFR classifies its roads functionally into inter-district roads, connectors/travel mobility feeder roads, and access feeder roads. Inter-district roads connect one district capital to another and carry relatively high volumes of traffic compared with travel mobility feeder roads (connectors) that are feeder roads with their ends connected to two other roads. Access feeder roads connect only one road—that is, the road goes to a dead end, and a motorist will have to travel back on the same road once he takes it. These are relatively short in length and carry relatively low volumes of motorized traffic. To conform to the Infrastructure Planning and Systems Software (IPSS) format, the functional classifications of roads by the three departments—GHA, DUR, and DFR—have been re-aligned to the IPSS classification (Table 2.3)

Table 2.3 Functional classification of roads by road agencies

Classification	GHA	DUR	DFR
Primary	National	Major arterials	Inter-district
Secondary	Inter-regional	Collectors/distributors	Travel mobility feeder roads (connectors)
Tertiary	Regional	Local/access	Access

Source: Compiled by the author with data from GHA, DUR, and DFR.

Using the surface and functional classification, six main categories of roads were established—paved primary roads, paved secondary roads, paved tertiary roads, unpaved primary roads, unpaved secondary roads, and unpaved tertiary roads—for which data were collected by districts. To obtain these categories of data from the departments, different methods were used owing to the different formats in which the departments maintain their

data. The GHA uses the Pavement Maintenance Management Programme (PMMP) as part of its pavement management system tool. The PMMP software contains a sectional listing notebook consisting of the entire road network under its jurisdiction and the lengths of each road. The roads are grouped based on their functional classification and the surface type but not organized into districts. To obtain the data by districts, the spatial database of the network was opened and superimposed on the spatial digital map of metropolitan, municipal, and district boundaries. The various lengths of roads within each metropolis, municipality, and district were calculated. The DFR roads database is organized according to metropolitan, municipal, and district and also by surface type and functional classification. It was therefore easy to obtain the requisite data. The DUR is found in about 15 municipal and metropolitan assemblies in Ghana and has a Microsoft Excel database with roads organized according to surface type and functional classification. Table 2.4 provides information on the classifications adopted for the IPSS and the corresponding road types in the various departments.

Table 2.4 Classifications adopted in the IPSS and corresponding road types in various departmernts

IPSS classification	GHA	DFR	DUR
Paved primary	Paved national	Bitumen inter-district	Asphalt/surface dressing major/minor arterial
Paved secondary	Paved inter-regional	Bitumen access	Asphalt/surface dressing distributor/collector
Paved tertiary	Paved regional	Bitumen connector	Asphalt/surface dressing local/access
Unpaved primary	Unpaved national	Gravel/earth inter-district	Gravel major/minor arterial
Unpaved secondary	Unpaved inter-regional	Gravel/earth connector	Gravel distributor/collector
Unpaved tertiary	Unpaved regional	Gravel/ earth access	Gravel local/access

Source: Compiled by the author with data from GHA, DFR, and DUR.

A large proportion of the roads in Ghana are gravel roads, making them vulnerable to periodic rainfall, and therefore they require maintenance programmes to sustain them. In general, the road network condition in Ghana can be classified according to international standards as poor: 40% of the total network is in very bad condition (MOT/NRSC, 2007). Generally, the road network in Ghana is about 50,000 km in length with 65% classified as feeder or rural roads, 27% as trunk or highway roads and the remaining 8% classified as urban roads (MOT, 2007). The rapid increases in car ownership as shown compared with buses, along with poor land use, poor planning, inadequate road space, lack of regulated parking systems, uneducated use of the road by pedestrians and motorists, and indiscipline have all compounded the problem of vehicle congestion on major urban and highway roads in Ghana. The public road transportation in Ghana is largely owned and operated by the private sector, with the government owning only a small proportion of buses. The overall quality of public transportation is poor. Most of the vehicles are close to or beyond their service lives, and maintenance standards are extremely low. High maintenance costs, arising from poor road surfaces, and revenue losses limit the operators from investing in new vehicles. There are no viable alternatives to roads, other than for the movement of bulk commodities such as timber, cocoa, bauxite, and manganese ore by rail from collection centres to the ports.

Trunk roads in Ghana are classified as national roads, regional roads and inter-regional roads, all of which form the Ghana road network. National roads, designated with the letter N, link all population centres in Ghana. Regional roads, designated with the letter R, are a mixture of primary and secondary routes and feed national roads, while inter-regional roads, designated with the prefix IR, connect major settlements across the regional borders. By virtue of linking major towns and cities, national roads sometimes double as regional

and inter-regional roads. The R40, which connects Accra to Adenta through the Tetteh Quarshie interchange, forms part of the N4, which links Accra to Koforidua and Kumasi through the Tetteh Quarshie interchange

2.9.3. Maritime transport

The original Takoradi Port was constructed in the 1920s for trade by Gordon Guggisberg (Governor-General of the Gold Coast). Between 1947 and 1953, the breakwater was extended, and in 1953–1959 additional breakwaters were built and berths were extended to create the present port. Takoradi's maximum berth limit is 9.5 m (Berths Nos. 5 and 6). An industrial complex for oil, cement, and flour milling is contiguous to the port. Alongside the breakwater are an oil berth and a bauxite berth, and in front of the industrial complex there is a clinker jetty. The bauxite berth is no longer used, and bauxite is loaded from self-propelled barges that carry bauxite from the clinker jetty onto ships anchored at the basin of the port. Significant changes have been forecast in the composition of cargo-handling demands for Takoradi. Most noticeably, an increase in container cargo of 75% over the years from 1995 and a concurrent decrease in general cargo of 75% during the same period. This will have profound implications for Takoradi as it shifts from its traditional role of export port with an additional heavy volume of container cargo.

In the past both Tema and Takoradi ports were served by the railway system. In Takoradi this continues to today, particularly for bringing in forest products, manganese, and bauxite. In Tema there has been no railway traffic into the port since 1993, and the line has not seen any maintenance since then. Tema Port is connected with the national capital Accra by a 4-lane motorway. Takoradi Port and Accra are connected by a trunk road,

Route N1. The road between Cape Coast (Yamoransa) and Takoradi was reconstructed in 1990 and rehabilitated in 1998.

The Tema and Takoradi ports both have master plans. A 500 m container berth and dry-bulk terminal is being constructed at Tema. There is a proposal for a new container terminal that will be reclaimed in the inner harbour, but the dredging cost is expensive due to the underlying hard bedrock. About 80% of all imported cargo is handled at the Tema Port, while Takoradi Harbour handles the remaining 20%. However, Takoradi handles 70% of all exports.

The purpose of the International Shipping Organisation (ISO) shipping container is to facilitate a worldwide shipping cargo freight which is fully interchangeable between ships, ports, and inland road, rail, and water transport in a multi-modal and inter-modal manner. The container and its contents can be transferred in large single units without disturbing or handling the contents inside. The dominant mode of transport used by shippers between the seaports and inland Ghana is road. However, due to an unreliable inland transportation system for the movement of containerized cargo, only 10% of the cargo is transported to the port in containers. An inland port has been planned as a free port with an adjoining Export-Free Processing Zone at Boankra in the vicinity of Kumasi. Inland ports, also referred to as inland container depots or dry ports, are essentially part of the transport chain for the flow of imports and exports, especially in countries with extensive inland countryside.

2.9.4. Lake transport

Volta Lake is one of the largest man-made lakes in the world. It has an area of 8,500 sq km and a shoreline of 2,500 km, with a maximum lake-water level of 278 Feet No Decompression Limit (NDL). The navigable stretch starts from Akosombo, 80 km north-east of Accra and continues for 415 km to Buipe in Northern Region. The cross-lake ferry services complement the road network by linking roads on either side of the lake, while the north–south service provide an alternative to road transport for longer-distance traffic. The transport potential of Lake Volta is largely unexploited owing to inadequate port navigation facilities, the existence of submerged trees, seasonal low water levels, and insufficient land connections. However, efforts have been made to overcome these deficiencies by including the construction of new oil storage facilities at Akosombo and Buipe. An oil pipeline has been completed to connect the oil refinery at Tema with the Akosombo storage facility. The Tema–Akosombo road rehabilitation to link to Volta Lake was completed in March 1999.

Major ports on the lake are located at Akosombo, Kete-Krachi, Yapei, and Buipe. The most promising potential for Lake Volta is its potential of transferring containers from Akosombo to Buipe for the northern region of Ghana, and possibly from there to landlocked countries such as Burkina Faso. The Volta Lake Transport Company (VLTC), a subsidiary of the Volta River Authority (VRA), operates five ferry crafts (Cross-Lake Ferry Services) that carry passenger, traders, and vehicles from one bank of the river to the other, where the formation of the lake has cut across the road network in the country. Of the five cargo barges, three are designed to convey general cargo, each with a capacity of 730 metric tons; one is a combination of barges which can carry general cargo or diesel

(capacity 650 m^3), and there is a specialized barge that carries petrol and kerosene (capacity 800 m^3). Two twin-engine pusher tugs are used to push one or more cargo barges.

2.9.5 Air transport

The Ministry of Transport (MOT) administers air transportation in Ghana. The Ghana Civil Aviation authority (GCAA) provides navigational services and operates Kotoka International Airport (KIA) and domestic airports at Kumasi, Tamale, Bolgatanga, Sunyani, and Takoradi. A new airstrip is being constructed at Wa. There are several other airstrips in the country, but they are used only occasionally and have no navigational aids or other essential services. Ghana Airways operated domestic air services until 2000. When the airline dropped the services owing to poor financial performance, the Ghanaian Air Force subsequently began flight services to Tamale and Kumasi in order to maintain transportation links. The service operated under the name Air Link and used Fokker F-27 turboprop aircrafts with a capacity of 44 passengers. Later a private airline commenced the flight operation for Kumasi, Tamale and Bolgatanga, Sunyani and Wa.

In 2012, KIA remains the only airport in Ghana in operation for international flights, with no current proposals to relocate to Tema. There are approximately 30 international airlines and six cargo airlines. Annual passenger numbers (for 2011 and including both arrivals and departures, as well as transit passengers) were 1,731,363. Transit passengers comprised 145,761 of this figure, 2011 unpublished annual report.

In 1996, the only scheduled domestic air services were from Accra to Kumasi and from Accra to Tamale. Sunyani also had occasional unscheduled flights. In 2012, there are

scheduled services from Accra to Four locations, Accra to Kumasi, Tamale, Sekondi-Takoradi and Sunyani, with a total combined monthly average of 38,654 passengers.

2.10. Conclusion

The systems approach to RTAs includes strong adjustments and maladjustments to man–environment–behaviour factors. A model derived from the systems theory is the three-factor behavioural model by Jørgenson and Abane (1999). These factors are represented by a triangle and are derived from the Mead, Florin and Gesler (1988) model, known for its use in studying disease causation in humans. Jørgenson and Abane (1999) made a heuristic adjustment of this model to fit it to the road-crash situation. This has been used by researchers in road safety and RTA-related issues. The three-factor behavioural theory underscores the fact that comprehensive traffic management should combine all the factors to provide a sufficient overview of the issues involved. Apart from such categorization, it is possible to isolate key variables for purposes of planning and policy. The model indicates how the factors interact in general and allows us to understand that most accidents are a combination of all many, if not all factors. In spite of some shortcomings in the model, its advantages have encouraged the adoption of this framework for the study. The aim is to provide a more comprehensive approach to the causes of the RTAs.

The review of theories and the literature showed that scholars have not adequately delved into the roles various stakeholders in road safety management can play in the management of RTAs. In this light, attention has been drawn to the roles these key players can play in dealing with RTAs in Ghana, particularly along the AKATA Corridor.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

The previous chapter discussed the various theoretical factors underpinning this study. This chapter primarily describes the AKATA Corridor and the study methodology. It also deals with a description of the research strategies used. Justification for the selected research approach and the design of the research are discussed. In discussing the methods and strategies used in data collection and analysis, considerable attention is also given to some challenges encountered during the study and how these drawbacks were resolved in the field.

3.2. Profile of the Accra–Kumasi–Tamale Corridor

The AKATA Corridor covers a distance of 654 km in total. The Accra–Kumasi section is 272 km long and is classified as a national road (the N6), while the Kumasi–Tamale section, which is 382 km long, is also classified as a national road (the N10). This route forms part of the Central Corridor Route and is the major route for the transportation of goods and services in Ghana. It serves the northern part of Ghana and the northern neighbouring state, Burkina Faso. The Accra–Kumasi–Tamale road has an average daily traffic volume of about 6,402 vehicles (MRH, 2005/2006).The average road width is about 7.3 m, with drains on one or both sides wherever applicable as one traverses the road. The road passes through five administrative regions of Ghana: Greater Accra, Eastern, Ashanti, Brong Ahafo, and Northern. The route serves as an international transit route for Ghana's landlocked neighbours, such as Niger, Mali, and Burkina Faso. In general, the road is asphalted and is considered a good road with an average condition score of about 80%

(MRH, 2005/2006). Due to its good readability, it serves as a major route for the transport of goods between Tema Port and Tamale and Burkina Faso (Figure 3.1)

Figure 3.1: Map of Ghana showing the AKATA Corridor

Source: MOT 2007

3.3. Research methodology

3.3.1 Research design

The study was designed to provide a coherent assessment of the causes of RTAs in Ghana and focuses particularly on the AKATA Corridor. The study was designed to address the main objectives of the survey and is a retrospective cross-sectional survey. The critical areas covered are the towns and locations most prone to accidents along the road corridor. To achieve this, a mixed methods design was used.

In justifying the combination of both quantitative and qualitative methods, Baker (1999) notes that these methods enable the researcher to gather evidence from multiple sources and obtain information from different points of view. One advantage he notes is that the mixed method, when used efficiently, can broaden the scope of research as well as strengthen its validity. He further notes that the mixed method is the best method to use when a researcher wants to look at broad patterns of social life or describe widespread social reactions to, for instance, social policies. Hence, this method is a powerful tool for gaining knowledge about the social world. Burges and Lindsey (1997) use the term 'multiple research strategy' to connect the terms. Kumar (1996) notes that both the quantitative and qualitative approaches have their strengths and weaknesses and concludes that in most studies one needs to combine both approaches. Despite their different epistemological backgrounds, both quantitative and qualitative methods are scientific, equally good for different purposes, and can be combined when necessary (Teye, 2012).

The qualitative research technique in this study covers a number of techniques, including interviews, focus group discussions (FGDs), participant observation, and a survey of the historical trends in RTAs occurrences on the AKATA Corridor (using newspaper

publications). The qualitative technique was used to collect primary data from accident victims and key informants. The aim of collecting information from newspaper briefs was to document comprehensively the historical development along the corridor and also to analyse the historical patterns in the distribution of traffic accidents on the AKATA Corridor. This is in accord with the assertion by Habermas (1985), as quoted in Flick (1998), that qualitative methodology justifies real situational changes from the traditional to the modern.

The quantitative survey involved a questionnaire with responses from 245 general public including passengers, pedestrian and past accident victims. While the qualitative method helped in understanding life experiences and shared meanings of people's everyday social lives and realities, the quantitative method provided comparisons and the statistical aggregation of the data in a quantified and comparable form (Flick 1998). This aided the assessment of the spatio-temporal trends and patterns of RTAs on the road corridor.

The first stage of the study identified the most accident-prone locations (black spots) using data from the Building and Road Research Institute (BRRI). The second stage involved a field survey that included drivers, passengers, pedestrians, and accident victims in selected towns located along the road corridor, using a representative sample of the towns stratified by characteristics where accidents are most frequent. The third stage of the design involved a more qualitative study where FGDs and in-depth interviews were conducted with individuals and groups, including officials drawn from the police MTTU and the road safety agencies. There was a stratification of discussants into groups based on their gender affiliation. In general, an attempt was made to investigate the knowledge, attitudes, and perceptions of people on the road safety problem. The fourth stage involved

informal/unstructured interviews with identified policy makers and implementers as well as with all stakeholders involved in road safety management.

The aim was to reveal the constraints to policy implementation and service delivery. In this perspective, key informant interviews were held with officials from the Ministries of Transport and Roads and Highways, as well as selected officials from the various Metropolitan, Municipal and District Assemblies (MMDAs) through which the corridor traverse. Other official also included some Assemblies members, the National Road Safety Commission (NRSC), and the DVLA, as well as some opinion leaders. The selection of key informants was generally accidental, since the team was completed to interview those available on annual at a particular location of my research interests. These methods were supplemented with personal observations.

The second part involved collection of data using quantitative methods. This part consisted of a retrospective review of RTAs on this stretch of the AKATA Corridor. To interrogate the historical perspective of RTAs on the corridor, the study used a review of the largest circulating newspaper in the country, the *Daily Graphic*. The newspaper review sought to identify major road projects along the main AKATA Corridor. In this regard, attention was paid to these major projects, including new road construction and the stretches that were rehabilitated within the period under consideration. In total, a review of a 26-year span of the newspaper was undertaken. The initial intention was to examine a 40-year span (from 1960 to 2010), but data availability after going through the major available libraries – Balme, Legon, Departments and African Studies institute, I had access to newspapers only from 1984 to 2010.

In all, 25 stories on road projects, including new construction and rehabilitation of existing roads, were reported by the *Daily Graphic*. To be specific, nine of the stories were on rehabilitation works, 13 were on new road constructions, and three had no information regarding the specific kind of work being done on the road—that is, whether it was rehabilitation work or new road. Also recorded were other equally important ancillary pieces of information, including the particular locations where the work was being undertaken, the cost involved in the project, the duration of the project, the distance that the road covered, the officials who had commissioned the road, and the persons or companies who were implementing the actual project. The study also sought secondary data from other published sources—books and reports, articles, development plans, media reports, and the Internet.

3.3.2. Questionnaire survey

3.3.2.1. Questionnaire design

A questionnaire survey was used to obtain data from drivers, passengers, pedestrians, and accident victims. Specifically, information was sought on issues such as individual profiles, environmental/physical factors and RTAs, road-user behaviour and driver training, traffic law enforcement, and institutional factors. In order to ensure that the questions were clear for respondents, they were pre-tested on drivers on the Amasaman road, near Accra. The questionnaire included questions for passengers and pedestrians. This was conducted with passengers on board vehicles to determine their socio-economic characteristics, such as their profiles, the reasons people are involved in traffic accidents, attitudes and perceptions on the spate of accidents, user satisfaction, and so on. (The full questionnaire is presented in Appendix I.)

3.3.2.2. Sampling procedure and administration of questionnaire

The sampling procedure for the driver survey and the field survey was designed based on Road Traffic Accident black-spots designed by the BRRI in 2004. The BRRI lists the accident black spots in Ghana as follows: the Accra–Aflao road, the Cape Coast–Takoradi road, the Accra–Kumasi–Techiman–Kintampo Road, and the Kumasi–Sunyani road. The focus of this study is the Accra–Kumasi–Tamale road.

The AKATA road was selected because it is busiest trans-national corridor in Ghana, linking the Country to Burkina Faso, Niger and Mali. (Grant, 2015). Accordingly, its high daily traffic volumes and goods, BRRI in 2004 classified the route as highly accident-prone. That notwithstanding, empirical research on the AKATA Corridor remains limited. Indeed, the BRRI report attributed the bad traffic situation on the corridor to lack of effective planning, vehicle misuse, poor management delays, and accidents, among many other factors. The sample for survey was purposely selected from the towns identified in the BRRI report primarily due to logistic, financial, and time constraints, in addition to the availability of data and the willingness of the populace to co-operate with the research team. The distribution of the selected field survey is given in Table 3.1.

Table 3.1 Study localities

Road name	Selected localities	No of general public	Total Respondents
Accra – Kumasi	Accra	50	47
	Suhum	30	29
	Ejisu	40	39
Kumasi – Techiman	Kumasi	40	37
	Techiman	35	34
	Tamale	50	49
TOTAL		**245**	**235**

Source: Based on information extracted from BRRI (2004)

In both Accra and Kumasi, views of three drivers each were sampled. This was informed by the fact that drivers at these stations travelled long distances (intra-regional or cross-country drivers) unlike the other selected town, where most of the drivers commute intra-regionally. Consequently, a respondent each was accidentally sampled in those other sampled towns, based on their willingness and availability to participate in the research. A detailed description of the methods used for the questionnaire surveys is presented below.

3.3.2.3. Driver, passenger and pedestrian survey

This was conducted with commercial drivers who used the road corridor. The study identified the demographic characteristics of those drivers plying the corridor. The questionnaire was pre-coded with several open-ended questions that required information on perceptions, risk, and attitudes, and institutional, physical, and behavioural factors that facilitate traffic accidents in the study area. To facilitate the exercise, research assistants were selected from the sampled towns on the road corridor and trained by the researcher to undertake the questionnaire survey. These assistants were further trained to administer the questionnaire to the general public in the sampled towns. A technique was employed in order to capture the views of both general public and specifically, prior accident victims on the corridor. It must be added that in each of the sampled groups, the views of at least five (5) accident victims on the corridor were purposefully captured, using the assistance of the assembly official and the snow balling techniques.

3.3.2.4. Interviews

The interview method was geared towards eliciting information from interviewees and listening to them as they expressed their views and opinions on their daily experiences. Persons for interview were purposively but accidentally selected based on their capacities

as policy makers, policy implementers, or key stakeholders, or as victims of RTAs or persons involved in road safety management and traffic law enforcement. English or the local dialect of interviewees within the particular locality was used to conduct the interviews. The interviews were conducted to obtain information on the factors contributing to accident causality on the corridor. An interview guide was prepared for usage. Moen et al. (2005) note in their study on risk perception that collecting information from a person who is directly involved in a hazard makes it possible for him or her to explain with personal feeling how dangerous the risk of a certain phenomenon is. Available information shows that the people who most experienced the effects of RTAs are the accident victims, because they are the injured parties. The second participant is the government, which is responsible for the provision of security, and the third are the owners of the damaged vehicles. It should be noted that accident victims include drivers, pedestrians, officials, and any kind of affected person regardless of their status. Therefore, an accident victim stands as a sample of every person in the study area. The intention of interviewing accident victims was to better understand their feelings and to present a reasoned account of their everyday life experiences, exploring the commonalities and diversities in their suffering and social experiences across time and space. Each key respondent was interviewed separately.

Apart from the key informant interviewers, a total of twenty eight (28) MTTU officers along the road corridor were internally computed to tap into their lived experiences concerning road accidents in the corridor. The guiding principle was to obtain information on how traffic policemen collect road traffic accident data, problems encountered in dealing with accidents and victims, how rules and regulations are enforced, and how interference from politicians and the general motoring public potentially contribute to the

upsurge of RTAs on the road corridor. Provision was also made for these interviewees to give their opinion on how RTAs could be prevented in their specific areas of operation.

As already noted, there were also some interviews with at least, a government official each from the Ministry of Road and Highways, the Ministry of Transport, the National Road Safety Commission (NRSC), and the Driver Vehicle and Licensing Authority (DVLA). Interviewed using the snow-ball methods. With regards to government officials, purposive sampling methods were used. The focus was on traffic rules and regulations, and on policy and safety measures taken to prevent RTAs on the designated roads in the corridor. In addition to using formal interviews with individuals and officials, informal interviews were conducted by talking to people from different places both within and outside the study parameters, including professionals, NGOs, priests, and community-based organizations, as well as magistrates at the various motor courts and the BRRI. These interviews were undertaken without an interview guide and to elicit views on accident causality

3.3.2.5. Focus group discussions

Two separate forms of group discussions (FGDs) (one in Accra and the other in Tamale), were conducted to provide insights in some of the contradictory results emanating from the quantitative survey. This also gave opportunity to provide checks and balances to make it easier to assess the extent to which a particular point of view was a shared view among all participants. Each group was made up of seven participants, four passengers, a police MTTU official, a driver, and an assemblyman representing the district assembly. This interactions provided opportunities to validate the responses during the key informants interview sessions previously undertaken. The analysis reached richly enhanced the subsequent analysis and the inferential conclusions.

3.4. Data analysis

The quantitative data collected were edited with a view to addressing questions and determining whether they had been answered fully, partially or not at all. After the editing, the coding of open-ended responses was undertaken. After careful editing, the data obtained from the field survey were entered into the Statistical Package for Social Sciences (SPSS for Windows 16.5) for analysis. The information from the FGDs and the interviews was analysed using largely qualitative methods (content analysis). Using SSPS, the quantitative data were summarised into frequencies and cross tabulations under the variouis themes guiding the study. The qualitative data on the other hand were also analysed thematically and used to complement the quantitative data.

3.4.1 Black-spot analysis

The spatial analysis of accidents on the AKATA Corridor was performed by running a hot-spot analysis tool (Getis-Ord Gi) and inverse distance weighted (IDW) for visualization to create an interpolated surface using ArcGIS 10.2 vision. Such applications are best used for studies such as crime analysis, epidemiology, voting pattern analysis, traffic incident analysis, and demographic analysis. They can indicate where disease outbreaks are concentrated, the location of evacuation sites, and where crimes are concentrated. Hot-spot analyses use vectors (not rasters) to identify the locations of statistically significant hot spots and cold spots in the data. Points are aggregated to polygons for this analysis.

In running this analysis, the resultant z-scores and p-values inform the researcher where features with either high or low values cluster spatially. This tool works by looking at each feature within the context of neighbouring features. A feature with a high value is interesting, but may not be a statistically significant hot-spot. To be a statistically significant hot-spot, a feature will have a high value and be surrounded by other features with high values as well. The analysis was performed using the following mathematical formula:

The Getis-Ord local statistic is given as:

$$G_i^* = \frac{\sum_{j=1}^{n} w_{i,j}x_j - \bar{X}\sum_{j=1}^{n} w_{i,j}}{S\sqrt{\frac{\left[n\sum_{j=1}^{n} w_{i,j}^2 - \left(\sum_{j=1}^{n} w_{i,j}\right)^2\right]}{n-1}}} \quad (1)$$

where x_j is the attribute value for feature j, $w_{i,j}$ is the spatial weight between feature i and j, n is equal to the total number of features and:

$$\bar{X} = \frac{\sum_{j=1}^{n} x_j}{n} \quad (2)$$

$$S = \sqrt{\frac{\sum_{j=1}^{n} x_j^2}{n} - \left(\bar{X}\right)^2} \quad (3)$$

The G_i^* statistic is a z-score so no further calculations are required.

The interpretation of the above G_i^* statistic returned for each feature in the dataset is a z-score. For statistically significant positive z-scores, the larger the z-score is, the more intense the clustering of high values (hot-spot). For statistically significant negative z-scores, the smaller the z-score is, the more intense the clustering of low values (cold spot). Conceptualization of spatial relations in this analysis used fixed distance band. Each

feature was analysed within the context of neighbouring features. Neighbouring features inside the specified critical distance receive a weight of 1 and exert influence on computations for the target feature. Neighbouring features outside the critical distance receive a weight of zero and have no influence on a target feature's computations. Euclidean distance was used in the distance method. This option is good for a straight-line distance (as the crow flies) between two points. All the points are located along the route. A further analysis was performed to visualize the results in terms of hot spots, using the IDW method. Visualization of results interpolates a raster surface from points using an IDW technique. The resulted maps and locational graph were interspersed within the main lead to enhance visualisation and comprehension.

3.5. Limitations of the study

The study was limited to the AKATA Corridor for time and financial reasons. The same reason also necessitated the sampling of a smaller number of people than what was expected. In the case of the drivers, the field study particularly targeted commercial drivers of private industry, especially the commercial drivers along the road corridor. This decision was taken in light of the fact that commercial drivers in general constitute the most vulnerable in RTAs (Abane, 2004). Although 'floating' drivers who were not registered or unionized with transport operators were targeted for interviews, their cooperation was minimal due to the perceived fear of being arrested by the police. In most instances, after many of the respondents unwillingly agreed to cooperate, a researcher had to visit them individually and, at times, late in the day before getting the questionnaire answered. This resistant attitude added extra cost to the project.

At the societal level in Ghana, death is often perceived as a taboo subject by most people. There is a direct relationship between death and RTA rates; hence, given the role of superstition and beliefs about RTAs, some respondents were hesitant in responding to certain questions related to death and injuries attributable to RTAs. Time and again the researcher had to parry monetary demands from respondents and assert that the research was mainly for academic purposes.

CHAPTER FOUR

TRANSPORT, ROAD DEVELOPMENT, INSTITUTIONAL FRAMEWORKS AND ROAD ACCIDENTS ON THE AKATA CORRIDOR: A HISTORICAL PERSPECTIVE

4.1. Introduction

Having engaged in the previous chapter with the research methodologies, this chapter of the study forms part of a historical analysis to understand the possible causes of RTAs on the AKATA Corridor. The intention is to use historical data and to show how the interplay of institutional arrangements, organizational issues, human error, technical failures, and environmental factors contribute to adverse events. This perspective is an important aspect of the study, because the primary goal of any policy recommendations emanating from this research is to help avoid or greatly reduce future RTAs. The historical perspective also provides an opportunity to determine whether the causal factors of road fatalities have changed over time in tandem with the socio-economic dynamics of the Ghanaian economy and Ghana's political institutions.

This chapter also examines the trends and the spatio-temporal analysis of traffic accidents on the AKATA Corridor. Data from the BRRI and historical reports from the *Daily Graphic* on RTAs on the corridor were combined for the analysis and discussion. The reason for fusion of data from the two sources is that data on the road corridor were scarce. Data obtained from the BRRI dealt with the broader aggregates of the trends and patterns of traffic accidents on the corridor. Data from the historical source, although disaggregated, combined with the BRRI data to provide the study with a comprehensive overview and a source of information on RTAs. Another reason for the fusion was to determine changes in the pattern of traffic accidents on the road corridor since 1980. This

also helped us to examine the relationship between RTAs and the socio-economic dynamics vis-à-vis spatio-temporal trends.

4.2. Historical overview of the Accra–Kumasi–Tamale Corridor and issues

In the colonial period, across the Gold Coast as in most West African countries, basic transport infrastructure investment focused on opening up the region for political and economic purposes, particularly mineral exploitation. This had tremendous implications not only for the movements of goods and services, but also for the levels of development in the various rural regions through which major lines of communication passed or did not pass. In addition to colonial government works, initiatives on road construction were also taken by local communities where economic incentives were apparent (e.g. Hill, 1970: 28). These dynamics continued long after the country's political independence, with most road construction occurring in the south. Below are some of the major road developments before and immediately after the Structural Adjustment Programme (SAP) of 1982–1992.

4.2.1. Road projects: 1984 to 1988

As Ghana's economy deteriorated in the 1970s—arguably due partly to over-regulation of markets, evidenced in efforts at the control of foodstuff prices and taxes on export crops—the number of new road projects declined considerably, and the conditions of existing roads deteriorated as did the number and condition of vehicles. Travel problems were compounded by petrol shortages. According to Clark (1994: 66), farmers and rural-based traders in the Kumasi region at this time had difficulty persuading drivers to take their vehicles along poor-condition roads to the hinterland to bring food to the city. Thus 'many villages fell off the transport map entirely'. She suggests that major centres benefitted to an extent, because traders in smaller centres had to spend so much time searching for

vehicles (ibid. 70, 207). Eventually, in the 1970s, even major trunk roads were deteriorating, thus restricting the activities of the major urban-based traders and further reducing the markets accessible to rural women.

In 1984, three road projects were recorded on the corridor, and all these were rehabilitation works (Table 4.1). The locations were the 55-km Nankpanduri and the Gbungurugu roads, the Nakpanduri–Yuuno road (both towns in the northern region of Ghana), and the Kumasi stretch of the corridor. The two projects in the north were rehabilitation works at a cost of ¢70,000 each and were undertaken under the auspices of the local people themselves, who financed the work and offered voluntary labour in the initial phase; the project was subsequently taken over by the government. The commissioner for both projects was Mr. Joseph Zabik, Member of the District National Mobilization Committee. On the other hand, the Anyinam-Kumasi section of the AKATA corridor is 100-km Kumasi stretch was carried out at a cost of about ¢1.5 billion over a 4-year period.

Between 1985 and 1988, five major road projects were recorded. Out of these, two were major road rehabilitations on the Taifa–Ofankor–Dome stretch in the Greater Accra Region and the Nkoranza road(s) in the Brong Ahafo Region. Again, the roads in Kumasi saw major rehabilitation, while the other two road projects were on the Kumasi–Offinso–Aborfour road and the Anyinam–Kumasi road. The Taifa–Ofankor–Dome road and the Nkoranza road were undertaken at a cost of ¢5.5 million and ¢10 million, respectively. The Nkoranza stretch was on a 28-km distance and took a year to complete. The Kumasi–Offinso–Aborfour road, a distance of about 30 km, was completed within 2 years. The Anyinam–Kumasi road was completed within just a year at a cost of ¢51.188 billion. In all these instances, only one project was undertaken by a foreign company and this was

the 100 km road asphalting of the Anyinam–Kumasi road in 1986; it was constructed by TAYSEC and funded by both the Government of Ghana and the German Democratic Republic. All other road projects recorded were either financed by the Government of Ghana or by local community members or constructed by Ghanaian companies.

Table 4.1 Major road works on the AKATA Corridor (1984–1989)

Year	Start of project	Location	Amount (Cedis)	Duration	Type
1984	01-02	Nakpanduri and Gbungurugu road	70,000	N/A	Rehabilitation
1984	07-04	Nakpanduri–Yuuno road	70,000	N/A	Rehabilitation
1984	14-11	Kumasi	1.5 B	4yrs	Rehabilitation
1985	15-01	Taifa–Ofankor–Dome	5.5 M	N/A	Rehabilitation
1986	24-01	Kumasi	1.2 B	4 yrs	New project
1986	31-01	Nkoranza	10 M	1 yr	New project
1986	17-11	Kumasi–Offinso–Aborfour	N/A	2 yrs	N/A
1989	27-01	Anyinam	51.18	1 yr	New project

M: million B: billion N/A: not available

Source: Data extracted from *Daily Graphic* issues between 1984 and 2010

Clearly, though the essence of good transportation networks was not lost on the policy makers at the time, severe economic constraints prevented them from achieving and deriving the maximum benefits from the sector. Even shortly after Ghana's independence in 1957, White (1962: 15), in reviewing the road conditions in the country, observed the remarkable impact of roads on surrounding populations: the cutting of a new road will have an immediate effect on the pattern of land use and settlement and thus attracts villages to the roadside, while the land within easy reach of the road becomes more extensively cultivated. Thus the land use pattern tends to take on a ribbon-like appearance, the zones of cultivation aligned along the roads. In the case of a road in southern regions, the

movement of populations was so large that 'in areas remote from the road cultivation has almost ceased' (ibid. 152).

All these developments appear obvious, but a scientific study, such as this one, needs to look beneath the surface. If we examine the matter a little more closely, the evidence up to the 1980s suggests that the rural poor in the southern parts of the country contributed substantially to road construction and improvement through (self-help) forced labour, but exercised no control in the selection of routes to be constructed or reconstructed. In those settlements which contributed labour along the new routes, some local elites and resourceful farmers benefitted from passing trade and the opportunity to become involved in the cocoa export trade, while others benefitted from the new opportunities offered by the arrival of the transport industry. But it can be fairly confidently assumed that those who contributed forced labour mostly constituted a rather different population from those with sufficient resources to benefit from investment in export agriculture. Landowners clearly benefitted most from the cocoa boom, as they were able to enter into highly advantageous sharecropping agreements with land-hungry migrant farmers, a practice which has a long history dating from the 1920s (Amanor, 1994: 45-6). Subsequent discussions will reveal how such mainly self-helped engineered roads impacted road accidents.

4.2.2. Major road projects: 1990–1999

Prior studies by the African Development Bank (1984) have revealed that by the early 1980s, much of West Africa was clearly suffering a severe recession. Consequently, IMF/World Bank packages—albeit reluctantly sought—gradually came to most countries. Ghana was first in 1983, but Nigeria followed, perhaps with surprising rapidity, in 1986,

mainly because of the collapse in oil prices. This was the Structural Adjustment Programme (SAP) era. The early phase of the SAP—which saw the implementation of currency devaluations, the elimination of subsidies, and the reduction of state intervention in the economy—brought immediate problems in the road transport sector in these African states. Roads deteriorated rapidly because of the shortage of funds for maintenance; vehicle purchases declined as a result of the escalating costs of imported vehicles, and spare part supplies declined for the same reason. In addition, the World Bank brought pressure to bear on governments to cut fuel subsidies.

Essentially, the initial impact of SAP was dramatically severe, to the extent that in 1988 only 28% of Ghana's roads were reported to be in good condition, as was also the case of most of their vehicle stocks (primarily composed of second-hand imports) (MOT/NRSC, 2011). State funds for road maintenance were still being regularly spent on expensive improvement and emergency works rather than on routine maintenance. There have been calls for governments in Sub-Saharan Africa to recognize the limits to paved road construction and concentrate on lower-cost feeder roads (e.g. Beenhakker, 1987). This has led to some change in emphasis in road policy in Ghana. The 1990s thus saw a stronger focus on feeder-road development, supported by the World Bank; but given the massive scale of the problem, the condition of rural roads generally remained a constraint on development and a possible recipe for disaster in terms of RTAs.

Thus, in the 1990s a total of four road projects were recorded within the study area. This included the 1991 road project, the two-lane road rehabilitation between the Kintampo and Tamale stretch of the corridor, a 117-mile road project constructed at a cost of about ¢6.6 billion. According to the then commissioner of the region, Col. (Rtd) E. M. Owusu, the

relevance of the project was to open up the hinterlands to encourage socio-economic activities. The third road constructed in 1991 was the Bimbilla–Salaga road. It was an 80-km road rehabilitation and, just like the Kumasi–Mampong project, its relevance, according to the Northern Regional Commissioner, Mr. Bawa, was to open up the farming areas. The last road construction which was more or less a beneficiary of the broader AKATA road rehabilitation, was the two-lane road construction project between Konongo and Agogo. The project duration was just five months and was to extend the already existing road network within the Ashanti Region. Table 4.2 presents the roads in question and other details.

Table 4.2 Major road works on the AKATA Corridor (1990–1999)

Year	Day/Month	Location	Amount (Cedis)	Duration	Type
1991	03/01	Kintampo–Tamale	6 B	N/A	Rehabilitation
1991	01/07	Kumasi–Mampong road	N/A	2.5 yrs	New project
1991	01/07	Bimbilla–Salaga	N/A	N/A	Rehabilitation
1993	07-09	Konongo–Agogo road	N/A	5 months	New project

M: million B: billion N/A: not available

Source: Data extracted from *Daily Graphic* issues (1984 – 2010)

From the foregoing it can be deduced that by the early 1990s, SAP measures, such as deregulation of fares and fuel, and parts importation had brought some improvement in transport services, even on many minor roads. Clark (1994: 67-8, 212 & 397) suggests this had positive implications for rural trade, since (urban-based) traders could more easily purchase products from farms, rather than having to buy at periodic (roadside) markets, and farmers could themselves more easily bring their produce directly to a major market. This would presumably have had some beneficial impact on women traders and possibly also on off-road populations as a whole. Nonetheless, poor road conditions in general,

especially along most rural portions of the corridor, and associated high transport and accident costs were identified as the most important factors affecting the ability of the poor to enter the market economy—according to the World Bank's (1993) review, 'Ghana 2000 and Beyond'. Indeed, the bank at the time described most rural areas in Ghana as largely a 'footpath economy', where transport was primarily via human porters (particularly women and their children) and fraught with serious health and accident risks.

4.2.3. Major road projects: 2000–2010

Recent records show that a new phase of (mainly) more positive change seems to have gradually emerged in the country since the first decade of the 21st century. This is reflected in (and reflects in) the fact that Ghana is newly classified as a lower-middle-income economy, resulting in an ambitious reform agenda and strong economic growth. Road infrastructure is still in poor condition and deserves attention towards improving it, and Ghana has fortunately been attracting new actors and interventions in the infrastructure sector. Donor policies have, to an extent, been refined, and new players are increasingly coming into the road sector. In Ghana, aid from donors such as Japan has brought marked improvements in the infrastructure sector (bridges and roads), while Chinese investment is increasingly coming in for similar projects. The arrival of the Chinese on the infrastructure-improvement scene, bringing their own contractors and a different attitude from previous (Western) donors, mirrors developments elsewhere in Africa.

However, Western aid to Africa remains one of the big ideas of our time; millions march calling for it, governments are judged by it, and celebrities proselytize for it. Calls for more aid to Africa are growing louder with advocates pushing for doubling the roughly 50 billion USD of international assistance that already goes to Africa each year (Kraus, 1991).

Robert H. Werlin in his article 'Corruption and Foreign Aid in Africa' argues: 'Poor countries suffer not so much from insufficient aid as from the poor quality of their governance' (Werlin, 2005: 517). The author argues that even if the United States and other Non-Government Organisations such as the World Bank increase aid to poor countries around the world, it will not make a difference because the majority of these countries are plagued with corruption. African governments are afflicted with corruption, and populations suffer under a combination of bad policies and bad governance. For example, Werlin reports that Zambia received millions of dollars in aid between 1964 and 2000, yet average incomes fell from USD 540 to USD 300 (ibid. 518). Zambia received more Western aid per capita than any other country, yet the increase in Western foreign aid over the years did not impact on the standard of living or the economy in any way; if anything, it rather reduced incomes. The author suggests that the regularity of corruption in Africa is what constitutes the extreme poverty of Africa. No matter how much aid is pumped into the economy, if corruption is not addressed, no gains will be made with economic growth. Django et al., in their article 'Does aide help?' argue that evidence presented over the years has shown that the effectiveness of Western aid to Africa is very discouraging (2006: 1). The authors show that Western aid has damaging effects on the political systems of countries and reduces their economic growth. They present empirical evidence to show that developing countries are suffering from the curse of *unnatural* resources, which is foreign aid. Many states in Africa receive large amounts of foreign aid—and in some cases it forms a large proportion of their Gross Domestic Product—yet these states have little or no economic development or growth.

The authors discuss the subject of whether can help to promote economic growth. They propose a number of mechanisms arguing that Western aid in the form of grants should be

given as loans. These, they argue, will cause governments to use the moneys generated most effectively. Going further, they argue that, for example, if a government know they have to pay back loans, this will make them more responsible. The authors conclude that governments should be held more accountable for the way funds are used. They believe that providing more loans to recipient countries rather than grants will go a long way to help with economic development.

Haroon Ashraf's article, 'Aid will help if African countries kick start reforms' (Ashraf, 2011), analyses the World Bank report dated 27 March 2011. The author suggests that development assistance by Western countries has little or no positive influence in African countries that avoid making economic reforms which can help alleviate poverty and improve health (p. 1019). Leaders of recipient countries have to be committed to reforms in order for foreign aid to make a positive difference in the economy and overall development of these countries.

Again, in a study by the World Bank in 1993 of nine Sub-Saharan African countries—Ivory Coast, Ghana, Kenya, Zambia, Democratic Republic of Congo, Mali, Uganda, Tanzania, and Nigeria—research discovered that Uganda and Ghana have been able to reform their systems, and therefore Western aid has been able to reduce poverty and increase development. The other countries examined in the World Bank study, however, had not reformed their systems, and therefore Western aid had not added to their development efforts. The author suggests that aid should be increased insofar as countries show reforms and have a strategy in place for such policy reforms. The author comments on the World Bank report, but fails to present tangible solutions on how the failing recipient countries can restructure their systems.

The above discussion has shown that Africa has had some few success stories in terms of Western aid, but the majority of the nations in Africa are mired in abject poverty, even though they have been receiving Western aid for decades. There is still no solution to the problem of Western aid.

The Chinese have also consolidated their dominance in the transport services sector (along with Indian manufacturers) with relatively cheaper bicycles, buses, cars, and other forms of motorized transport. The Chinese aid, however, is based on a set of principles of economic and technical assistance to African countries, the core content of which features equality, long-term benefits of aid projects, mutual benefit, and more diversified and flexible ways of dealing with no strings attached, vis-à-vis multiform technical and managerial cooperation. The Chinese aid thus has the advantage of helping African countries build up self-development capacity, since development is undertaken only if it relies on the countries' own strengths. This is evidenced by the Chinese practice whereby it does its best to help recipient countries to foster local and technical forces, build infrastructure, and develop and use local resources so as to lay a solid foundation for future development in order to embark on the road to self-reliance and independent development.

In addition, Chinese aid imposes no political conditions on recipients, and it upholds principles of peaceful co-existence, respect for recipient countries' rights to independently select their own path and model of development, and a belief that every country should explore a development path appropriate for local conditions. In other words, China does not use foreign aid as a means to interfere in the recipient countries' political affairs or seek privileges for itself; rather, it approaches foreign aid as mutual help between

developing countries. This form of assistance has been beneficial to most African countries.

It is therefore not surprising that most of the road constructions on the corridor have been recorded between 2000 and 2010. A total of 13 road projects were recorded, most of which were primarily new constructions or an extension of an already existing road. In all, seven of these road projects were for the extension of the macadamized surface from Kumasi to the north, while five of the road projects were carried out between Accra and Kumasi. The Kumasi road engineering, which was essentially a double-surfacing with side drains, was constructed at a cost of ¢400 million, while the Tamale–Kumbungu–Nadowli stretch cost ¢4.4 billion. In 2002 two other projects were also recorded. The first was the Yamfo Junction–Ahyiaem road, reconstructed at a total cost of ¢5.12 billion, and the second was a project carried out in 2002 on the Apedwa–Anyinam road at a total cost of ¢135 billion. This figure of ¢135 billion was the second-highest spent on all roads reconstructed in that decade. The highest was the Ofankor–Achimota road, undertaken at a cost of about ¢400.4 billion and over two years; it covered a distance of 33.3 km and was jointly constructed by DAEWOO and Messrs Sonitra Ltd. Between 2004 and 2006, a total of 5 road projects were recorded, with 2004 recording just one and the rest undertaken in 2006.

In 2004, the Asafo–UTC interchange in Kumasi began at a cost of ¢73 billion and was expected to last one year. The year 2006 witnessed the construction of the 73-km Kumasi–Techiman road, which was funded by the African Development Bank and executed by TAYSEC Construction Ltd. Other roads constructed the same year were the Tamale–Techiman road, the Ofankor–Achimota road, and Techiman–Ofuman road. Between 2007 and 2010 a total of 4 road projects were recorded. The first was the Nkawkaw-Obomeng

road constructed in 2007. This was a two-lane road project, with construction duration of about 18 months. In 2008, the Nsawam–Apedwa dual-carriageway was also started at a total cost of GH¢157 million and expected to last 39 months, with a distance of 31.7 km. The Techiman–Kintampo road was constructed in 2009 at a cost of GH¢36 million and spanning 29 months; it was funded by the African Development Bank and the Government of Ghana. The last road project recorded in 2010 was the 25 km single-lane Tumu–Navrongo road, constructed at a cost of GH¢29 million. An interesting feature of road projects within this period was the use of foreign companies as contractors.

Tables 4.3 and 4.4 list these major road projects and the various companies that undertook them.

Table 4.3 Major road works on the Accra–Kumasi–Tamale Corridor (2000–2010)

Year	Day/Month of project start	Location	Amount (cedis)	Duration	Type
2000	22/02	Kumasi	400 M	3 months	New Project
2000	15/09	Tamale–Kumbungu–Nadowli	4.4 B	N/A	New Project
2002	21/03	Yamfo-Junction–Ahyiaem	5.12 B	N/A	N/A
2002	20/03	Apedwa–Anyinam	135 B	2 yrs	New Project
2004	16/12	Asafo–UTC Interchange	73 B	1 yrs	N/A
2006	26/04	Kumasi–Techiman road	N/A	N/A	New Project
2006	30/06	Tamale–Kumbungu–Nawuni	16.1 B	10 months	New Project
2006	10/09	Ofankor–Achimota road	400 B	3 yrs	New Project
2006	10/11	Techiman–Ofuman road	233. 2 M	N/A	New Project
2007	26/05	Nkawkaw– Obomeng road	N/A	18 months	New Project
2008	15/08	Nsawam–Apedwa road	157 M	39 months	New Project
2009	04/02	Techiman–Kintampo road	36	29 months	Rehabilitation
2010	16/12	Tumu–Navrongo road	29	N/A	New Project

M: million B: billion N/A: not available GHC: Ghana Cedis

Source: Data extracted from *Daily Graphic* issues (1984–2010)

Table 4.4 Projects and companies involved

Project	Companies involved
Kumasi–Tamale	Executed by Messrs Limex Ban
Kumbungu–Nadowli	Executed by Messrs Aaund N. Ghana Ltd
Yamfo Junction–Ahyiaem	Financed by the GOG and executed by UNIQUESCO Ltd
Apedwa–Anyinam	Executed by 2 companies: DAEWOO and Messrs Sonitra Ltd
Asafo–UTC Interchange	Executed by Messrs SARRACH Gelfi JV and funded by IDA-World bank
Kumasi–Techiman road	Funded by African Development Bank and executed by TAYSEC Construction
Ofankor–Achimota road	Executed by Messrs China Railway Engineering Corporation

Source: Data extracted from *Daily Graphic* issues (1984–2010)

From all indications, the infrastructural services have witnessed a significant boost since 2000. However, the impact on accident incidence by the mostly young, often inexperienced drivers who use these roads has been extremely high (see Alti-Muazu & Aliyu, 2008; Adogu et al., 2009). This is particularly disturbing with the proliferation of motor-bike taxi services since at least 2009, though the government's attitude to this proliferation is distinctly unfavourable, with strong concerns being expressed about road safety (*Ghanaian Times*, 4 April 2009)[1]. Equally disturbing has been the growing incidence of highway robbery; these robberies have become more rampant and efficient due to the very rapid expansion of mobile phone networks into even some quite remote areas.

[1] http://www.modernghana.com/news/209796/1/no-okada-motor-biketaxi-service-in-ghana.html

Table 4.5 Recorded accidents and number of casualties on the AKATA Corridor (1980–2010)

	1980–1989	1990–1999	2000–2010	Total
Accidents	7	50	73	130
Deaths	53	318	431	802
Injury	82	478	424	984
Number of vehicles	13	88	153	254

Source: Data extracted from *Daily Graphic* issues (1984–2010)

Similar to the decadal pattern in numbers of RTAs, Figure 4.5 shows an equally increasing trend, with the lowest rates recorded between 1980 and 1989 (Table 4.5). However, it increases through the 1990s to 2000, oscillating in their intensity depending the variable under consideration for example, whiles the rate of width and the death rose between 1990s and 2000s, injury decreased from 478 in the 1990s to 424 during the 2000.

The seasonality of accident prevalence rates on the road through the 1980s to the year 2010 is fairly divergent, with monthly prevalence from as low as 3% to a high of over 16% (Table 4.6). The monthly prevalence is less than the yearly figures in Figure 4.1, from March (8.5%) through December (9.2%) and peaking in January at a high of 16.2%. The higher prevalence rates recorded for November (9.2%,) January (16.2%) and February (13.1%) is a reflection of the busy nature of the transport system in the country during preparation for and travelling during the Christmas and New Year festivities.

Table 4.6 Monthly total number of accidents on the AKATA Corridor (1980–2010)

Month	Accidents recorded	Percentage (%)
January	21	16.2
February	17	13.1
March	11	8.5
April	10	7.7
May	10	7.7
June	7	5.4
July	4	3
August	10	7.7
September	12	9.2
October	4	3
November	12	9.2
December	12	9.2

Source: Data extracted from *Daily Graphic* issues (1980–2010)

The daily pattern of RTA prevalence on the road, however, exhibits an oscillating random pattern (Table 4.7). The lowest weekly record was 12 accident cases on Thursdays, increasing to 24 on Fridays, and dropping to 14 and 13 reported cases on Saturdays and Sundays, respectively. The numbers assumed an increasing dimension, however, surging to 16 and 23 cases on Mondays and Tuesdays, respectively, and peaking at 28 recorded cases on Wednesdays. The random and, to some extent, uniform daily fluctuating levels observed are a direct reflection of the general busy nature of the road every day of the week. But it is clear from Table 4.6 that there is a far greater noticeable difference between Wednesdays and the rest of the week. This is likely attributable to the fact that Wednesdays are noted as market days along most of the towns on the study area (Kintampo, Techiman, Suhum, Tamale and Kumasi-all along the corridor). The number of vehicles plying on the corridor increases, hence the upsurge of traffic accidents on Wednesdays.

Table 4.7 Weekly aggregates of accidents on the AKATA Corridor (1980–2010)

Day	Number of accidents	Percentage of total
Monday	16	12.3
Tuesday	23	17.7
Wednesday	28	21.4
Thursday	12	9.3
Friday	24	18.5
Saturday	14	10.8
Sunday	13	10

Source: Data Extracted from *Daily Graphic* (1980–2010)

The types of vehicles involved in accidents along the road over the three decades also reveal an interesting pattern. Mini-buses (207 Benz and Urvan) recorded the highest accident rate (Table 4.8). Of the total identified 254 vehicles, 76 were mini-buses. This alarming rate of accidents involving mini-buses has raised questions about their suitability for long journeys. In the early 1980s, the death toll associated with these vehicles led to an official ban on their use for long journeys. Traditionally, these mini-buses were not passenger vehicles but were converted without official specification upon reaching Ghana. Records show these vehicles were primarily involved in head-on collisions. Despite this trend, the general affordability associated with travelling with these buses made them popular among the lower-middle and lower classes, who could not readily afford the higher fares of actual buses.

In addition, of the total number of vehicles involved in accidents, 64 were articulated cargo trucks. These trucks, which traditionally are for conveying freight, were involved in accidents when, as records show, they were being used as passenger vehicles. For instance, an accident that produced 25 deaths and 78 serious injuries at Zagyuri in Tamale involved

a cargo truck which was conveying mourners to a funeral. Details of the accident stated that 'the cargo truck, loaded with over a hundred mourners somersaulted after a failed attempt to overtake a tipper truck' (*Daily Graphic*, 2010: 15). Furthermore, the widespread overloading of these trucks beyond their standardized specifications also could be a reason for many of the mechanical failures leading to lack of control among the majority of these trucks involved in RTAs. Notably, driver fatigue was a major factor in many reported cases involving these cargo trucks. Most of these vehicles travel on long journeys over many hours through the length of the country to deliver goods.

Another major category of vehicles involved in crashes was that of private automobiles (saloon cars and four-wheel drives). Of the total, 34 vehicles were private cars, of which over 80% were involved in head-on collisions from failed attempts to overtake the vehicle in front of them. In general, speeding by private cars often aggravated accidents and resulted in high casualty levels. Twelve accident cases involving fuel tankers were recorded along the stretch over the decades, of which more than half the tankers burst into flames and burned the occupants. Of the remaining vehicles involved in accidents, 18 were long buses, 17 were taxis, while 38 vehicles were unidentified in the reports.

Table 4.8 Type of vehicles involved in traffic accidents on the AKATA Corridor (1980–2010)

Type of vehicle	Number recorded	Percentage of total
Cargo trucks	64	25.2
Long buses	18	7.1
Mini-buses	76	29.9
Private cars	34	13.4
Tankers	12	4.7
Taxis	17	6.7
Other	38	15

Source: Extracted from *Daily Graphic* issues (1980–2010)

The nature of the accidents recorded on the road also provides relevant insights. About 58% of the total RTAs recorded resulted from head-on collisions arising from poorly calculated overtaking. Besides collisions, 42.0% of recorded accidents were the result of various mechanical failures, such as brake failure and bursting of tyres. Overloading remains a probable cause of these vehicular structural failures. (See Figure 4.9). From this pattern, speeding and overtaking remain two major general causal factors of accidents on the AKATA Corridor. The intensification of road safety campaigns and road codes in the country could be very important steps to control RTAs on the corridor and in the country at large.

Table 4.9: Causes of road traffic accident on the AKATA Corridor (1980–2010)

Type of Accident	Number recorded	Percentage of total
Head-on	75	58.0
Mechanical Failures (as a result of speeding and overtaking)	55	42.0
Total	130	100

Source: Extracted from *Daily Graphic* issues (1980–2010)

4.3. Reported accidents on the AKATA Corridor

The geographical analyses of historical data indicate that structural characteristics of the road network create crash hotspots and high-risk locations on major road corridors. These analyses were undertaken using historical data from the *Daily Graphic* from 1984 to 2010. Another important area-level characteristic that predisposes to RTAs is level of social capital, though it must be stressed that this variable should be interpreted with caution. While the number of deaths in each area may be small, fatality may be influenced by many other factors, creating considerable statistical uncertainty. The AKATA Corridor is a key portion of the network linking many parts of the country, especially most of the regional capitals. In view of the significant contribution of the road to the agricultural and industrial growth of Ghana from the post-independence era to recent times—in the widespread use in the transport of farm products and finished goods—the incidence of accidents on the corridor since the 1980s has attracted enormous attention from government and individuals countrywide.

Reports from the *Daily Graphic* issues for the period 1980–2010 indicated that a total of 130 accidents were recorded on the corridor in the three decades (Table 4.5). Within this period there was a sharp decadal variation, with an increasing rate of accidents and accompanying numbers of casualties. In the decade 1980–1989, a total of seven accident cases were recorded, with 53 deaths and 82 injuries. The relatively limited ownership of automobiles in the country during that decade was coupled with a trajectory of economic growth, manifest in an improvement in people's standard of living and dominated by an improvement in food supply and other basic commodities. During that period, a total of 13 vehicles were involved in the seven accidents recorded.

The trend, however, assumed an increasing dimension in the 1990–1999 decade, with the recording of a total of 50 accident cases in which there were 318 deaths and 478 injuries. The increasing pattern of accidents (observed in the preceding decades) maintained a similar trend in 2000–2010, with a total of 73 cases in which 431 deaths and 424 injuries resulted. This increasing decadal trend observed in the occurrence of accidents and concomitant deaths and injuries may not be mutually exclusive of the general socio-economic and political conditions prevailing in the country.

While there were major socio-economic improvements culminating in stability and growth in major sectors of the Ghanaian economy from the 1990s, road construction and maintenance were merely community responsibilities often funded from communal levies. The Accra–Kumasi–Tamale road, which was no exception, maintained its untarred status at many locations until the early 2000s. The large increase in the number of accidents from 7 in the 1980s to 50 in the 1990s ties in with the time when vehicular movement increased on the road, when parts of the road were still akin to a feeder road and the conditions were

deplorable in many locations. The increasing standards of living apparent in the wake of the economic liberalization brought on by the adoption of the SAP after the 1980s could account for the proliferation of vehicles in the country and the sharp upsurge in the number of RTA cases.

The growth of major cities such as Tamale, Kumasi, and Accra as both economic and administrative hubs during this period also enhanced the exchange of goods and services between these important towns, culminating in the growing busy nature of the road through the early 1990s to the present. Private commercial vehicles, especially the use of mini-buses, grew in importance to complement state-owned inter-city transport systems in the early 1990s, with public patronage of goods and services along the corridor growing on the incentive created by the opening up of areas along the corridor after the improvement of the road (Amegashie, 1989). The proliferation of cargo trucks after the late 1980s as a major means of carting goods from the ports in Tema and Takoradi to major towns in the country and to neighbouring landlocked countries, especially Burkina Faso, along the AKATA Corridor was also key in dictating the eventual busy nature of the road, even in its poor state at the time. The poor condition but busy nature of the road through the early 1990s and early 2000s could have triggered the huge upsurge in the number of accident cases from 7 in the 1980s to 50 in the 1990s.

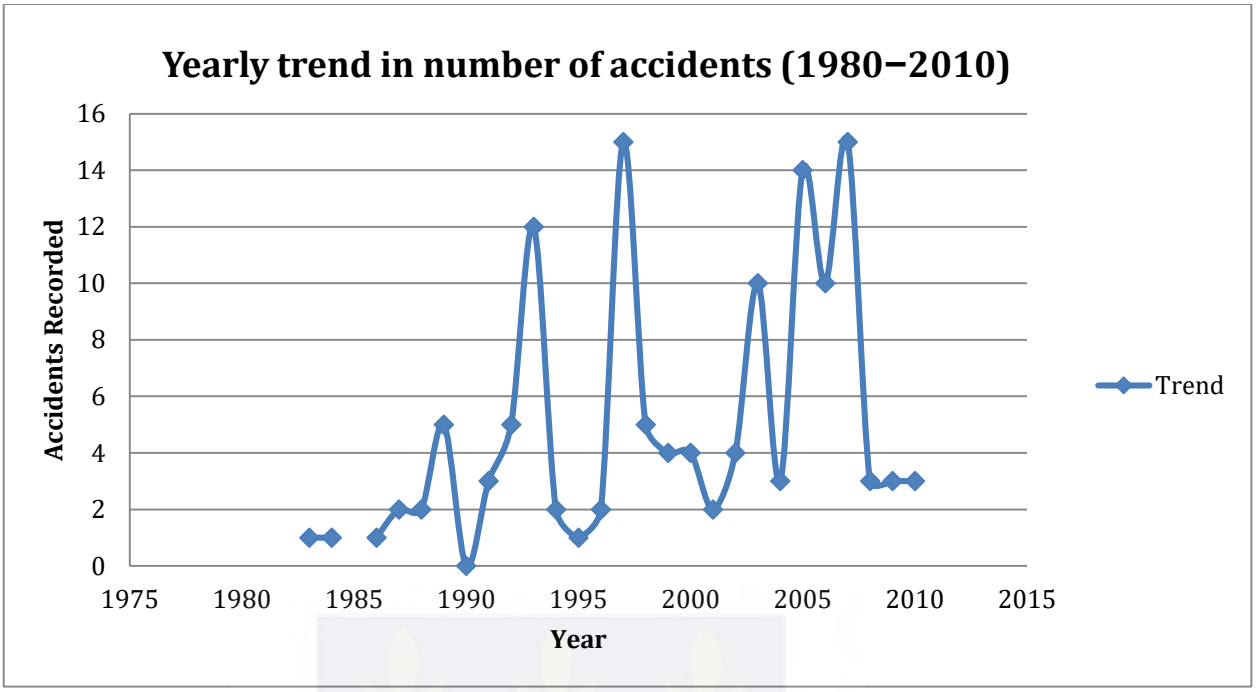


Figure 4.1: Annual total accidents recorded on the AKATA Corridor (1980–2010)

Source: Extracted from *Daily Graphic* (1980–2010)

Figure 4.1 indicate the decline of RTAs on the corridor in 2010. This development can be attributed to the increased use of mobile phones, which seems to have reduced the need for face-to-face interactions that formerly necessitated extensive travelling. People, particularly traders, now save money and travel time by using mobile phones.

4.4. Contribution of physical factors to RTAs on the AKATA Corridor

Environmental and physical factors not only provide necessary subsistence materials on which humans depend, but also restrict such things as movements and the organizational complexity on the road. The environment can be a social, economic, cultural, physical, or psychological setting, but in the context of this study it is the physical, the built-up, and the economic settings that matter (Rune, 2002). Concerning the physical environment, various climatic threats and geo-hazards such as heat, fog, high winds, snow, rain, ice, flooding, tornadoes, hurricanes, and avalanches affect roads and consequently can cause

traffic accidents (Moen et al., 2005). The weather (heavy tropical rainfall), apart from affecting productivity, also threatens surface transportation and has an impact on road safety and mobility, and it can increase the rate of accidents on the road corridor.

The contribution of the weather to RTAs was examined, and the results clearly indicated that RTAs occurred on the road on occasions when the weather conditions were very clear. The rate of accidents occurring in foggy and dusty weather conditions is almost negligible. The analysis indicates that quite a substantial number of accidents occurred on the road corridor when it was drizzling. Interestingly, however, the number of accidents occurring on rainy days was found to be minimal and insignificant. The results show that RTAs increased during clear weather conditions, especially during daytime. This indicates that drivers are increasingly becoming more careless largely due to the relaxation of enforcement of regulations on speeding and drink driving by the appropriate agencies, particularly the police MTTU during rainy seasons. This is traceable to the fact that during bad weather conditions, the police MTTU perform hardly any physical motor checks on the road

The data shows that there is only a minor difference between daytime RTAs and night time: 50.8 % and 49.1%. This finding is therefore inconsistent with the findings by Odero (1997). Again the results also show that where a portion of the road corridor was not lighted at night, the accident rates increased. In the case of daytime accidents, most occurred in the year 2009. The year 2002 witnessed the least accidents on the corridor. With regard to nights, where the roads were not lighted the pattern of RTAs recorded exhibited a cone attaining its peak in the year 2008 and then decreasing in the year 2011; however, it was obvious that the year 2011 recorded a slight increase over 2010 in the

same category. From 2009 the figures for accidents during lit nights increased with the years, peaked in 2010, and then declined in 2011. The findings suggest that RTAs occurred more during the daytime when the roads were clear and visibility was good than during the night. These results do not support the study done by the NRSC in 2009, which reported that the majority of RTAs occurred during the night. The high number of traffic accidents during the day may be explained in the sense that it is more usual for vehicles to travel during the day than at night. Highway brigandage during the night is on the rise and may have forced more drivers to travel during the day in order to avoid the menace of armed robbers. More drivers resort to driving in the day, thereby increasing the accident rates during the day on the corridor. Interestingly, the distribution of accidents along the corridor indicates that in 2002–2011, crashes occurred only at straight sections of the road and not at major intersections. No accident was found to have occurred on staggered roads and Y-junctions or at railway-line intersections. Just a handful of accident cases were recorded at T-junctions, crossroads, and roundabouts. This indicates that most accidents are caused by speeding and overtaking on straight stretches of road.

4.5. Road surface conditions and traffic accidents

The design of a road can contribute to accidents by making it more difficult to see other vehicles either in front or behind, creating hazardous pinch points, presenting dangerous obstacles for drivers, or increasing susceptibility to weather conditions. Inadequate signage or signals or their misplaced location on a road can confuse drivers or make it more difficult for them to anticipate potential hazards. The alignment on the road, the degree to which it is banked, the lighting on the road, and the visibility of the markings on the road can all contribute to RTAs.

In planning, design, and maintenance of the road network, four elements affecting road safety have always been identified. These elements are i) safety awareness in the planning of new road networks, ii) the incorporation of safety features in the design of the new roads, iii) safety improvements on existing roads, and iv) remedial action at high-risk crash sites. The absence of any of these four elements of safety is a risk factor for crashes.

The nature of the road infrastructure in the study area is one of the principal factors that interview, FGD, and questionnaire participants blamed for careless and inconsiderate driving and for being the cause of many RTAs. Participants described the poor state of the road which they ply daily:

> *Look at this road. This cannot be described as a road. As if we are not part of the country. It is actually called man-holes instead of potholes. Plying this section of the road makes driving very dangerous. The huge trucks are the worst offenders. They normally cross us, and if you don't take your time,* wahala [trouble]. (40-year-old commercial driver, at Techiman, interview, 15 February 2014)

Participants acknowledged the fact that most sections of the roads on the highways have no speed limits and insufficient road furniture posted along them. Speed-calming measures were also ineffective in reducing accidents, because these measures were constructed by communities and hence were illegal. These illegal speed ramps, constructed by youth leaders in the communities, tended to be very risky constructions and also led to accidents.

According to one of the respondents:

> *Often there are no speed limits and light erected on the road, so in the night the road is not lit. This makes night visibility ineffective and driving dangerous. In such a situation, we use our minds to drive*. (25-year-old driver, at Fufulso, interview, 17 February 2014)

Participants at an FGD talked about how the construction of bad roads results in the creation of large potholes during the rainy seasons. According to the participants, these potholes cause accidents when drivers try to manoeuvre their way around them; sometimes they hit pedestrians, other vehicles, or objects by the side of the road.

One male respondent said that although a lot of money is used for road construction, many sections of the corridor get large potholes a few months after completion of construction work. He added:

> *It is strange to see that a few months, two or four months after completion of some roads, big holes appear in it. This forces vehicles to use one lane, which means vehicles from one direction have to wait for oncoming ones to pass first. This has contributed to accidents, especially in the evening as drivers might not see the potholes*. (30-year-old private driver, at Anyinam, interview, 12 February 2014)

A female participant added that some construction companies tend to dig trenches by the side of some roads and leave them uncovered for a long time. These trenches, where present, may contribute to RTAs on many of the road corridors. During FGDs with students, one male participant said there are no road signs along some sections of the road, and even where present some road signs are not visible in some sensitive areas. During this discussion session, all participants agreed that this development has contributed to RTAs, in some instances when pedestrians cross thinking that drivers are aware of their presence on the road.

In an interview with the regional MTTU commander at Kumasi, he revealed:

> *Road signs are not sited in the proper locations along roads. Absent road signs and the way some drivers do not respect the crossing signs for pedestrians is very problematic. The MTTU are taking proper measures to punish drivers who are breaking road traffic rules and regulations through arrests, with imposition of fines by the courts.* (Interview, 11 March 2015)

An interview with a Ministry of Health (MOH) official was quite instructive:

> *The road is a facility designed to accommodate the characteristics and behaviour of road users. Parts of the road were constructed without appropriate consideration for some of the risk factors that tend to cause traffic accidents. There are no speed limit signs on some portions of the corridor. There is poor visual guidance, poorly controlled and uncontrolled intersections. The road is narrow in certain places, and there are poor alignment standards and naming of roads. These have contributed significantly to increasing risk of accident occurrences and the severity of crashes and injuries.* (Interview, 9 March 2015)

4.6. Spatial distribution of accidents on the AKATA Corridor

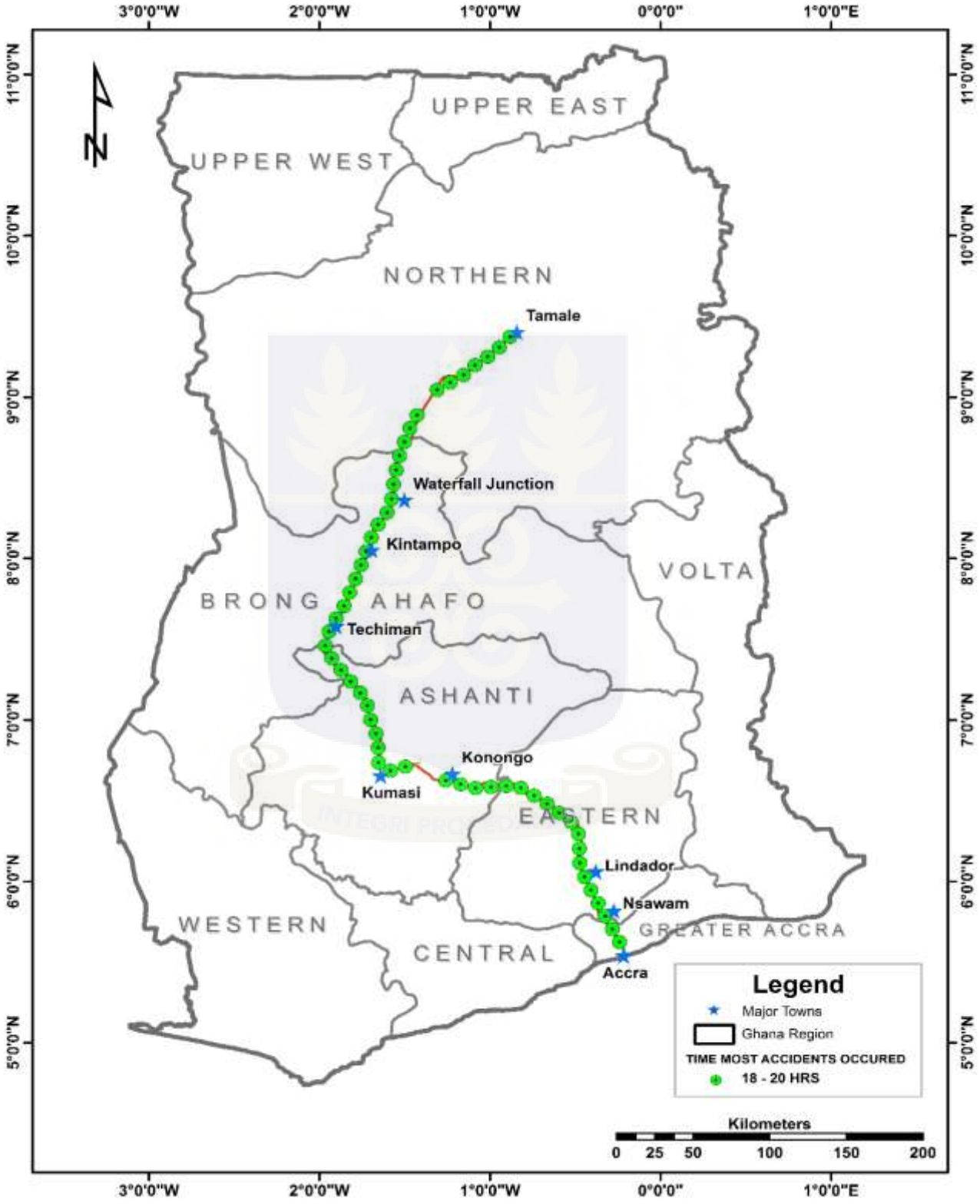
Figure 4.2 shows the hot-spot analysis and visualization of accident cases on the corridor within the study period. The analysis revealed that the average kilometres per accident was as follows: Accra to Nsawam, 5.4 km; Nsawam to Kumasi, an average of 2.3 km; Tamale to Kintampo, an average of 0.6 km; Kintampo to Techiman, an average of 1 km; and Techiman to Kumasi, an average of 1.9 km. The indication was that for every 0.6 km on the Tamale to Kintampo road, an accident was likely to occur. The average distance used in calculating the distance band is 2.

The analysis indicated that the stretch of the corridor from Tamale through Techiman to Kumasi is more prone to accidents compared with the other stretches of road mentioned above. Traffic accidents were found to have occurred within every 2 km along the Kumasi–

Techiman–Kintampo–Tamale stretch. This gave this stretch a hot-spot confidence level of 99%. Because the distance band parameter used is below the average distance, the analysis indicated that the Accra–Nsawam–Kononго section of the corridor is a cold spot, but with a varying confidence level from 99% through 95% to 90%. This was inconsistent with findings of others studies conducted on the Nsawam to Konongo stretch of the road corridor. The BRRI report of 2004, for example, indicated that the Nsawam–Konongo stretch is a hot-spot. The report further revealed accident locations that had no relationship to parts of the corridor considered either cold-spot or hot-spot.

A further analysis was performed to visualize the hot spots results by the IDW method. Visualization of results interpolates a raster surface from points using an IDW technique. The output value for a cell using IDW is limited to the range of the values used to interpolate. This gave a high value of 19.8485 concentrations within the hot-spot location and a low value of -5.73518 within the cold spot location.

Figure 4.2: Map of Ghana showing spatial distribution of accident hotspots on the AKATA Corridor

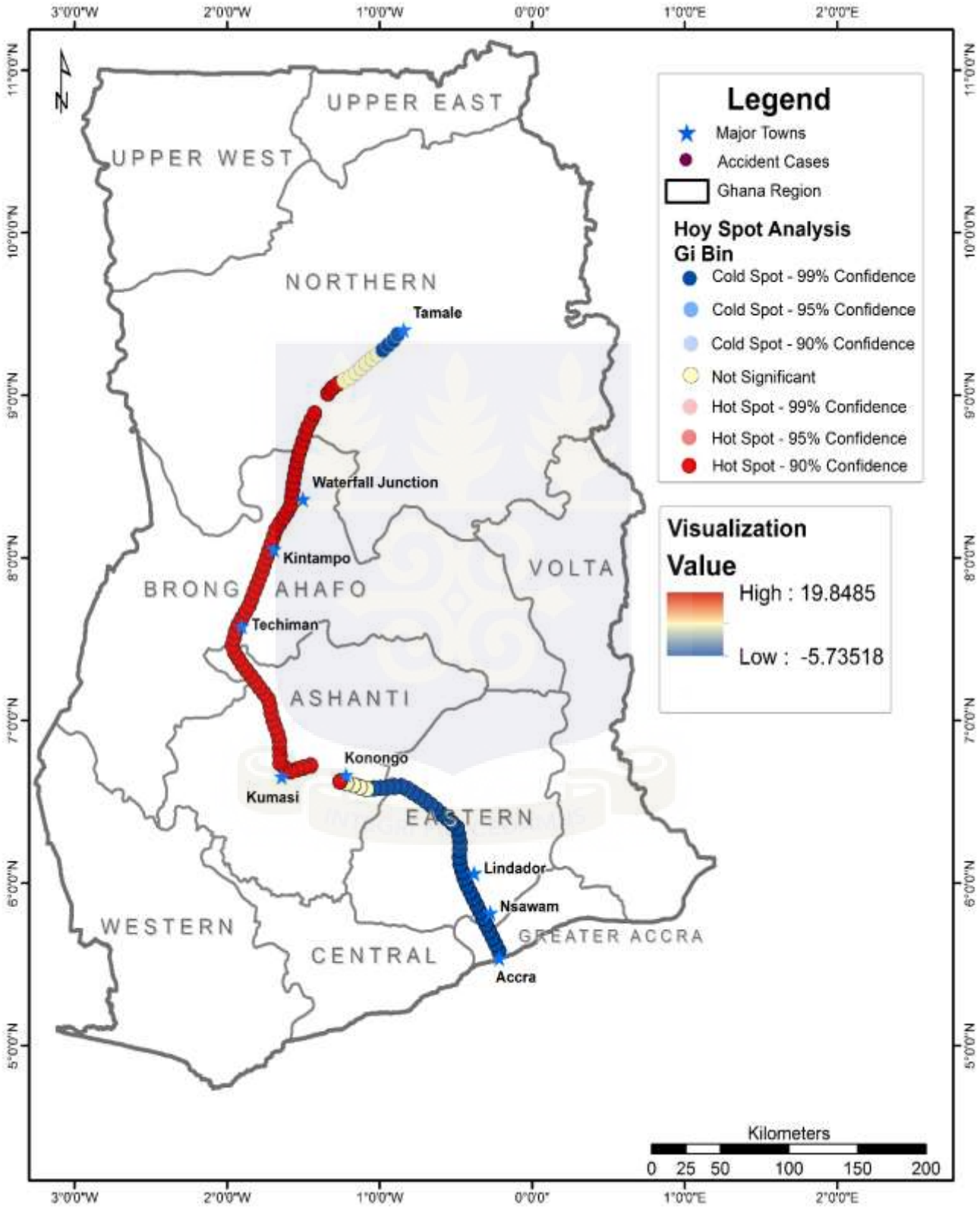


Source: Extracted from the National Accident Data, BRRI 2004

4.7. Temporal analysis of traffic accidents on the AKATA Corridor

The temporal analysis of traffic accidents on the AKATA Corridor is shown in Figure 4.3. A query builder was used to select a subset of features by entering a Structured Query Language (SQL) expression. This method resulted in segregating of all accident cases on the highway into two groups: those that occurred during the daytime and those that occurred at night. Out of 746 accident cases geo-coded, 380 accidents occurred during daytime from 06.00 to 18.00 hours, representing over 50.9% of all RTAs. The remaining 49.1% accidents occurred during night from 18.00 to 00.00 hrs. Cross-tabulation with a hot-spot analysis reveals that most daytime accidents occurred within the hot-spot regions. The seemingly high accident rates occurring in the hotspots in the evenings and at night may be attributed to visibility problems.

Figure 4.3: Map of Ghana showing temporal analysis of road traffic accidents on the AKATA Corridor

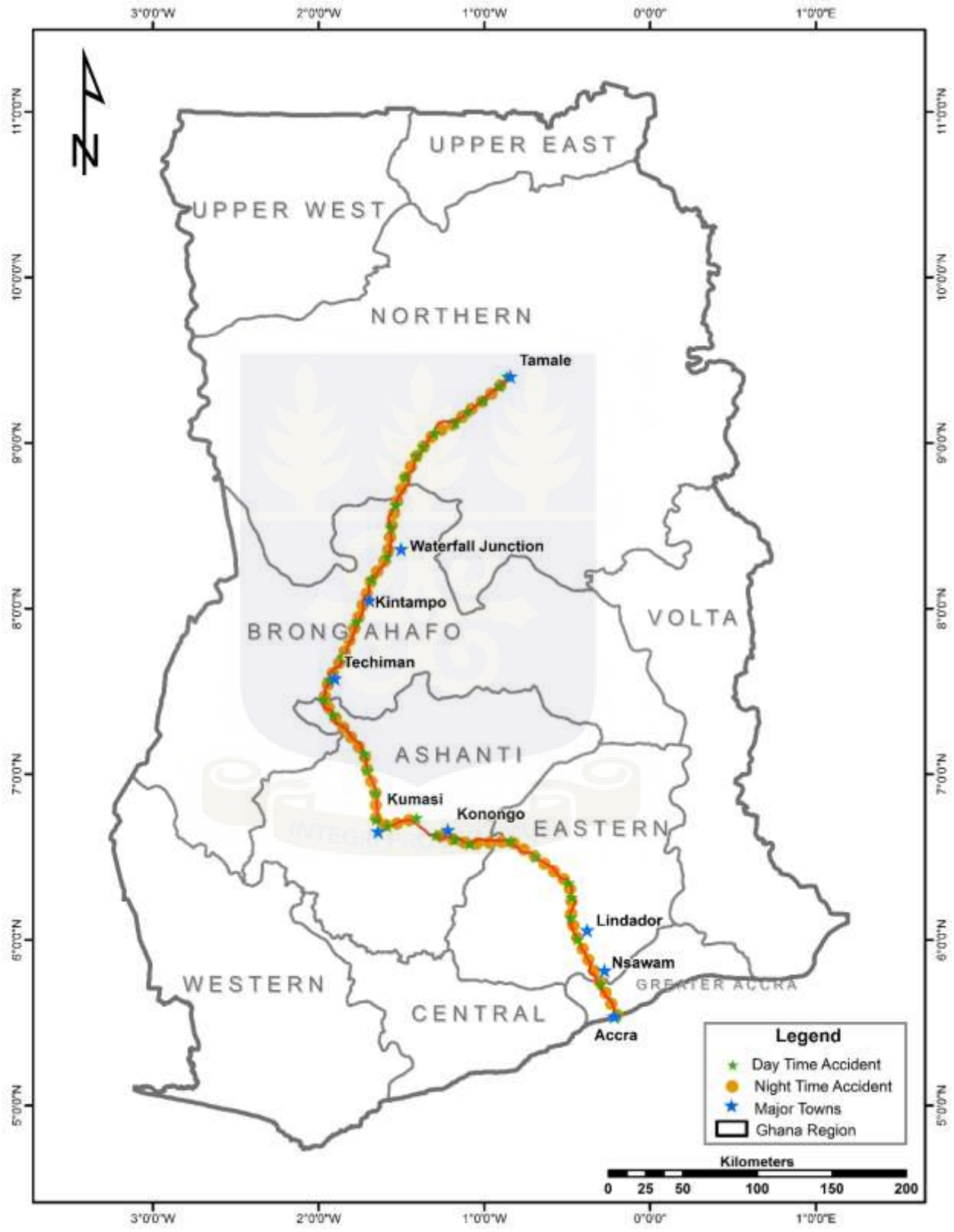


Source: Extracted from the National Accident Data, BRRI 2004

In addition, a time-specific analysis was performed to determine at which time of the day most accidents occur. This was done by performing an SQL query in relation to time specificity. The accident cases that occurred within a 24-hour time period were assigned to the 2-hour periods 00.00–02.00 hrs, 02.00–04.00 hrs, 04.00–06.00 hrs, 06.00–08.00 hrs, 08.00–10.00 hrs, 10.00–12.00 hrs, 12.00–14.00 hrs, 14.00–16.00 hrs, 16.00–18.00 hrs, 18.00–20.00 hrs, 20.00–22.00 hrs, and 22.00–00.00 hrs.

The findings revealed that a significant number of accidents occurred from twilight to early evening in the period of 18.00–20.00 hrs. Sixteen per cent of accidents occurred within this period, representing 123 cases. Moreover, 67% of the accident cases within this time period occurred on the Tamale–Kumasi section of the corridor, designated as a hot-spot stretch. This pattern may be attributed to the fact that there are more commuters on the road and in the evenings as they return home late. The likelihood of traffic accidents occurring during those peak hours is consistent with national figures. Figure 4.4 shows the time-specific analysis of accident cases from 18.00–20.00 hrs at the major accident hotspots.

Figure 4.4: Map of Ghana showing time-specific analysis of traffic accidents on the AKATA Corridor



Source: Extracted from the National Accident Data, BRRI 2004

The data also revealed that January, February, November, and December recorded the highest rates of RTAs on the corridor. (See Table 4.6) November and December 2011 recorded almost one-fifth of all RTAs, which is consistent with national figures. The highest number of accidents on the corridor was recorded in the months of January and December and may be attributable to the rush associated with Christmas festivities in those months (see Table 4.6). With more people travelling during these festive months, more vehicles were found plying the corridor. The spate of careless and inconsiderate driving tended to increase markedly among commercial drivers. They saw these periods (Easter and Christmas) as an opportunity in order to speed to make extra money from the increased number of travellers and trips. The trend where Christmas seasons and activities were associated with an increased rate of accidents sometimes changed. In 2011, for instance, the months of November and December recorded decreases in traffic accidents compared with the figures for November and December 2010, respectively (NRSC, 2012).

The highest rate for Saturdays occurred in 2007 (253), while the lowest rate for Saturdays on the corridor was recorded in 2011. The decrease in the rates for 2011 can be attributed to the rigorous education and awareness-creation exercise as well as the particularly consistent enforcement operation team set up by the MTTU to enforce traffic regulations on the corridor. In the case of hours of occurrence, the period between 16.00 hrs and 18.00 hrs remained the peak period for accidents. On the corridor, the highest peak for that period (16.00–18.00 hrs) was recorded in 2008, while the lowest was recorded in 2002.

4.8. Institutional arrangements for road safety management

The collaboration among public stakeholders responsible for the promotion of road safety in Ghana leaves much to be desired. Without doubt, issues related to road safety

management have been problematic for many countries. In Ghana, as in other African countries, road safety management is a shared responsibility among several institutions, spread across various ministries, departments, and agencies, and local assemblies. These agencies deal with road safety issues in a multi-sectoral manner, and decision making, budgeting, and execution of tasks are carried out in this way. As a consequence of lack of coordination across these sectors, the implementation and monitoring of road safety activities by these public stakeholders have not been effective in reducing RTAs in Ghana.

Global best practices in road safety management require that measures taken to improve road safety management be built around the four 'Es' of road safety: education, engineering, enforcement, and emergency medical services. A deficiency in any one of these factors results in dire consequences. (NRSC, 2012).

The following discussion seeks to shed light on the institutional arrangements for road safety management in Ghana, to highlight the possible challenges, and to make recommendations for rectification. Also, the importance of a multi-stakeholder approach as a strategy to road safety management is addressed. The discussions are based on the available literature and empirical data obtained from the survey.

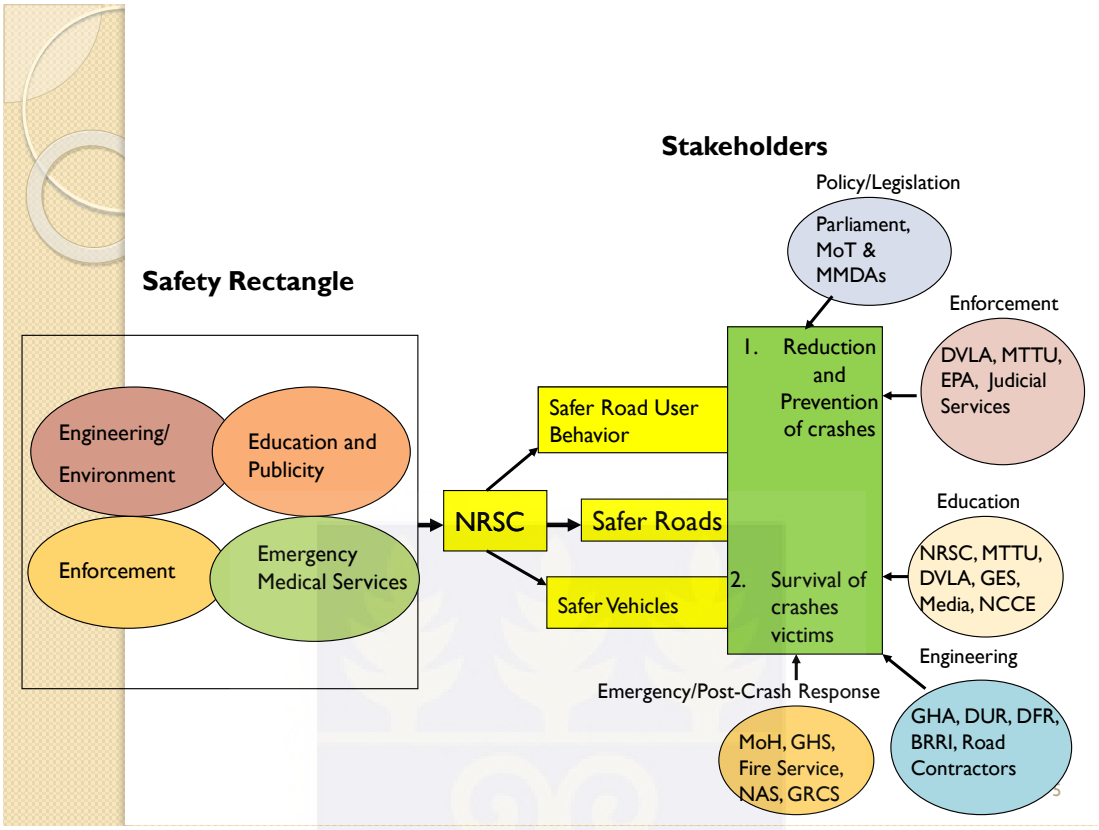
4.8.1. Current institutional arrangements

Attempts were made to solicit the views of major stakeholders on institutional arrangements for road safety management. Available data in Ghana reveal that the MOT provides the broad framework for road safety management. Within the policy framework, the NRSC plays the coordinating role that brings the efforts of the key players together to facilitate the implementation of activities and programmes. The NRSC guides and

encourages the key players through board meetings, direct contacts, and the facilitation, preparation, and implementation of detailed action plans by these key players. The NRSC translates these strategies agreed upon at such meetings into action plans for every key player, with a view to coordinating, monitoring, and evaluating road safety activities.

For this study, an institutional arrangement is defined as enduring and potentially mutually beneficial patterns of relationships between two or more actors based on a written or verbal agreement, the basis of which is to reduce the death toll on the roads. The management of road safety interventions in Ghana hinges on policy and regulation as well as on an emergency medical services. Engineering comprises road improvements such as signs, markings, roundabouts, traffic lights, pedestrian crossings, and speed-calming measures that promote road safety. The education departments consist of stakeholder institutions, among others; they organize media campaigns and training programmes for road users, primarily drivers and school children. Enforcement, comprising traffic rules and police enforcement, are all geared towards road safety promotion. Figure 4.5 illustrates the overall framework for road safety management and the related key public stakeholders in Ghana.

Figure 4.5: Framework for road safety management in Ghana



Source: NRSC (2009)

The central coordinating role of the NRSC ensures that all issues related to engineering, education, enforcement, and emergency medical services are properly coordinated to ensure safer roads, safer vehicles, and safer road-user behaviour. The essential objective of the coordination is to ensure that the key stakeholders play their roles effectively to reduce and prevent crashes. Further interventions are put in place to ensure that victims of traffic crashes survive their injuries, if any, and hence the emphasis on the role of emergency medical services. In general, stakeholders appear satisfied with this basic system, although it has an inherent fundamental problem—namely, coordination.

4.8.2. Institutional arrangements: Policies and strategies

Formulating and implementing policies are necessary for improving road safety. Policies and strategies will have no effect on road safety unless they are implemented. This is against the background of the fact that road safety work is a complex process involving different sectors. There is thus the need for a functional and effective institutional framework for the development and implementation of policies and programmes to prevent crashes and hence injuries. Developments in Ghana over the last several decades have revealed that clearly defined policies have not been fully implemented to coordinate road safety management activities among road safety agencies.

In view of the magnitude of the problem of RTCs and fatalities, the Government of Ghana, through the MOT and NRSC and in collaboration with all stakeholders, has been implementing data-led programmes and activities to address the road safety challenges in the country. The evolution of the development of road safety policy began in the year 1988, marking a turning point with the organization and management of road safety activities. In that year, the Ghana Road Safety Project (GRSP) was launched under the World Bank-financed Transport Rehabilitation Project (TRP).

The available literature reveals that the primary objective of the GRSP was to increase the knowledge, skills, and capabilities of personnel in key Ghanaian organizations and of professionals to tackle the country's road safety problems more effectively. The GRSP was designed around five mini-projects that focused on strengthening the following stakeholders: i) the National Road Safety Committee; ii) the then Vehicle Examination and Licensing Division (VELD), which is now the DVLA; iii) the Ghana Highway Authority (GHA); iv) the Department of Urban Roads (DUR); and v) the Motor Traffic

and Transportation Unit (MTTU) of the Ghana Police Service (GPS). The project was complemented with the establishment of an improved data system on RTCs.

A key recommendation of the report on the GRSP was the proposal to transform the National Road Safety Committee into the National Road Safety Commission (NRSC) with the requisite legislation (enacted finally in 1999) and to provide it with appropriate staff and funds to enable the new commission to promote and coordinate road safety activities in Ghana. From 1991 to 1994, the second phase of the TRP was implemented. The principal objective of the road safety component of the second phase was to provide continued assistance in order to consolidate the achievements of the road safety program of the first phase of the TRP. This second phase provided support in the form of training, equipment, materials, and budgetary support to the National Road Safety Committee, the BRRI, GHA, DUR, MTTU, and VELD.

Since 1994, when the TRP ended, the two phases of the Urban Transport Project (UTP) were subsequently implemented in the country with road safety components. In 1997, the merger of the then Ministry of Roads and Highways (MRH) and the Ministry of Transport and Communications (MOTC) into the Ministry of Road Transport (MRT) brought the principal road safety stakeholder agencies—namely, the GHA, DUR, VELD, and NRSC—under a single ministry. The merger presented the greatest opportunity for the coordination of road safety activities in the country. Currently, the major stakeholders—namely, the GHA, DUR, VELD (now the Driver and Vehicle Licensing Authority – DVLA), and NRSC—are under the MOT.

In 1999, Act 567 established the National Road Safety Commission (NRSC). Presently, a chairman, executive director, and 18 representatives from 6 ministries and 12 organizations constitute the membership of the commission. The absence of an overall road safety policy for Ghana made the coordination of road safety activities a challenging function, because there was no documented point of reference for the NRSC and its stakeholders to design and implement a holistic road safety programme that all stakeholders could own and identify with.

In December 2009, the National Road Safety Policy was launched by the Minister for Transport, Mr Mike Hammah, to underpin and validate road safety interventions implemented in Ghana since 1999. The policy provided a guideline for the design, implementation, monitoring, and evaluation of road safety programmes and activities from 2008 and beyond. The policy was geared towards assisting the NRSC and its key stakeholders to be proactive and result-oriented with the organization and management of road safety activities so as to achieve set strategic objectives and targets.

The policy identified institutional inadequacies in the road transport industry in Ghana and further examined the challenges with a view to finding solutions. Furthermore, the policy outlined the key challenges contributing to traffic accidents in Ghana. In this regard, the policy reviewed the challenges and found strategic governmental policies to address issues relating to the driver, the vehicle, the road infrastructure, non-motorized transport, road safety legislation, enforcement, and post-RTC care.

4.8.3. The National Road Safety Strategies and Action Plans

The National Road Safety Strategies (NRSS) have become the main thread for the NRSC's performance from 2001 to date. Since the establishment of the NRSC in 1999 its efforts to fulfil its mandate have been dedicated to collaborating with other stakeholders to coordinate the implementation of data, and to lead road safety programmes and activities in Ghana. The first of such programmes was the National Road Safety Strategy I (NRSS I), covering 2001–2005, which provided a broad framework for coordinating the efforts of all agencies with a view to reversing the upward trends in RTCs and casualties. The implementation of the NRSS I led to a significant enhancement in the institutional, technical, regulatory, and enforcement capacity of the NRSC and its key stakeholders.

The NRSS I and the Action Plans of 2000–2005 had a vision to develop the capacity of relevant agencies and to influence the quality and spread of road safety interventions in the country. The NRSS I ended in December 2005. In February 2006, an evaluation that was carried out revealed that the strategy had been useful for developing and managing road safety efforts in the country over the strategy period. The achievements included increased awareness among policy makers and civil society, transformation of driver licensing and vehicle inspection processes, enactment of a new Road Traffic Act, and enhancement of road design, construction, and maintenance.

Despite the achievements at the end of 2005, the level of road accidents was still rising, an indication that the strategy did not achieve its ultimate objective. The review found that the following major challenges prevented the full implementation of the interventions in the NRSS I: inadequate enforcement of road traffic laws and regulations by both the MTTU and the DVLA; GHA's slow pace in the improvement of hazardous sections and

spots on the roads, particularly on trunk roads; weak collaboration and coordination between key stakeholders; and over-dependence by the NRSC and key stakeholders on donor support for the implementation of road safety programmes and projects.

In spite of the achievements of the NRSS I, emerging road safety challenges coupled with the ever-increasing vehicular fleet in the country have necessitated the need for a new strategic direction. In response to these challenges, the NRSC, in collaboration with its key stakeholders, designed an NRSS II for implementation from 2006 to 2010 to address emerging challenges and build on the gains of the NRSS I. The NRSS II was developed to provide a broad framework for a coordinated national effort in developing and implementing best practices and cost-effective countermeasures. The strategies outlined the main traffic accident contributory factors, the framework for road safety management, and the mission, objectives, focal areas, and expected outputs and outcomes to be achieved for 2006–2010 by specified public and civil society institutions that had been identified as key road safety stakeholder organizations.

A novelty for the NRSS II was the formulation and adoption of a national vision for road safety in Ghana with the intention of stimulating and driving the nation forward towards achieving what is acceptable for the nation. This national vision for road safety was intended to make Ghana's transportation system the safest in Africa. In line with the national vision for road safety, the strategic objective was first set to reduce RTA fatalities on a year-on-year basis and to achieve a total of less than 1,000 crashes by the year 2015. In the NRSS II, greater efforts were directed towards ensuring the safety of the two most vulnerable road-user groups: pedestrians, including children, and passengers. The strategy also outlined safe conditions for mass transportation of passengers with a view to ensuring

a significant reduction in deaths involving pedestrians. The strategy aimed to create high numbers of well-trained and legally licensed drivers, improve structural integrity for commercial buses, and increase road safety awareness among all categories of road users. To meet these objectives, the new strategies to address road safety problems targeted road users, vehicles, enforcement, and emergency services and care.

There are eight public institutions whose activities and operations relate to road transport and possess the capacity to influence positive changes. In line with the objectives and within the framework of NRSS II, these institutions constitute what have been described as 'major stakeholders'. They include the MOT, the NRSC, the DVLA, the GHA, the DUR, the MTTU, the National Ambulance Service (NAS), and the Ghana Red Cross Society (GRCS).

The National Road Safety Strategy III (NRSS III) covers a ten-year period, 2011–2020. The key objective of NRSS III, flowing from the second strategy, is to halt the rising trend of road traffic fatalities and injuries by 2015 and thereafter reduce it by 50% by the end of 2020, as recommended in the United Nations (UN) Decade of Action for Road Safety. The goal is to ensure a safer road transportation system in Ghana. The strategy consists of directions and policy actions aimed at driving the national road safety performance towards the targets set for 2020. The NRSS III is thus a follow-up strategy to consolidate the achievements of the NRSS II.

The NRSS III should be viewed in the context that there is clear evidence that the right interventions can make a significant positive impact towards the prevention of RTCs. This third national strategy is unique in two ways: first, its tenure is a decade; and second, it

coincides with the UN decade of action for road safety, a global initiative that requires governments to drop the rhetoric and rather act on initiatives that will deliver a 50% reduction in road traffic fatalities over a ten-year period. The driving pillars of action for road safety in Ghana and the NRSS III dwelt on the following: promoting the safe use of public transportation systems, implementing an integrated speed-management system, ensuring the use of safer vehicles, promoting greater responsibility, dedicating and committing to a sense of urgency by stakeholders in the road transportation system, and developing the knowledge, skills, and behaviour of all road users.

As captured in the available literature, the road safety issues addressed in the NRSS III were diagnosed in the form of a problem tree. This was done to ensure an integrated logical approach to dealing with the road safety challenges in the country. The problem tree was translated into a goal tree with definite interventions. As stated above, the broad objective of the NRSS III is to stabilize the unacceptable levels of road traffic fatalities and injuries by 2015 and thereafter reduce it by 50% by the end of 2020, as recommended in the United Nations (UN) Global Plan for the decade of Action for Road Safety 2011–2020. The general strategy is developed into specific action phases.

In an interview with the chief director of the MOT, he stated:

> *A review of the action plans of the National Road Safety Strategy 3 and the development of 2014–2015 Action Plans by the NRSC revealed that the contents of the NRSS III were too many, and some activities were broad-based and not specific. The review also indicated that these assessments of inputs, technical and financial support at the planning stage were inadequate. It was also noted that the effectiveness of activity implementation did not trickle to the regional and district offices of the NRSC. There is therefore limited ability to translate the NRSC activities into effective actions at the regional and district levels. The review also identified limited integration of similar activities with others, such as the MTTU.*

> *The review also noted difficulty in monitoring and correlating individual partner contributions to the outcome through outputs with objectives of multiple activities being implemented by multiple mini-strategies within different time frames and at different progress rate by different stakeholders.* (Interview, 9 February 2014)

The chief director of the MOT also noted:

> *The review of the actions plans for the NRSS III underscores the fact that there is the need for three levels of effective coordination amongst the implementation agencies. The first is on the enforcement between the MTTU and DVLA. The second is on road-design standards and capacity development between the GHA, DFR and DUR; and the third between the emergency response units.* (Interview, 9 February 2014)

4.8.4. Education and road safety management

Road safety education is said to be a potent tool for the reduction of RTAs. The GOG (1999) National Road Safety Act, 1999, Act 567 established the NRSC to plan, develop, and promote road safety education for all categories of road users across the country. The NRSC exists to promote best road safety practices for all categories of road users through the conceptualization, design, implementation, and monitoring of data-led road safety interventions. In Ghana, the sector ministry (the MOT) provides the broad framework for management of road safety. Within the policy framework, the NRSC plays the coordinating role that brings the efforts of all key players together to facilitate the implementation of road safety activities and programmes. To raise awareness and to improve the behaviour of different groups through public campaigns, the NRSC undertakes various traffic accident interventions through different activities at the regional and national levels. The NRSC develops and maintains a comprehensive database on RTAs and publishes reports related to road safety. In spite of the great efforts to attain its

objectives, the NRSC is confronted by a whole host of challenges. In an interview with the executive director of the NRSC, he stated:

> *Road safety continues to be lowly ranked in the hierarchy of events across the entire society, to the extent that policy/decision makers consider expenditure on road safety as a cost rather than an investment. The result is that there is relatively very low budget allocation or not at all for road safety activities. For example, road safety budget under the Road Fund constitutes 0.6% of the total Road Fund Budget annually. Again, road safety components in road infrastructure delivery fall less than 0.01% of the total cost of road safety infrastructure.* (Interview, 9 February 2014)

To illustrate the gravity of the problem, it should be noted that data on the finances of the NRSC show that the annual state budgetary allocations were as follows: in 2008: 0.4%; in 2009: 0.98%; in 2010: 1.10%; in 2011: 0.98%; and in 2012: 1.09% (Republic of Ghana, 2013). According to Adu Sarpong (2014)—in a presentation at the 2004 West African Road Safety Organisation (WARSO) Conference in Sierra Leone—in 2004 the funding source of the NRSC by law included a 75% governmental contribution, a marked improvement over the previous years. He also said at the conference that the insurance industry contributed 20%, while corporate sponsorship constituted less than 1%. Regrettably, the contribution from the Government of Ghana constituted less than 5% of the entire budget for the NRSC. Conversely, the total budget of other road safety-related institutions in the annual budget in the year 2014 stood at 34 million Ghana Cedis, equivalent to about eight times the NRSC budget in 2014. Perhaps it is because of the gaps in finance for road safety activities that the NRSC (2002) strategy report noted the over-reliance on foreign donor support by most of the stakeholders. The report (NRSS II) mentioned that the gaps in funding affected the implementation of their project and training programmes within the time frame specified in the National Road Safety Action

Plans. On the issue of behaviour and its effects on road safety, the executive director of the NRSC stated:

> *Indiscipline in traffic, especially among motorists and pedestrians has culminated into acts of recklessness, carelessness and other unacceptable road-user attitudes and behaviour, to the extent that there is total disregard for road traffic laws and regulations. Key among such unacceptable behaviours are: very high travel speeds far in excess of acceptable limits; driving tired, particularly among commercial vehicle drivers and principally due to inadequate regulatory framework for the road transport industry; wrongful overtaking without due care on the highways is the order of the day, and; disrespect for other road users, especially pedestrians. All these are surely the result of lack of education and training.* (Interview, 9 February 2014)

This statement by the executive director of the NRSC underscores the fact that there is a deficiency in education and training for road safety awareness in Ghana. This is, perhaps, traceable to inadequate funding to prosecute the agenda. In spite of the efforts of the NRSC and its stakeholders to collect funds to support road safety activities, this key challenge still persists today.

4.8.5. Enforcement factors

The Police Service Act 350 (Act 1974) and the Road Traffic Act (Act 683) (Act 2004) mandates the police to enforce all traffic rules and regulations in Ghana. The police uses the MTTU to enforce traffic rules and regulations in Ghana. A large proportion of RTAs are attributed to road-user behaviour (Abane, 2012). More specifically, accidents occur because of decisions taken by road users to disobey or break the road. In fact, accident rates and compliance are inversely related. Law enforcement agencies, such as the traffic police, can implement strategies to ensure that road rules are obeyed and compliance is improved (Aparacio et al., 2011). These authors attribute the success of police visibility

on the roads and the penalty point system in Spain to the gradual 'stepping up' of the surveillance system. Rothengather (1982) also supports this view that police visibility can significantly improve compliance. This is evidenced by the fact that sustained law enforcement plays a critical role in the reduction of road accidents and fatalities.

The current survey also revealed that with regards to the MTTU, its effectiveness is hindered by undue interference in traffic offence investigations and prosecution, and the MTTU have been accused of weakness in the enforcement of the traffic law and regulations. The cause of this problem is not difficult to find. In Ghana, although all the world's best practices are being employed, it is noted that the Ghana Police MTTU, though mandated to enforce the country's traffic laws, is poorly equipped in terms of human resources and logistics, thus making it the weakest link in the chain of road safety management. In the Greater Accra Region, for instance, the current operational concern is to combat armed robberies with regular day and night patrols. No doubt many important MTTU traffic points in the city are often left unmanned because the men are drawn away for other so-called 'important' duties.

While most people perceive traffic offences as insignificant, others obstruct the police through interventions and pleading for mercy for offenders. Most Ghanaians have an aversion to going to court. Any person with some influence thinks he/she can intervene on behalf of a defaulting or arrested driver who has broken a regulation. This rather de-motivates MTTU personnel and encourages corruption, with the result that the unit has earned a bad name among road users.

In general, respondents described the ineffectiveness of traffic law enforcement by the MTTU and perceived it as a major de-motivating factor to dealing with key problems on the road and reducing RTAs. A 35 years driver operating between Accra and Tamale remark on MTTU enforcement of traffic rules and regulations:

> *The Police too are not helping matters …. They* [the MTTU] *do operate for a week. They arrest deviant drivers, but as soon a day passes, the drivers start their negative behaviours again. You hardly see any drivers being prosecuted for any violation of traffic rules and regulations. I am inclined to believe that most commercial drivers pay their way out of these arrests. To be effective, I believe, the police should recruit competent personnel to manage traffic laws and not thieves who parade themselves as traffic law enforcement officers.* (Personal interview, 9 March 2014)

In the opinion of majority of the respondents(about 86%) in most of the cases, the police who are assigned duty on the road seem rather more interested in making fortune or extorting money from the motorists who commit traffic offences and letting them go unpunished rather than in enforcing the law. Another driver who has been in the profession for close to 42years and play his trade from Kumasi to Tamale stated emphatically:

> *They* [the MTTU] *are the cause of many of the traffic accidents; they only know how to collect bribes from drivers. They are not doing anything about the accident problem—just collecting money under the pretext of conducting motor checks. They intimidate us to take money from us. They are known here as 'one-cedi-for-your-pocket'. They have turned the drivers and road into goldmine. That is what they 'eat'…* (Personal Interview, 9 March 14)

On the subject of whether drivers are satisfied with the performance of the MTTU, the majority of the respondents (66%) said they were not satisfied, while only 34% said they were satisfied. Those who said they were satisfied ascribed to the police presence a

deterrent force to recalcitrant drivers who have the tendency to flout traffic rules and regulations with impunity. They emphasized that the role of the police in managing traffic congestion during peak hours is commendable. They also commended the police for occasionally arresting and removing unsafe vehicles from the road. The respondents who differed in (66%) opinion explained that the MTTU do not check 'overloading' of passenger vehicles, but rather extort money from lawless drivers; they lack courtesy; and they tend to remain at one place instead of being mobile when engaged in their daily routines.

This group of respondent however noted that notwithstanding the nefarious behaviour of the police on key, their sometimes tends to reduce RTAs. They explained that the presence of police on motorbikes and in vehicles ordinarily puts fear into drivers, who tend to be very cautious driving as soon as they see the police. They cited common instances where drivers flash headlights and toot their horns to warn their fellow drivers heading in the opposite direction that there is a police presence spot on the corridor. A total of 34% of respondents said the police presence on the road actually *mitigates* RTAs. They however decried situation where the MTTU on highway patrol tend to hide in curves and obscure places to suddenly stop vehicles. They also complained that the police are fond of parking vehicles along the verges of the road in long queues. These are factors that increase the possibility of traffic accidents on the corridor.

The study sought the opinion of personnel of the MTTU in the matter under research. The personnel were asked whether enforcement of traffic rules and regulations were relaxed or stringent. Out of the total 25 police interviewees, 18 (72%) said that, in most cases the enforcement of the road laws were relaxed. This group of officers explained by referring

to the fact that 'Big Men' in the society unnecessarily interfered with their jobs professionally. Many of the vehicles they stop on the roads, they said, belong to politicians, senior public officers, judges, etc or the relatives and cohorts. They further cited frequent withdrawals of the police from highway patrol duty, and the insufficient deterrence effect of the punishments meted out to traffic offenders were also cited as factors that contribute to police ineffectiveness on the road corridor. The six remaining MTTU personnel respondents (24%) said enforcement is stringent and cited situation where recalcitrant arrested and drivers are sent to court as a proof of their effectiveness. Additionally, they noted that, most non-road-worthy vehicles are impounded and forwarded to the DVLA to issue prohibitory notes on them.

The interview below provides the general impression that the enforcement of traffic rules and regulations is generally relaxed due to unnecessary civil society interference. The Director-General of the MTTD had this to say on the challenges the MTTU faces:

> *Many traffic offences are strict liability offences, and they require concrete evidence to facilitate arrest and prosecution. Equipment such as the speed radar guns, alco-meters or breathalyses, digital height gauges, magic lights, digital/video cameras, and reflective jackets are needed to support the human efforts. The unit over the years has been dependent on charity from individuals and corporate bodies for the supply of such items upon persistent appeals. In 2007, the NRSC graciously supplied the unit a quantity of these tools and equipment. These were, however, not sufficient for distribution to all units countrywide. Many of these items have broken down due to over-usage. The unit also has financial constraints to meet the huge costs involved in having the alco-meters and speed guns calibrated by the Ghana Standards Board. There is little or no resources at all, making enforcement of traffic laws and regulations the weakest link in the road safety management chain. The police MTTU has over the years depended on charity to enable it meet its mandate. To compound the situation, the MTTU has*

> *no budget, suggesting that the unit is not considered during resource allocation.* (Personal Interview, 9 February 2014)

The Director-General of the MTTD said the lack of the right calibre of personnel on the job market and the inadequate number of accident-and-emergency units in health facilities nationwide present a hindrance to the MTTU's operation. With regards to the MTTU, the lack of quality human resources is posing a serious threat to the unit. To enhance professionalism it is essential that regular training programmes are organized for personnel. Traffic regulations enforcement is one of the major roles played by the police MTTU in Ghana. The Director-General concluded that in-service training in communication skills, etiquette, knowledge of the traffic laws and other regulations, as well as specialist training in road collision investigations and data collection are imperative but lacking. Legislation, information, and policies will not yield the desired impact without an effective and purposeful enforcement.

4.8.6. Emergency medical services

It is said that many accident victims survive an accident in the first instance, but they pass away later owing to a delayed emergency response or a wrongful handling of the accident scene or on the way to the hospital. The medical emergencies and disasters that have occurred over the years have strongly highlighted the need for Ghana to initiate an emergency medical service. In 2004, President Kufour in his Session Address to Parliament emphasized the urgent need for ambulance services as part of the emergency response system to address this issue. On 9 May 2001, the necessity had already become unfortunately clear with the Accra Sports Stadium disaster, in which 126 people lost their lives. Thus, in 2004 the MOH in collaboration with the Ministry of Interior established seven pilot ambulance stations to tackle the problem of emergencies.

Accessibility to an emergency service is crucial to ensure that human lives are saved in the case of RTAs. As captured in the available literature, the proximity of health facilities to the AKATA Corridor can be said to limit the number of deaths related to accident injuries. Data suggests that a total of 52 health facilities were found to be located along the Accra–Kumasi highway alone (MOH, 2012). According to the report, these health facilities comprised 24 (46.2%) hospitals, 10 (19.2%) clinics, and 18 (34.6%) health centres. In all, 23 of the health facilities were located in the Ashanti Region, 23 in the Eastern Region, and only 6 in the Greater Accra Region.

During the semi-structured interviews, one participant (a widow) said treatment of RTA victims is very expensive and many families cannot afford it. She disclosed that after being involved in an RTA, she underwent five surgeries that cost a lot of money; and to manage, her children decided to sell a piece of land they owned. Another said she was assisted by relatives and friends who contributed for her treatment and surgeries. Another female participant said she had health insurance that covered only the medical expenses and the physiotherapy clinic. What she was covered for was only the transport cost to hospital. According to an NAS staff member at Nkenkansu, in all RTA cases, patient-payment of treatment costs is not required. He said the NAS faces many challenges in the increasing number of people involved in the rising number of cases of RTAs on the corridor. Treatment costs are high because most of the logistics have to be imported, and he appealed to benevolent agencies to contribute to the state effort in order to save more lives.

The literature in Ghana shows that a number of organizations and health institutions in the country also provide emergency services. These include the St. John Ambulance Service, the Ghana National Fire Service, major government hospitals, and the Ghana Red Cross

Society. All these institutions play very important roles in the provision of emergency and healthcare services for victims of RTAs. However, it is necessary to harmonize their activities to ensure the effectiveness of emergency and care services. There is a need for cooperation and the setting up of a coordinating body to advance the harmonization process.

4.9. Institutional capacity of public agencies

Public agencies entrusted with management and administrative responsibilities in road traffic and accident reporting and the collection and analysis of data can have a direct and effective impact on road safety, if their staffs are skilled on issues related to road safety. Based on the above concern, the study probed the above-mentioned institutions on whether their staffs were skilled and experienced in the implementation of road safety activities. All the public safety institutions, except the DVLA, which cited constraints, indicated that their staff acquired skills in tackling road safety activities through the regular programmes organized by the DUR, NRSC, BRRI, National Insurance Commission (NIC), and Government of Ghana.

On whether these public agencies motivate their staff in the implementation of road safety activities, the agencies contacted claimed they motivate their staff through the payment of allowances. The police MTTU has no motivation scheme for their staff. These findings imply that the absence of motivation for relevant agency staff, although skilled, in addition to other factors mentioned above, does affect the regular monitoring and implementation of road safety activities on the corridor, as evidenced by the rising trend in road safety problems.

Communication among public agencies pursuing similar objectives is vital for the exchange of ideas and information. Hence, the study attempted to discover the means by which these institutions exchanged ideas and information and also how effective these means were. Based on the responses of the institutions, the following communication channels were identified: letters, reports, in-service training, memos, inter-personal communication, hand-outs on the rudiments of road safety, workshops, and joint operations. Concerning the effectiveness of these means of communication, all the stakeholders said it was effective-except the police MTTU, who said it was ineffective. Among the factors that render the means ineffective, the police MTTU cited the irregular nature of workshops, insufficient time for organizing seminars and workshops, and the long time it takes letters and reports to reach their destination.

These findings indicate that though the majority of institutions agree that communications are effective, it is still urgent to assist the remaining key player, the police MTTU, to improve the effectiveness of their means of communication so as to sustain their effective contributions towards the promotion of road safety. Relations among stakeholders who have an interest in a particular decision are an important ingredient in any multi-stakeholder concept. In view of this, the study sought to understand how the institutions relate with each other and to determine whether the relationships have helped the institutions in carrying out road safety activities. The investigations revealed that the NRSC regularly collaborates with the police MTTU, BRRI, DVLA, DFR, DUR, and GHA in road safety educational campaigns, through seeking and securing funding, correspondence, and workshops and seminars. In the same vein, the BRRI regularly collaborates with the NRSC, police MTTU, GHA, DFR, and DUR in training their staff and in the sharing of road-accident information. The partnership between the DVLA,

NRSC, and police MTTU is also good. This is achieved through policy implementations, seminars, and workshops, as well as joint-enforcement task force operations.

Focusing directly on the corridor, the picture of relations among the stakeholders is quite different, in that enquiries showed that the NRSC, police MTTU, GHA, and private transport unions operate on road safety educational campaigns. However, there is irregular collaboration in the enforcement of road traffic laws between the police MTTU, DVLA, and other stakeholders in the enforcement of road- and traffic-related issues.

It can be deduced from the existing communication networks among the stakeholders in the corridor, that whereas regular collaboration existed in road safety educational campaigns, enforcement of traffic laws, regular maintenance of roads, and infrastructure, the NAS itself did not enjoy regular collaboration with the other parties. This revelation points to the fact that the existing collaborative links with the NAS need to be improved in order to ensure that victims of RTAs are immediately attended to in a bid to reduce the fatality rates as a result of accidents on the AKATA Corridor. With regards to the MTTU, inadequate training, poor professional discipline, and the lack of equipment all contribute to the reasons the unit is seen as the weak link in the road safety management chain. It is therefore necessary to give the MTTU the maximum support possible and the training they require in order to tackle the road safety problem. It is also necessary to ensure a uniform collaborative network among all relevant stakeholders to ensure effective and sustained promotion of road safety activities on the corridor.

4.10. Summary

A historical review of road construction over the 20th century on the AKATA Corridor has revealed an understanding of contemporary provisions and their impacts on traffic accidents along the road. Three phases in road provision and transport services development and their impact on the economy were identified:

i. A colonial phase, when the emphasis was based on access to major export-producing areas along the corridor. This had tremendous implications not only for the movement of goods and services, but also for the levels of development in the various towns and regions along the roads. The roads constructed in this era were very few and always in poor shape.

ii. A Structural Adjustment Programme (SAP) phase from the mid-1980s to the 1990s, when external interventions once again came to bring influence to bear on local policies and conditions. The early SAP phase, which saw the implementation of currency devaluation, the elimination of subsidies, and the reduction of state intervention in the economy, brought immediate problems in the road transport sector in Ghana. Roads deteriorated rapidly because of the shortage of funds for maintenance. Vehicular purchases dwindled because of the escalating costs of importing vehicles, and spare parts supplies declined for the same reason. In addition, the state was pressurized to cut fuel subsidies. Economic stagnation led to the non-maintenance of roads, and the transport sector deteriorated, leading to the localization of regional economies. More people were unable to purchase vehicles because of the economic downturn and the declining standard of living experienced in the country. This, naturally, also affected the roadworks on the corridor, and only five major road constructions were undertaken. The RTA rate

on the road corridor began to pick up only around 1995, following the resuscitation of the economy; before then, the RTA rate was low from the early 1980s. (See Figure 4.1)

iii. The change in the trends of RTA rates can be placed at 2000 and beyond. This is reflected in the fact that Ghana is newly classified as a lower-middle-income country, which has resulted in an ambitious reform agenda and mostly strong economic growth. Although the road infrastructure still leaves much to be desired, the country has been attracting new actors and interventions in the infrastructure sector. The AKATA Corridor experienced a major quantum leap from seven projects in the 1980s to 50 in the 1990s and 73 in the 2000s, thus triggering a monumental increase in vehicular traffic along the corridor—and, unfortunately, in concomitant accidents. This is attributable to the increase in standard of living and the economic liberalization following the adoption of SAP. However, the decline of RTAs on the corridor in 2010, as evidenced in newspaper reports, can be attributed to the increased use of mobile phones, which seems to have reduced the need for face-to-face interactions that formerly necessitated extensive travelling. People, particularly traders, now save money and travel time by using mobile phones.

The spatio-temporal trends in RTAs indicate that accidents tend to occur mainly at locations not associated with any form of junction control; rather, they occur mainly on straight roads. They also occur mainly in the evenings during the peak rush hour of 16.00–18.00 hours. The assessment of road accidents by days of the week reveals that the concentration of accidents is highest on Tuesdays, Wednesdays, and Fridays. With respect to the months of the year, accidents are highest in the months of January and February. A

high number of accidents were recorded in December and January because of the related Christmas and New Year festivities.

The findings also revealed that the average incomes of countries improve with road development. This was reported by Mike Winnet at the African Road Safety Conference in Accra (NRSC, 2007). He also noted that 45% of those killed in traffic accidents are pedestrians—70% are males and 60% of those are 18–55 years—and that 55% of RTAs occur in rural areas. Given the high proportion of working age males that lose their lives in RTAs, Winnet pointed out that many women thereby become widows and single parents prematurely. With a family's loss of earning power, access to credit for single women in rural areas is difficult, and children are unable to go to school and become destitute. Ghee's study in Bangladesh reported that 80% of accident victims have dependants, and these dependents have to bear the cost of treatment for the injured, putting further strain on the already poor. The key issue here is that reducing traffic crashes will not solve the issues of poverty, but it will help to keep the poor from becoming poorer. Education of vulnerable road users is crucial to the campaign to reduce accidents on the roads, and there is a need to convince leaders that road safety is an investment with positive returns for development.

The study's qualitative survey showed that the construction and development of more sections of the corridor has led to increased RTAs over the years. Although it is beneficial for the government to increase a quality road network as part of increasing the nation's infrastructure base, it is crucial to balance such developments with campaigns and policies that will reduce the forecasted increase in road accidents that is likely to follow.

The study used both qualitative and quantitative data in an attempt to provide a holistic picture of the performance of various institutional arrangements currently operational in Ghana and how these contribute towards a sustainable and effective road safety management regime. An attempt was made to discover how the various stakeholders interact to deliver under their mandate in road safety management. The views of heads of the leading agencies were also sought. Such information was helpful in identifying the strengths and weaknesses of prevailing institutional arrangements.

It will be an understatement to reiterate the fact that Ghana is saddled with a road safety management problem. There are problems of coordination, collaboration, and partnership on the AKATA Corridor. The historical lack of proper planning and the subsequent laissez-faire, unplanned development have compounded the problem. In many instances in the road safety management chain, the study discovered that important policy stipulations have not been given the necessary attention. The challenge of dealing with the human factor, especially in regard to mainstreaming road safety educational programmes into the activities of MMDAs and police training, as well as the institutionalization of safety education in schools, lorry parks, churches, and mosques, requires urgent attention.

There is sufficient reason to suggest, quite strongly, that these interventions to deal with the problem are laudable and have the potential to assist in reducing the RTAs on Ghana's roads. Indeed, the interventions compare favourably with known best practices in road safety management. Unfortunately for the road safety managers in particular, and Ghanaians in general, the country continues to witness avoidable injuries and deaths inflicted on the populace almost on a daily basis. It should therefore be understood that road safety is a multi-disciplinary and multi-departmental enterprise that must be

approached in a cooperative, coordinated, and collaborative manner on a common platform. There should be, on this platform, all relevant stakeholder groups. Road safety is a shared and collective responsibility. It is also the case that desirable outcomes can be achieved only through a sustained political framework at the highest level, an appropriate regulatory framework, effective institutional structures and systems, and increased sustainable funding. That is the only way to eventually ensure desirable positive change in road-user behaviour.

The study has demonstrated that the current financial circumstances of both national and local institutions financing road safety activities in the country are difficult. These circumstances make it difficult for road safety stakeholders to take full responsibility for providing the needed interventions to curtail the RTA problem. It is also evident from the discussion that private involvement in road safety management has done little to contribute to solving the road safety problem. Removal of financial constraints and increased investments in road safety activities within the various sectors will play a major role in reducing traffic accidents in the country.

An equally important conclusion is that there are deficiencies in the road transportation sector in respect of vehicle growth, poor maintenance of our road network, general road-user indiscipline, and a lack of proper coordination and partnership—and that these factors all contribute to the death and injury toll on our roads. To address these deficiencies, road safety management stakeholder institutions have made tireless efforts to promote road-user education information and publicity. The aim of these efforts is to instil in drivers respect for vehicle safety regulations and to ensure effective enforcement and timely emergency response, but these efforts have not achieved the desired impact owing to the

limited capacity and lack of resources for effective operations. Budget allocations to these institutions are irregular and inadequate, thus making it difficult to execute planned operations and programmes to prevent or minimize traffic accidents.

To improve road safety management, enforcement has been identified as the strongest means to ensuring road-user discipline. The assessment indicates that in Ghana—although the world's best practices are being employed—the police MTTU, which is mandated to enforce the country's traffic laws, is poorly equipped in terms of human resources and logistics. This makes it the weakest link in the chain of road safety management. It is in the light of this fact that this study calls on the government to commit adequate resources and attention to road safety activities, and in particular to strengthen the capacity of the police MTTU to enable them to effectively and efficiently provide the needed support in minimizing RTAs on the corridor and on all roads in the country.

CHAPTER FIVE

BEHAVIOURAL FACTORS AND ROAD TRAFFIC ACCIDENTS: REFLECTIONS ON THE AKATA CORRIDOR

5.1. Introduction

The death and injury toll on Ghana's roads has been attributed to behavioural and attitudinal factors (Abane, 2012). The role of behavioural factors in risk research remains unclear despite a plethora of related research (e.g. Iversen & Rundmo, 2002). Although a great deal of research has considered the problem of traffic psychology (Hilakivi, 1976; Hanson, 1998; Arthur et al., 1991: Evans, 1991; Elander et al., 1993), the contribution behavioural factors can make to road safety and traffic management has often been neglected in most road safety policies and research in Ghana. A study developed by Parker et al et al. (2006) revealed that safety skills (e.g. conforming to speed limits and perceptual motor skills such as fluent driving) are important predictors of a number of traffic accidents in most developing countries, including Ghana.

Reflecting on this background, this chapter discusses behavioural and attitudinal factors as causes of RTAs on the AKATA Corridor. Socio-demographic variables of respondents, issues related to driver training and experience, and the acquisition of a driver's licence and its procedures are also examined. The chapter also analyses the contribution of perceived risk perception among road users on the corridor. This was undertaken with a view to determining which specific behaviours of respondents' contribute to an increased risk of traffic accidents on the corridor. The presentation is based on data collected from field work.

5.2. Socio-demographic characteristics of respondents

Socio-demographic variables are generally recognized as an important predictor of various important conditions, including traffic accidents. The identification of socio-demographic variable determinants of risk to RTAs provides opportunities for targeting preventive interventions to specific groups of road users. This section discusses the demographic characteristics related to education, gender, marital status, and profession and how these influence the behaviour of a total of 245 road users interviewed on the AKATA Corridor.

The age distribution of respondents shows that roughly 27% were aged 21–30 years; 40% were aged 31–40 years; 22% were aged 41–50 years; 10.2% were aged 50–60 years; and the remaining 1.6% were aged above 60 (Table 5.1).

Table 5.1 Socio-demographic characteristics of respondents

Variable	Frequency	Percentage
Gender		
Male	204	83
Female	41	17
Age		
21–30	65	26.5
31–40	97	39.5
41–50	54	22.0
51–60	25	10.2
60+	4	1.6
Educational status		
No formal education	25	10.3
Basic education	54	22.2
Secondary education	69	28.4
Tertiary education	95	39.1
Marital status		
Single	50	20.4
Married	166	67.8
Separated	22	9.0
Widowed	3	1.2
Divorced	4	1.6

Source: Field survey, 2012

From the table, it is apparent that majority of respondents sampled were young people, aged 31–40 years. This age group represents the economically active, a category among which many have become victims of RTAs on the roads. It is therefore highly probable

that respondents, if driving, could equally engage in aberrant driving. The effect of age was increased after the adjustment of socio-economic factors. Several possible reasons have been proposed, including greater risky behaviour in young people, or greater exposure to high-risk situations through behaviour on the road. This result is in agreement with findings by Abane et al. (2010), who examined the relationship between age and RTC risk and observed the relative induced risk calculated for 25 metropolitan, municipal and district assemblies (MMDAs). Their study revealed that drivers below 40 years old were generally found to have a relatively higher induced crash risk than their much older counterparts in Ghana. The propensity for this category to engage in deviant driving is high, leading to increased RTAs on the corridor.

Education not only broadens a person's perspectives on major issues, but also opens up access to greater opportunities in that person's living conditions. Education has been found to have played a significant role in drivers' level of inducement to crash risks (Keal, 1995). Drivers with a high level of education are more likely than those without formal education to quickly read and process traffic information and take decisions that will not expose them to avoidable risk. Formal literacy in driving is acquired through reading and from private information channels. The formal schooling system remains the best process for improving access to information and broadening people's perception Sam (2011). In the context of driving, education is normally achieved through driving schools. Most of the information on driving is obtained through learning on the job—what is termed the 'informal system' in Ghana.

The survey showed that 10.3% of drivers had no formal education; 22.2% had basic education; 28.4% had secondary; and 39.1% had tertiary education. The analysis indicated

that the majority of the respondents had more than basic education. The striking difference is that the survey is inconsistent with national data (BRRI, 2004) that says the majority of road users on the corridor have tertiary education. In general, the situation is that the majority of drivers on most of Ghana's roads do not have even full basic education (Abane, 2012). Surprisingly, that is not the case on the AKATA Corridor.

The number of drivers who are illiterate has implications for traffic safety in the towns and villages along the corridor. Many of the drivers may not be able to correctly read road signs and symbols and markings, thereby increasing their possible risk of crashes on the road and further exacerbating the accident problem. Levels of education may also be related to traffic risk perception. Education can be considered as an indicator of social status, and it is possible that perceived traffic risks vary between individuals with higher and lower social status. In this regard, Hoseth and Rundmo (2005) found that people with higher education took less transport risk. This indicates that individuals with higher education pose lower levels of traffic risk than people with low education. The results showed that respondents perceived higher probabilities of traffic accidents than the probabilities reflected in the national mortality statistics in terms of RTAs in Ghana (NRSC, 2012).

Marriage is recognized by society as union between a man and woman for the purposes of procreation, mutual support, and companionship. In the Ghanaian and African context, marriage is actually a union between two families. Marriage is socially defined to include formal unions that are legally, traditionally, or religiously sanctioned as well as informal cohabitation. It has always been said that marriage determines the level of responsibilities

of individuals; this appears to be the case in driving also. The relationship between the marriage lives of drivers and risk-taking on the road was also examined.

The results from the survey indicated that more than 67% of respondents were married. The respondents who were unmarried was 33% for respondents aged 21–30. The proportions that were divorced separated and widowed were limited to the older ages. The high percentage of drivers who were married was expected, because the majority of them were in the age category where people are economically active. A sizeable number were school drop-outs or had basic education, but had got married immediately upon leaving school. Also more than 56% of those who were married had between one and five children. The analysis showed that wide socio-demographic disparities among respondents exist along the corridor. These attitudes in turn fuel the magnitude and extent of RTAs along the AKATA road corridor.

5.3 Driver training, licensing and testing

An important challenge to the national fight against RTAs is the work of transport institutions, be they policy makers, implementers—such as the NRSC, the MTTU, or the DVLA—or private driver training schools. The results of a self-assessment risk survey and content analysis of the curricula of selected driving schools in Ghana revealed weaknesses, as did the test items used by the DVLA to licence motorists. Both revealed that a substantial proportion of ingredients for producing efficient and effective drivers are still missing (Abane, 2012). The deficiencies relate particularly to skills acquisition, attention to risk-increasing factors, and self-evaluation issues. Most of the driver training programmes do not cover social pressure, lifestyle, and group norms, yet these are

important issues in producing efficient and effective policies and programmes for road safety management.

The essence of driver training is to harmonize the industry with new methods of training delivery which are effective and efficient towards addressing attitudes and behaviour in order to reduce crashes in accordance with the NRSS III. Currently, the National Drivers Academy, a collaboration between the NRSC, the DVLA, and the Government Technical Training Centre (GTTC), has been established with a view to raising the profile of driving as a profession to secure investment from vehicle owners and to reduce RTAs by helping drivers upgrade their skills and knowledge basis.

Indeed, it appears many drivers are not very clear about their goals when venturing into driving. For some young persons, driving seems to be a convenient means to earn some money, given the challenges in finding more preferred jobs. Not surprisingly, a national survey on perceived risks-which included data on possession of licences, distances covered per month, and personal involvement in crashes-showed that many drivers would not qualify to drive if subjected to a test based on a driver education framework developed and proposed by Berg (2006). This is not entirely unexpected, given the fact that among those who described themselves in the survey as professional drivers, substantial numbers had relied on friends, family members, or the age-old ‘driver’s mate’ system rather than on driving institutions when learning how to drive (Table 5.2)

Table 5.2 Medium used to learn driving by type of occupation (%)

Medium	Public service	Engineer	Businessman/ Woman	Unemployed	Peasant farmers	Professional Driver
Family	10	2	15	30	30	20
Private Instructor	40	30	40	20	20	30
Media	5	-	-	-		-
Driving School	30	60	30	15	20	10
Mate System	2	-	2	40	30	40
No Response	13	8	13	5	-	-
Total	100	100	100	100	100	100

Source: Field survey, 2012

Table 5.2 indicates that only 30% of public service drivers received their training from driving schools. Among unemployed drivers, 40% received their training via the mate system. Among professional drivers, 40% received their training from the mate system.

The data reveals that a substantial proportion of respondents remain at the first and second levels of Keskinen's hierarchical level of driving behaviour model (1996). This implies that some drivers who convey passengers daily to their various destinations are still committing lapses that are characteristics of learners. They constitute a serious hazard and are an essential component of those responsible for the deaths and injuries on our roads (Abane, 2012). What is particularly dangerous is that in traffic management terms, all these persons possess valid driver licences and are constantly behind the wheels. An interview with participants revealed how they learnt to drive: the interviewees said almost all

commercial drivers learnt driving through the apprenticeship system (driver's mate training). According to one driver:

> *I learnt driving as an apprentice under the supervision of a master for three years. When I graduated, I served my master for six months and he helped me get a driver's licence. Luckily, within the same year I got someone's car to driver*. (A personal interview with 40-year old commercial driver at Kumasi, 12 February, 2014)

The drivers noted that this training is by observation only and takes place on the job:

> *Yes. You cannot write down anything; you are training while on the job. I mean you are supposed to be observing how your master is driving at the same time as you play your role as a mate*. (A personal interview with 50-year-old commercial driver at Nsawam, 10 February, 2014)

Some of the drivers, especially the older ones, seem to recognize that the current spate of reckless driving on the part of young drivers stems from the inadequate training they undergo. In the opinion of the older drivers, inadequate driver training, especially among the young, is assuming dangerous dimensions and is a cause for concern. According to one interviewee:

> *But in our time, we used to train a number of years to learn driving than they do these days. This time they spend about one or two weeks; then they become drivers. And they call themselves professional drivers. You know what they do? They come to tell you they want to learn driving. You tell them it will take three years. They say OK. When they start, as soon as they know steering control, they leave to look for cars and start driving.... Some even learnt how to drive at car-washing bays. I know about three drivers who were washing cars. They now drive cars. They learnt to drive when they were washing cars. Some started as sprayers, only to end up as drivers*. (A personal interview with 50-year-old driver, at Amasaman, 9 February, 2014)

The DVLA is responsible for issuing driver licences in Ghana. A great number of the Ghanaian motoring public have attributed aberrant driving to the method and manner of acquisition of driver's licences and have argued that this raises the possibility of occurrence of RTAs. Abane et al. (2011) argued that the ability of drivers to acquire driver's licenses from the recognized and genuine source is one of the main contributing factors to reducing potential dangers associated with road usage. Results for the survey revealed that the majority of male drivers (83.2%) stated that they had acquired their driver's license from the DVLA. Also, 73.1% of female drivers covered by the study said they had acquired their driver's license from the DVLA (Table 5.3).

About 12% of respondents, both male and female, said that they had obtained their driver's licence through '*goro* boys' (middlemen/fixers). These 12%, who openly admitted that they acquired their licence through *goro* boys, explained their choice as a means to avoid the delays and frustration in acquiring a licence directly from the authorized source, the DVLA.

Table 5.3 Acquisition of driver's licence by sex

Sex	**DVLA (%)**	***Goro* boys (%)**	**Total (%)**
Male	180 (83.2)	24 (11.8)	204 (80.2)
Female	30 (73.1)	11 (26.19)	41 (8.0)
Total	210	35	245

Source: Field survey, 2012

An interview with a driver revealed the following:

> *Driver certification as having passed the driving tests or before one is granted a driver's license is not transparent. The conditions are not the same some pay and licences are readily offered. A potential driver must be able to understand road signs and interpret road markings, must have good sight and be able to read at a distance of 20 yards in good day light. Drivers ought to be able to drive and control the motor vehicle in traffic and finally be able to take precautions at crossroads and junctions.* (A personal interviewed with a 45-year old driver at Techiman, 9 February, 2014)

On age and disability, an interview with a commercial driver revealed the following:

> *Applicants must not be less than 18 years and must not be disabled before they acquire a driver's licence. Drivers must be able to handle the steering wheel, must be able to start, move, change gears while in motion and stop when necessary, must show courtesy and consideration for other road users and must finally be able to make proper use of traffic signals. These are necessary requirements for the acquisition of driver's licence*. (A personal interviewed with a 35-year old driver at Techiman, 9 February, 2014)

On whether the current procedures for acquiring a driver's license were adequate and good, an officer from DVLA in Accra said:

> *Applicants should pass through the process. There are procedures through which applicants should be able to acquire a driver's license through electronic procedures. Applicants should therefore ignore* goro *boys.* (A personal interviewed with a 40-year old driver in Tamale, 9 February, 2014)

The interviews show that although there is an official DVLA procedure for the acquisition of a driver's licence in Ghana, it is quite rigid, cumbersome, and time-consuming—and hence the tendency to seek other routes for obtaining a licence. Some people therefore pass 'through the backdoor' or acquire licences through *goro* boys. Evidence also indicates that

these *goro* boys are in cahoots with some officials of the DVLA to procure drivers licence to drivers based on the ability to pay.

Observation revealed that of those who acquired their driver's licences after a DVLA test, 60% were issued with their licence in Accra, while the rest received their licences from the Weija, Koforidua, Tamale, Cape Coast, or Sekondi-Takoradi and Kumasi offices of the DVLA.

A surprising discovery was that a substantial number of those who obtained their licence without a DVLA test claimed to be professional drivers who drove vehicles belonging to official agencies, such as the Ghana Private Road Transport Union (GPRTU) and various governmental and non-governmental agencies. In contrast, only slightly more than 18% who obtained their licences after a thorough examination said they were professional drivers and had over five years' driving experience, while a third of these said they had been involved in at least one accident since they acquired their licences. With this as a background, the survey elicited from respondents whether or not they had undertaken any driver training courses after the acquisition of their various driver licences.

Table 5.4 Driver training after the acquisition of licences

Sex	No (%)	Yes (%)	Total (%)
Male	98 (48.2)	105 (51.8)	203 (82.8)
Female	14 (33.3)	28 (66.7)	42 (17.2)
Total	112 (45.7)	133 (54.3)	245 (100)

Source: Field survey, 2012

This is reinforced by the findings of a study conducted by the Pan African Health Organisation and the National Road Safety Council of Jamaica, which revealed that 71% of persons who obtained driver's licences without being examined had no accidents, while 40% of those who obtained drivers licence with training (Davidson, 2006) had accidents.

The study has revealed that quite a sizeable percentage of respondents (45.7%) have never received training after their first acquisition of a driver's license. The male to female ratio for no training after acquisition and issuance of a driving license is one in two males relative to one in three females. This state of affairs is worrisome in connection with efforts to reduce road crashes. Education and training is said to hold the key to effective development (Groeger, 2004) and change in attitude, which will eventually lead to reduction in the carnage on our roads

The results show that inadequate driver training is a significant contributor to the upsurge of RTAs on the corridor. It has been discovered that the mode of training of drivers on the corridor is 80% informal. Driving knowledge is primarily acquired through informal contacts and observation rather than proper education and training. The concern is that this mode of training poses a great threat to road safety management. It is well known that driving skills and competence are acquired through instruction and practice (Groeger, 2006). Therefore, the number of years spent in acquiring driving skills helps to shape road-use attitudes and behaviour in a significant way (Groeger, 2000, 2004). The result of inadequate driver training and improper means of licence acquisition leads to dangerous and inexperienced driving. This leads to an upsurge in RTA cases. Since such informal driver training is just via observation under the supervision of a 'master', dangerous driving and aberrant behaviour are passed on from one reckless driver to another. The

result is poor interpretation and comprehension of road signs and symbols. Thus, drivers engage in aggressive driving, speeding, and general road-rage behaviour, all of which lead to increased RTAs in Ghana. This is consistent with a study in Europe which revealed that aggressive driving is the cause of most accidents (Parker et al., 1996.)

5.4. Road-use behaviour on the AKATA Corridor

Driver behaviour and attitudes towards traffic safety and road safety management are issues that still generate heated debates worldwide. Attitudes influence behaviour, and so behaviour can have either positive or negative implications on what one is doing, including driving. It is widely reported in Ghana, as in many other countries, that 80–90% of all reported road crashes result from the negative attitudes, wrong behaviour, and wrong perceptions of road users: drivers, motorcycle riders, and pedestrians (Amegashie, 1989; Abane, 1994; 1995; 2004; 2010; Obeng-Odoom, 2010).

Many accidents in all countries are attributable to the driver. The key issue here is that the driver is at the centre of the causal factors of traffic accidents, because most crashes are caused by the human factor. This human factor is largely shaped by attitudinal problems exhibited by drivers. With the upsurge in traffic accidents, attitudes and perceptions have widely become an area of concern, since it is believed that personal perceptions of risk beliefs always act as mediators between knowledge and behavioural factors (Berg, 2006).

A set of negative behaviours and attitudes, listed as deviant behaviours and therefore constituting danger on the road, was examined (Table 5.5). The survey found that among the listed set of behaviours perceived by road users as negative and unsafe, the majority of the respondents were of the view that the behaviours listed constituted deviant behaviour.

The negative behaviours were ranked according to the frequencies with which they occurred. The mean rating was based on a five-point scale, where 1 represented 'Never' and 5 represented 'Always'.

Table 5.5 Lapses/errors and violations by drivers on the AKATA Corridor

Negative behaviours of drivers	Never	Seldom	Sometimes	Often	Always
I drive continuously for more than 4 hours	25	16	29	12	18
I drive while communicating on a phone	40	16	36	5	3
I tailgate other drivers	44	24	28	2	2
I honk my horn more than most other drivers	49	19	21	7	4
I force people off the road while driving	59	21	14	3	3
I flout road speed-limit regulations	62	14	18	2	4
I yell at others whether they can hear me or not	61	13	22	3	1
I do not know road signs and signals	69	19	10	0	2
I get into physical fights with others while driving	75	13	8	3	1
I drink and drive	76	11	11	2	0

Source: Field work, 2012

Table 5.6 Kendall's coefficient of concordance of result of violations of drivers on the AKATA Corridor

Item	Parameter
Number of observations	245
Kendall's W[a]	0.13
Chi-square	294.40
Degrees of freedom	9
Asymptotic significance	0.00

Source: Field work, 2012

From Table 5.6, the Kendall's coefficient as a result of the analysis was found to be 0.13. This indicates there is a positive agreement among respondents that deviant driving factors listed in Table 5.5 significantly influence behaviour and therefore increase RTAs on the corridor. This result confirms the findings of Abane (2010), which indicated that negative behavioural factors exhibited by drivers or driver violations lead to increases in road deaths and injuries from RTAs.

The survey found that 60 respondents said they drive and communicate, while two respondents said they always tailgate while driving. Eighteen respondents said they sometimes flout speeding regulations. The implication is that the issues of deviant behaviour are increasingly becoming a challenge on the corridor. Costs are incurred through deaths and injuries in accidents on the corridor, and these costs and numbers of accident victims are likely to be increase. On the financial side, a study focusing on economic cost implications of RTAs is required.

The findings on driving while using a communication device are consistent with the findings by Abane et al. (2010: 83), who found an inconclusive relationship between receiving/making calls while driving and an upsurge of traffic accidents in Ghana. However, Abane et al. (2010) point out that the use of a telephone while driving is gradually becoming an important risk factor in the country as the use of mobile telephones expands. It is increasingly becoming very clear that the use of telephones while driving/riding presents a new challenge in road safety management that ought to be addressed.

5.5. Perception of risks among road users on the AKATA Corridor

The interplay of risk factors in the road traffic system is so complex that presenting them in a neat risk intervention pairing is impossible without being repetitive and simplistic. However, we cannot ignore the risk factors contained in the whole continuum of road traffic accident causation. These factors continue to play a very significant role in how people perceive the traffic accident problem. The success of any initiative to deal with the RTAs will very much depend on recognition and care-seeking behaviour by the people affected, as it is said that perceptions mould people's reaction to the world around them. Individual risk perceptions need to be considered within the particular socio-cultural belief models which orient local definitions of health and illness (Van de Geest, 1997).

This study also sought to understand how drivers perceive certain behaviours as risky and how these behaviours have the potential to cause traffic accidents and injuries on the corridor. A set of questions was therefore asked to determine these perceptions. The seven negative behaviours identified by respondents are listed in Table 5.7. Each of these variables was ranked on a scale of 1–5, with 1 representing 'Never' (the lowest probability of causing RTAs) and 5 denoting 'Always' (the highest probability of causing RTAs). The mean rank determined that more drivers perceived that they indulged more in such risky acts.

Table 5.7 Perception of faulty vehicles as risk factors to accident causation on the AKATA Corridor

Faulty vehicles leading to road accidents	Lowest	Very low	Low	Moderate	High	Very high	Highest
Worn or smooth tyres	22	19	16	10	9	10	14
Under-inflated tyres	33	31	10	10	4	7	7
Tyre burst (prior to accident)	9	8	13	5	11	19	35
Poor brakes	7	7	24	17	16	10	19
Faulty steering	11	13	9	34	14	12	2
Poor lights	11	12	16	11	34	9	5
Poor general maintenance	5	10	12	12	11	31	15

Note: All figures denote percentages across a row

Source: Questionnaire survey, February 2012

Table 5.8 Kendall's coefficient of concordance results of perception of faulty vehicles as a causal factor of accidents on the AKATA Corridor

Item	Parameter
Number of observations	245
Kendall's W[a]	0.14
Chi-square	199.78
Degrees of freedom	6
Asymptotic significance	0.00

Source: Questionnaire Survey, February, 2012

Table 5.7 demonstrates that more than half of drivers agreed that a tyre burst prior to an accident constitutes risky behaviour and therefore has a high probability of causing a crash on the corridor. Apart from tyre burst, the majority of drivers also perceived and agreed that general maintenance of vehicles is necessary to avoid RTAs on the corridor. The survey indicated that non-maintenance of vehicles was therefore perceived as the second most risky activity on the part of respondents, and it has the potential to cause traffic accidents on the corridor. The import of these findings is that respondents perceive the set of identified behaviours as negative and unsafe, and they believe each has the potential to induce a traffic accident on the corridor. The finding is an indictment, not only of drivers who engage in such behaviours, but also of institutions tasked with ensuring safety on the corridor which do not take active measures to control and limit such behaviours. This finding is consistent with a study by Rundmo and Iversen (2004), who posited that the consequences of negative events will be evident when thinking about the risk source. They concluded that there is a need to take preventive action to avoid traffic accidents.

Fatigued drivers were named by 10% of respondents. Disobeying existing traffic regulations and running red lights scored about 1% each among respondents. Alcohol and drug abuse contributed to about 8% per cent of the perceived risk by respondents. Some 6.49% of respondents perceived speeding as a risk factor contributing to RTAs. About 25% of the sample related the capability of perceived risk factors to cause traffic accidents to other factors, such as impaired vision, lack of physical strength, pedestrians using the middle of the road, general physical impairment, poor attitude, and bad judgment.

The findings demonstrate that overtaking in the face of oncoming vehicles was perceived as a problem area. The majority of respondents perceived that it is the largest perceived

risk in terms of inducing accidents on the corridor. Respondents perceived issues relating to attitude and judgment as the lowest factors leading to traffic accidents on the corridor. This perception contradicts the old assertion that judgment and attitude are among the main factors responsible for traffic accidents. The result is also inconsistent with the findings of most literature on RTAs, especially the study of Hoseth and Rundmo (2005). The reason, this current study discovered, can be attributed to the fact that the majority of respondents were well educated and that their judgment and attitude regarding road safety problems was adequately high. This reason accords with findings by the same Hoseth and Rundmo (2005), who noted that the risk perception of lower-level traffic risk is different in individuals with higher education from that in those with low education.

5.5.1. Gender dynamics of traffic accidents on the AKATA Corridor

Overall, findings in this study indicate that male respondents are perceived as taking higher risks in regard to traffic violations, compared with their female counterparts. The variation in terms of gender regarding risk perception factors in the study area tended to hugely vary. The data obtained from the field ranked some perceived risk-taking behaviour according to gender common to the motoring public. The respondents ranked the risk-taking behaviour as ranging from speeding through running red lights and driving under the influence of alcohol and drugs.

The findings from the survey were that 5.25% of the female population sampled on the road with a mean rank of 10.25% per cent perceived overtaking in the face of oncoming vehicles as a dangerous risk factor contributing to RTAs on the corridor. Male respondents, constituting about 5% of the mean ranking, also perceived overtaking in the face of oncoming vehicles as equally risky. This indicates that the female population perceive

overtaking in the face of oncoming vehicles as more risky than their male counterparts do. The finding supports the generally held perception that women are more careful behind the wheel. Dejoy (1992) argues that males perceive themselves as less susceptible to traffic accidents and have better driving skills than females. The findings of a traffic safety campaign among Norwegian adolescents by Rundmo and Iversen (2004) revealed that females reported higher probabilities of traffic accidents after the campaign. The male respondents in the Norwegian study, therefore, corroborate the finding on the AKATA Corridor that males have a lower perception of risk than females.

With regard to perception on driving under the influence of alcohol and drugs, the findings revealed that the majority of male respondents perceived higher risk than their female counterparts: 20% of females and 80% of males. The reason is that males have the habit of drinking as a social habit more than females do, and so this applies to driving. This reinforces the 'health belief model' cited in Stroebe and Stroebe (1999): preventive behaviour is more probable when the individual perceives him-/herself as vulnerable to the particular risk item in question. Accordingly, it is likely that an individual will behave more carefully in traffic if he/she perceives higher probabilities of traffic accidents. Several studies indicate that a cognitive component of traffic risk perception (i.e. probability of traffic accident) and driver behaviour are weakly related. It is for this reason that Rundmo and Iversen (2004) attribute a weak predictor of behaviour to accident risk. However, these results should be interpreted with caution for two interrelated reasons. First, these studies investigated a general perception of traffic risk, instead of risk perception related to specific traffic accidents and situations. Secondly, the internal reliability in the risk perception scales in these studies is questionable. Variation in perceived traffic risk was not solely related to the particular traffic situation in question.

5.5.2. The effects of culture, religion and socio-economic factors on traffic accidents on the AKATA Corridor

The survey found that commercial drivers perceived that there are major risks associated with the work they do. When commercial drivers were interviewed, however, it appeared that their survival needs and cultural and religious beliefs mediated their perceived risk of RTAs on the corridor. This is what a 30-year-old commercial driver said in an interview in Kumasi about his religious beliefs and their relationship with RTAs on the corridor:

> *It is very possible and practicable that I don't think about the influx of road traffic accidents. The Bible says that whatever we say with our mouth shall come to pass…. I don't think I want to think about the problem of accident at all. I obviously believe that accidents can be caused by bad spirits like evil dwarfs. It can also be traceable to curses.* (A personal interview, 10 February, 2014)

Other drivers interviewed said that thinking about accident risk factors and death are taboo subjects in the culture of their area. In the words of a 20-year-old commercial driver in Techiman:

> *As far as I am concerned, I will never be a victim of road traffic accident. What you think is what you get. My mouth will give all sorts of trouble to me. It can be a curse; it can be a blessing. Whatever comes from your mouth comes from your heart. This is what the Bible says.* (A personal interview, 15 February, 2014)

Women respondents generally perceived risk as an occupational hazard. This seems to have fuelled the accident problem on the corridor. The study also found a significant relationship between gender and traffic accidents on the corridor: male participants tend to perceive other drivers as worse (more likely to cause an accident) as they get older, whereas women perceive them as better (less likely to cause and accident) as they grow older.

In Ghana aberrant driving falls under two broad classifications, according to the Republic of Ghana (2004), Road Traffic Act 2004 (Act 683). Section 2 of the Act says that a person drives dangerously if (a) the way and manner that person drives falls below what is expected of a competent and careful driver or (b) if it is obvious to a competent and careful driver that it would be dangerous driving the vehicle (i) in that manner, or (ii) in its current state (p. 13-14). In the same Act, Section 3 defines careless and inconsiderate driving as when 'a person who drives a motor vehicle on a road without due care and attention, or without reasonable consideration for other persons using the road'. The contravention of the Act's driving rules and regulations attracts penalties for offenders.

Generally, risk perception has to do with how drivers of motor vehicles deal with driving situations on the road by adapting their action both to the physical environment and the behaviour of other road users. Although drivers appear to understand that the driving occupation has risk factors with potentially dire consequences for all road users, they seem to describe them as mere occupational hazards. The available literature supports this finding. Dery (1999) carried out a study on hazard and risk perception among young novice drivers and observed that young drivers in general underestimate the risk of accidents in hazardous situations. Young male drivers also tend to rate dangerous traffic situations as less risky than old drivers (Trankle et al., 1990). These authors suggested that educational measures designed for young drivers should focus on different aspects of their risk perception and risk tolerance.

Some participants explained that the influence of culture makes it a taboo to talk about accidents and death. For others, religious practices encourage them not to have negative thoughts about future events because, as they explained, whatever you say with your

mouth will come to pass. And for yet another group, they were almost always pre-occupied with their challenging socio-economic conditions to the extent that these conditions excused and provided a justification for their perceived risky driving. Drivers were evasive in their response to the questions: 'How probable do you think it is for you to be involved or injured in a traffic crash?' 'How concerned are you about traffic crash risk?'

The consequences of inaccurate risk perception are dangerous for driving and for attitudes to vehicle maintenance. The study's finding on risk perception is supported by a risk compensatory theory and a risk homeostatic theory proposed by Wilde (1994) and Adams (1999). These theories assume that humans adapt their behaviours to the intensity (high or low) of risk as a function of their subjective perception. For example, if drivers see themselves to be in a greater risk situation, they will try to behave with a lot more caution than when they perceive themselves to be in a less risky situation (Wilde, 1994).

This is consistent with the findings of the present study, given the fact that Ghanaian driver's traffic risk perception is not just a simple matter but rather a complex issue mediated by culture, religion, and socio-economic status. Results from the survey showed that respondents perceived attitudes as important predictors of driver behaviour in the AKATA Corridor. Of all the attitudes and behaviours, respondents ranked driving continuously for more than four hours as one of the RTA-inducing behaviours on the corridor. Following that is driving and communicating at the same time. Respondents perceived drunk-driving as least dangerous.

Section 118 of Road Traffic Regulation 2012 (LI 2180) (Republic of Ghana, 2012) requires that a person or owner of a motor vehicle should not drive or cause or permit another person to drive a vehicle for a continuous period exceeding four hours, amounting

in aggregate to more than eight hours in a period of 24 hours, unless the driver rests at least 30 minutes after each continuous period of four hours. Even though the objective of the regulation is to limit or prevent driver sleepiness and fatigue behaviour during long trips, it has been abused and this constitutes a negative attitude that fuels the accident problem on the corridor. Similarly, Regulation 107 of the Road Traffic Regulation 2012 (LI 2180) prohibits the use of communication devices while driving; yet respondents ranked this second and agreed it is a negative behaviour that most drivers on the corridor indulge in. The lowest-ranked behaviour was drunk-driving. This disproves a survey by Asiamah et al. (2002), which asserted that drunk-driving was a major problem among commercial drivers in Ghana. In general, our study revealed that respondents perceived lack of knowledge of road signs and symbols, flouting traffic rules and regulations, and drunk-driving as very low risk factors among other traffic violations.

Our study revealed that respondents were aware that the behaviour of other road users, such as pedestrians, passengers, and cyclists, influences driving behaviour in significant ways. They pointed out that the behaviour of passengers, for example when they are on board a vehicle or they are waiting by the roadside to board, poses a great deal of danger to drivers by way of forcing them to make a series of intermittent stops, often at short notice and at dangerous spots. Respondents also expressed concern about the fact that passengers wait anywhere along the corridor, including accident-prone areas, and expect vehicles to stop and pick them up—and hence the upsurge in the rate of pedestrian and passenger casualties on the road corridor.

As Table 5.5 demonstrates, fairly low but significant proportions of respondents agreed that they had sometimes committed these driving errors themselves in the course of their

driving. The low returns can be explained by the 'positive self, negative other' attitude of people. No one wants to admit to being a bad driver. In fact, it is always the other driver who is performing badly (see Abane, 1994, 2004: Abane et al., 2010). Such behaviour—which can be described as a self-enhancement bias, an illusion of superiority and overconfidence (Walton & McKeown, 2001)—is a threat to road safety management.

Errors and rule violations relating to the issues mentioned in Table 5.5 constitute a serious road safety challenge in the country and should be given adequate prominence in road safety action plans and strategies. Several previous studies have highlighted this challenge, and this should have become the main-stay of the national road safety policy. For instance, Abane (1995, 2004, 2010), Afukaar (2001), and Asiamah et al. (2002) found drivers in various parts of the country, including Cape Coast, Kumasi, Tamale, and Accra, to be prone to crashes due mainly to excessive speeding, aggressive driving, reckless driving, and running through red lights. In another comparative study of urban traffic crashes in Accra and Trondheim, Jørgensen and Abane (1999) also underscored the need to ensure that road users strictly abide by speed limits and observe traffic regulations, since over-speeding was obviously among the leading causes of crashes. Afukaar (2003) and Afukaar et al. (2003), after studying behavioural characteristics and their involvement in different types of road crashes, attributed high road-crash casualty to excessive speeding by drivers and singled out driving violations as one of the strongest variables that can be used to demonstrate a direct link with crash risk. This is largely in accord with the findings of the current study.

This finding corroborates findings by Damsere-Derry et al. (2008), whose study in Ghana looked at two dimensions of driver behaviour: speed-mean (the average speed of a moving

vehicle within the distance covered as posted by the speed limit) and dispersion (the greater or larger differences in speed between moving vehicles, or the spread of the distribution of speed within vehicles). They used unobtrusive measures, such as speed guns, to collect data on the travelling speeds of 28,489 vehicles at 15 different urban locations on highways categorized into three types. They found that 98%, 90%, and 97% of vehicles that plied these three route types (national, inter-regional, and regional roads, respectively) exceeded the required speed limit of 50 km/hour. They thus concluded that excessive speeding and speed dispersion are highly prevalent on highways in Ghana.

5.6. Conclusion

What the present study has shown is that the distribution of RTAs on the AKATA Corridor by socio-demographic variables mirrors that of the national situation. The results showed that personal characteristics of drivers, such as sex, age, and education, are related quite well to road traffic accident occurrence, and these results are consistent with earlier findings by Abane (1994, 1995, 2010). The results also demonstrated that behavioural factors and risk perception are by far the most important factors influencing aberrant driving and RTAs on the AKATA Corridor.

The analysis further revealed that the behaviour of road users on the AKATA Corridor requires guidance and control for appropriate interaction with other components of the road traffic system. In findings similar to other research already conducted in Ghana, the study concluded that 58% of the total RTAs recorded as head-on collisions resulted from poorly calculated overtaking, and 42.3% of recorded accidents were as a result of various mechanical failures, such as brake failure and burst tyres. It is therefore true to say:

'Accidents just don't happen; they are caused.' Human behaviour and risk perception on the corridor weigh very significantly in terms of traffic accident causation.

The study found that the commonest negative driver behaviours observed on the corridor include driving continuously for more than four hours without resting, driving while communicating, tailgating, and flouting regulations on speed limits. The frequency of occurrence of these negative practices is surprising, considering the fact that during the survey several police officers were visible on the corridor. There is therefore reason to suspect that actual policing is not a priority for all police personnel working on the corridor, although if they were to perform their official duties and enforce the regulations it would certainly help to reduce the number of avoidable accidents. Another possible explanation for the increased negative behaviour on the road is that drivers, and road users generally, are inadequately informed about the contents of the various Acts and regulations on road use, including the Ghana Highway Code. Closely related to this is the problem of illiteracy: some of the drivers interviewed (10.3%) had had no formal education and could neither read nor write. Consequently, they are unable to take advantage of the Highway Code to refresh their knowledge on traffic rules and regulations.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

This study focused on investigating the main factors contributing to RTAs on the AKATA Corridor. The study has brought to light a number of issues related to traffic accidents and safety management on Ghana's roads, especially on the AKATA Corridor. The objectives of this concluding chapter are as follows: first, to show that the research objectives and propositions were achieved; second, to examine the research findings vis-à-vis the theoretical debates articulated in the study; third, to draw forth some recommendations; and fourth, to present some areas for further research.

6.2. Summary of major findings

This study set out to identify and investigate the factors that contribute to the upsurge of RTAs on the AKATA Corridor. The findings of the study lend support to the role of behavioural, environmental, demographic, and institutional and vehicle-related factors in accident causation.

6.2.1. Road traffic accident contributory factors

It has been established that RTAs occur as a result of a combination of factors, a finding which is in line with the systems framework employed in the study. This means that understanding the system as a whole and the interaction between the elements, and identifying where there is a potential for intervention, are crucial for reducing the accident problem on Ghana's roads. For instance, indiscipline and risk assessment (behavioural factors) are important factors in accident causation. These behavioural factors are in turn affected by demographic factors, such as education.

6.2.2. Road traffic accidents and socio-economic development

The historical review of road construction over the 20th century on the AKATA Corridor revealed a relationship between road development and socio-economic development. It was also found that the accident rate increased following the resuscitation of the economy of Ghana in the 1990s, in contrast to the situation in the early 1980s. This increased accident rate is probably the result of the effect of increased prosperity on car ownership, mobility, and the pace of the economy. In recent years, however, the widespread use of mobile phones has reduced the need to travel and is likely to be responsible for the drop in traffic accidents by 2020.

6.2.3. Institutional collaborations and partnerships

Collaboration and joint efforts enhance effectiveness in promoting road safety. The study revealed weak and ineffective collaboration (in terms of communication) between institutions is responsible for road safety management along the AKATA Corridor, especially at the municipal and district levels (NRSC, DVLA, MTTU, and road agencies).

6.2.4. Behavioural factors as causes of traffic accidents

This study established that behavioural factors play a key role in the cause of traffic accidents on the AKATA Corridor. Road users were also identified as largely ignorant of traffic rules and regulations, and those who are not ignorant do not adhere to them. In addition, road design, traffic management, improved vehicle standards, speed control, the use of seatbelts, and the enforcement of alcohol limits are important factors in accident causation. In particular, the study found that the youth, those under 40 years old, have a relatively higher crash risk than their older road users. The propensity for younger road users to engage in deviant driving is high, and this leads to RTAs on the corridor.

6.2.5. The police and traffic law enforcement dilemma

The police are seen by drivers as ineffective in enforcing traffic rules and regulations and as the weakest link in the road safety management system. This is because they lack the basic tools and the necessary professional skills in carrying out the requirements of their mandated tasks.

6.2.6. Training and research

During the field work, it was realized that the human-resource capacity of the various stakeholder institutions, especially the police MTTU, was totally inadequate. Most have gained their experience simply through long service rather than through training.

6.3. Conclusion

The study suggests that the main causes of roads accidents on the AKATA Corridor are structural, perceptual, and regulatory. Perceptual solutions include community participation—especially in the implementation of policies to educate road users about safe road use—improved driver education, and modification of the attitude of police officers towards their duties. Regulatory approaches include effective implementation of rules and regulations in dealing with offenders, and the installation of high-safety standard equipment on roads to identify the contravention of traffic rules and regulations, especially in urban areas.

The study revealed that the best practice for managing road safety on the AKATA Corridor is enforcement of the traffic rules and regulations; this is the strongest tool to ensuring road-user discipline. In Ghana, while the best practices are being employed, it is nevertheless important to note that the police MTTU, which has been mandated to enforce

the country's traffic laws, is poorly equipped in terms of human resources and logistics, thus making it the weakest link in the chain of road safety management and enforcement.

The study also highlighted the deficiencies in the road transportation sector in respect of the growth in the number of vehicles, poor maintenance of vehicles, poor maintenance of the road network, and general road-user indiscipline—and how all these factors contribute to the death and injury toll experienced on Ghana's roads. To address these deficiencies, road safety management stakeholder institutions have made tireless efforts at road-user education through information dissemination and publicity, enforcing driver- and vehicle safety regulations, road engineering, general enforcement, and emergency response. These efforts do not achieve the desired impact, however, as a result of limited capacity and lack of the necessary resources for effective operations.

The study also confirmed the fact that budgetary allocations to stakeholder institutions engaged in road safety management in Ghana are irregular and inadequate, thus making it difficult for the relevant agencies to execute planned operations and programmes to prevent or minimize RTAs. In light of this, it is important to call on government to commit adequate resources and attention to road safety activities and, in particular, to strengthen the capacity of the police MTTU to enable them to effectively and efficiently provide the necessary support in minimizing RTAs.

6.4. Recommendations

Clearly, there is a need for increased education and awareness creation about the upsurge in numbers of RTAs and a need to adopt pragmatic interventions to reduce the high rate

of injuries and mortality. In view of these needs, this study makes the following recommendations for policy formulation and implementation:

6.4.1. Increases in manpower strength of stakeholders

The total MTTU strength should be increased by 25% of its current numbers. The staff strength at the National Headquarters (N/MTTU) needs to be raised from the current 310 to 900 senior police officer (SPOs), and the men and women employed as part of the MTTU from the current 1,796 to 5,000 nationwide. It is essential that all major MTTUs are equipped with strong vehicles to facilitate rapid deployment of personnel for patrols as well as for supervisory duties. This will also improve the response time of the unit to emergencies.

6.4.2. Improvement of hazardous sections of roads

Government is urged to provide adequate funding for the road agencies for the installation and maintenance of road furniture. There is also the need for a consistent policy to create a centralized traffic-monitoring system for all the signalized intersections in major towns along the AKATA Corridor. The Department of Urban Roads and the Ghana Highway Authority should expedite action on the proposed installation of 14 weigh bridges along the corridor in a bid to prevent the deterioration of sections of the road. These bridges will limit the problem of overloading, an issue which leads to constant deterioration of the road and exacerbation of the severity of accidents.

6.4.3. Resources for road safety management and enforcement

Lofty aims for increasing road safety can be achieved only if the work of the MTTU is taken seriously and the unit is adequately resourced to enable it to deliver on its mandate.

To reduce the RTA fatality rate (deaths per 10,000 vehicles) to a single digit by 2020, there is a need for government to commit adequate resources and attention to road safety activities.

The equipment and materials required by the MTTU to operate efficiently have not been available owing to lack of funds. However, when given the opportunity, the unit has the capacity to internally generate funds to run its operations. Operations such as the Towing Services and the Courier and Escort Service as well as the driver training programmes are all ways of generating revenue. Other sources of funding are payments for accident reports and the payment of a percentage of spot fines to the unit.

It is recommended that there should be a policy to empower the MTTU to explore the possibility of using such self-funding opportunities to generate revenue to support its operations. The policy should also authorize the payment of a percentage of the funds thus accrued to be used to motivate hardworking personnel. It is hoped this would seriously reduce problems of corruption.

6.4.4. Strengthening operational and institutional capacities of key road safety stakeholder agencies

Government should strengthen the operational capacities of the road safety stakeholder institutions in such a manner that they can operate effectively. The stakeholder institutions must be legally, administratively, and financially strong to be able to demand safety and to enforce the regulations to ensure discipline on the roads. Initiatives for institutional capacity enhancement of some of the stakeholder institutions, such as the NRSC, DVLA, and NAS, would improve performance in the area of compliance, regulation, coordination,

and financing. This requires state support. In addition, the DVLA needs to fully outsource vehicle inspection to licensed private institutions and assume a regulatory and oversight responsibility. This should be done countrywide. There is also a need to provide an effective ambulance service to save the lives of RTA victims. The NAS should be upgraded to a national coordination and regulatory body for emergency response services.

6.4.5. Road traffic indiscipline

To address the problem of traffic indiscipline in Ghana, there is a need to intensify road safety education, information, and publicity to create greater awareness of road traffic laws and regulations, especially in relation to black spots located on the AKATA Corridor. There is also a need to improve training of drivers to improve their professional skills, and to improve driver licensing and vehicle registration procedures in addition to strict enforcement of the regulations. Strict enforcement of the provisions in the Road Traffic Act, 2004 (Act 683) and Road Traffic Regulation 2012 (LI 2180) should be performed by the MTTU on accident black spots on the AKATA Corridor.

To limit the problem of public interference in the apprehension and prosecution of traffic offenders, Regulation 157 of the Road Traffic Regulation 2012 (LI 2180) (Republic of Ghana, 2012) should be enforced for minor traffic offences. It is hoped that the implementation of spot fines would minimize the temptation of MTTU personnel to engage in corruption. It would also reduce the opportunity for influential personalities to intervene once a ticket is issued for a spot fine. The politicization of police actions weakens enforcement and incapacitates the police. Government is recommended to implement a policy on this issue to encourage and motivate enforcement personnel to consistently and impartially perform their duties.

6.4.6. Driver training

The MOT, acting through the NRSC, DVLA, and Government Technical Training Centre (GTTC), should establish fully the National Drivers' Academy in all ten regions in Ghana to provide professional training and development/refresher courses to drivers to improve their knowledge and skills. It is also recommended that there is the need to invest and concentrate efforts on driver education, training, and a progressive development for road safety officials, especially for personnel of the MTTU and for commercial drivers.

6.4.7. Public education on road safety

It is essential to advance road safety knowledge throughout Ghana and raise the profile of safety at all levels. This will involve the systematic and on-going creation, codification, transfer, and application of knowledge that contributes to improved efficiency and effectiveness of the road safety management systems. The process will require information dissemination on strategy and research findings.

There is a need to sustain public education on road safety. In view of this, it is also recommended that there should be a national policy for all radio stations to air road safety programmes. The media is considered an important stakeholder in road safety management; they have been helpful in informing and educating the public on many issues that have supported police operations. This is against the backdrop of the fact that the constant criticism of the personnel of the MTTU by the media demotivates these personnel and makes enforcement of traffic rules and regulations very difficult. Rather than emphasizing the negative aspects of the MTTU, their positive achievements should also be highlighted.

The NRSC should be strengthened to intensify road-user education for drivers (in all ten regions) with the requisite finding. The NRSC is entitled to a small percentage of every road toll charged at toll booths, and although road charges have been going up since 2008, the amount paid to the NRSC has not changed. This is a significant fact, given that road tolls have increased by over 100% since 2007 and that since 2008 vehicles pay for both in and out trips and for every other round trip they make. In this light, it is only fair for the state to increase the percentage paid to the NRSC so that it can efficiently discharge its obligations to the people of Ghana. The state is also encouraged to increase road tolls that have not been reviewed since 1999 to enable the road fund to provide more funds to the NRSC to sustain its educational efforts.

6.4.8. Enforcement of traffic laws and regulations

To improve enforcement, it is recommended that the capacity of stakeholder institutions, particularly the MTTU, be enhanced. Actions towards this effort should include regular in-service training programmes for MTTU staff to enhance their professional capacity, equipping the MTTU countrywide with strong vehicles (including tow trucks, motor-hearses, and motorcycles), and procuring traffic enforcement equipment to support human efforts. It is suggested that the MTTU should be properly upgraded to a departmental status like the CID, with direct responsibility to the Inspector General of Police. Any watchful observer may have noticed that the unit is now referred to as the MTTD-in other words, the upgrading has already occurred-but this is only in name (for this reason, the study has used MTTU throughout, instead of MTTD). It is important to make the change substantive; in other words, give the MTTU the new policy framework that will empower it with the increased powers and capabilities, appropriate new structures, necessary logistics and equipment, and additional well-trained men and women to carry out its duties.

Further, in order to coordinate the activities of the police on our roads and highways, all units that operate on the roads ought to be brought under the control and management of the MTTU. The MTTU should increase its strength to ensure widespread police visibility on the roads. Transport operators should support the MTTU to conduct basic checks on drivers and vehicles at lorry stations for compliance with basic safety requirements prior to embarking on their journeys. All the various police training institutions in their curricula should include courses on road-traffic enforcement and road safety issues, in order to build the capacity of the MTTU to enforce traffic rules and regulations without hindrance.

The study also recommends that enforcement of traffic rules and regulations should be intensified on the AKATA Corridor during the months of January, February, April, September, and December just as August (see Table 4.6), especially on Mondays, Tuesdays, Wednesdays, and Fridays. These are the periods for which the greatest numbers of traffic accident cases including death and/or injuries were recorded.

6.4.9. Local institutional setting for road safety management

Many government departments share responsibility for road safety even at the local level. Their responsibilities and accountabilities, their interventions, and their related institutional management functions are necessary to achieve the desired results of reducing RTAs. There is therefore a need for the NRSC to be supported by strong horizontal inter-stakeholder coordination arrangements with technical, non-governmental, and business sectors, and with political groups and committees. There is also a need for a robust vertical coordination of national, regional, and local activities by the representatives of these three levels and a coordination of the necessary delivery partnerships between stakeholders at each level.

It is recommended that the NRSC at the national level should focus on a high-level promotion of road safety strategy across government agencies and society, along with regular monitoring, evaluation, and strong research and technical support in the regions and the MMDAs. The institutional setting for the NRSC's implementation of activities should be structured at the regional and district levels on the basis of technical sub-groupings—instead of a broad-based road safety committee approach—made up of education, enforcement, and emergency. Clear guidelines should be laid down to steer these activities.

A new driver training regime is necessary to reduce the number of drivers with behavioural risks, and thereby reduce the rate of traffic accident on our roads.

6.5. Suggestions for further research

This study encountered problems due to the deficiency in databases on some major and critical road safety issues. While the data from national sources were solid and reliable, those from the districts were neither comprehensive nor current. It came to light that data at the regional offices of various road safety stakeholders were defective and usually unreliable. Studies in this direction, focusing on how to build a comprehensive database at the MMDAs at the regional and district levels, will greatly help policy formulation and implementation to achieve set targets in road safety.

Another area open to further investigation is the multi-stakeholder collaborative process towards the promotion of road safety. The literature on institutional reforms on road safety reveals that road safety management is multi-disciplinary and multi-sectoral. The study revealed a lack of coordination, however, among various safety stakeholders at the MMDA

level. And although the NRSS (2001–2005) recognized the need for joint efforts from many different stakeholders, the interest of stakeholders and their potential impact in the promotion of road safety activities were not considered. The current disjointed approach of programmes tends to exacerbate the already dangerous situation on Ghana's roads, and hence the need for an extensive and comprehensive study to unravel the key issues and identify feasible solutions.

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APPENDICES

Appendix 1: Road traffic accidents on the Accra–Kumasi–Tamale

AKATA Corridor Driver Survey

SECTION A: INDIVIDUAL BACKGROUND/ PROFILE OF RESPONDENTS

A1. Sex

1. Male [ ] 2. Female [ ]

A2. Age ……

A3. Marital status

1. Married [ ] 2. Single, never married [ ] 3. Separated [ ] 4. Widowed [ ]

5. Divorced [ ]

A4. Level of education?

1. No formal education [ ] 2. Basic [ ] 3. Secondary [ ]

4. Tertiary [ ]

A5. How many living children do you have? Total……

A6. Occupation

1. Peasant farmer [ ] 2. Professional driver [ ] 3. Civil servant

4. Businessman/Businesswoman [ ] 5. Other (specify)……

A7. Town/Village ……..

A8. Do you have any personal physical impairment?

1. Yes [ ] 2. No [ ]

A9. If yes, mention the type of physical impairment that you have

……..

A10. Does it distract you in the process of driving?

1. Yes [ ] 2. No [ ]

A11. What applies to you most?

1. Driving is my profession
2. I need to drive during work
3. I drive to and from work
4. Other (specify)……

SECTION B: ENVIRONMENTAL FACTORS/PHYSICAL FACTORS AND ROAD TRAFFIC ACCIDENTS

Vehicle details

B1. Do you have a car? ……

B2. Do you drive a car? ……

B3. What type of vehicle do you drive? ……..

B4. Is your vehicle a manual or an automatic vehicle?

1. Manual [ ] 2. Automatic [ ]

B5. How old is your vehicle…….?

B6. Have you ever been involved in a road traffic accident?

1. Yes [ ] 2. No. [ ]

B7. If yes, when did the accident occur?

1. Month …….

2. Day of the week …….

3. Time period: 3a. Day [ ] 3b. Night [ ]

B8. How many vehicles were involved in that accident……..?

B9. What were the defects in the vehicle prior to the accident? .....?

B10. Ownership of vehicle

1. Private [ ] 2. Government [ ] 3. Commercial [ ]

B11. Where did the accident occur?

Location ……..

Road surface condition

B12. What was the condition of the road?

1. Wet [ ] 2. Dry [ ] 3. Other (specify) .....

B13. Describe the nature of the road?

1. Curvy [ ] 2. Sloped [ ] 3. Flat [ ]

B14. What was the situation/condition on the road / at the scene just before the accident?

1. Pedestrian in the way [ ] 2. Objects in the way [ ] 3. Vehicles in the way [ ]

4. Overtaking [ ] 5. Heavy rainfall [ ] 6. Heavy wind [ ] 7. Other (specify)

……..

B15. What was the weather condition when you were involved in the accident?

1. Rainy [ ] 2. Foggy [ ] 3. Dusty [ ] 4. Other (specify) ……..

B16. Was the visibility good when the accident occurred?

1. No [ ] 2. Yes [ ]

B17. Was the road lighted?

1. No [ ] 2. Yes [ ]

B18. At what speed were you driving when the accident occurred?

……

B19. What was the accident damage to your vehicle?

Particulars of persons killed/injured

B20. What was the severity/magnitude of injury of the accident victims?

1. Minor injury [ ] 2. Major injury [ ] 3. Death [ ]

B21. What part of the vehicle were those who were injured as a result of the accident located? ……..

B22. Did you wear your belt in the process of driving when the accident occurred?

1. No [ ] 2. Yes [ ]

B23. If yes, why? ……..

B24. If no, why? ……..

B25. If injured, what was the outcome of the diagnosis?

1. Fully recovered [ ] 2. Temporarily recovered [ ] 3. Temporarily disabled [ ]

4. Other (specify) ……

B26. Who of the following was injured during the course of the accident?

1. Driver [ ] 2. Passenger [ ] 3. Pedestrian [ ] 4. Other (specify) ……..

B27. List in ascending form the contributory factors that vehicle aspects contribute to road traffic accidents? '1' for lowest and '7' for highest

1. Worn or smooth tyres
2. Under-inflated tyres
3. Poor brakes
4. Faulty steering
5. Poor lights or vehicle visibility
6. Poor general maintenance
7. Tyre burst prior to accidents

SECTION C: ROAD USE BEHAVIOUR AND DRIVER TRAINING

These questions contain statements about your driving behaviour. Use the following to indicate how much each statement describes you:

a. Never descriptive of me
b. Seldom descriptive of me
c. Sometimes descriptive of me
d. Often descriptive of me

e. Always descriptive of me

	How much each of these statements describe you	**Never a**	**Seldom b**	**Sometimes c**	**Often d**	**Always e**
C1	I yell at others whether they can hear me or not					
C2	I tailgate other drivers					
C3	I drive continuously for more than 4 hours					
C4	I get into physical fights with others while I drive					
C5	I honk my horn more than most other drivers					
C6	I force people off the road while driving					
C7	I flout road traffic regulations regarding observing speeding limits					
C8	I drink and drive					
C9	I drive and communicate in the process of driving					
C10	I do not know road signs and signals at all the time					
C11	My feelings of anger do not interfere with my driving profession					

C12. To what would you attribute the cause of your accident?

1. Speeding [ ] 2. Drunk-driving [ ] 3. Overloading [ ] 4. Reckless driving [ ] 5. Lack of attention [ ] 6. Other (specify) ……

C13. What in your opinion do you think motivate drivers to drink and drive at the same time?

.....

.....

.....

C14. How did you acquire your driver's licence?

1. DVLA [ ] 2. Goro boys [ ] 3. Other (specify) ……

C15. How long have you been driving on the road…….?

C16. How long did it take you to obtain a driver's license……..?

C17. Were you road tested and examined before you were issued with a driver's license?

C18. If yes, what was the duration of the road test?

C19. Did you take any examination in road traffic signs and symbols before being issued with your license?

C20. Did you ever undertake any driver training course after the issuance of your driver license?

1. No [ ] 2. Yes [ ]

C21. If yes, at which institution did you undertake the driver training course?

1. MTTU [ ] 2. National Driver Academy [ ] 3. NVTI [ ] 4. Driving school [ ] 5. Other (specify) …….

C22. At what age did you obtain your driver's license?

C23. Did you write and pass a medical theory and practical driving test before being issued with a driver's license?

a. No
b. Medical only
c. Theory only
d. Medical and theory

C23. How was your examination and testing done?

a. Off-road
b. On-road in real traffic
c. Partly off-road, partly in real traffic

Seatbelts

C24. Do you have a seatbelt in your vehicle?

C25. If yes, how often do you wear your seatbelt?

a. Almost every day

b. A few days a week

c. A few days a month

d. A few times a year

e. Never

C26. Do you have a child restraint device in your vehicle?

a. Yes

b. No

C27. How often do you drive with your children in your vehicle?

……

C28. Does your vehicle chime, beep, or make other signals if the seatbelt if not fastened?

Yes/No

C29. Are you aware of the warning labels on seatbelts?

Yes/No

C30. Are you aware of the current seatbelt law in Ghana?

……

C31. Does the law affect the wearing of your seatbelt?.....

C32. Which situations will make you wear seatbelts more often/Why do you wear seatbelts?

……

……

C33. What reasons can you give for not wearing your vehicle seatbelts?

.....

Speeding

C34. People have different feelings about driving. Do you agree or disagree with the following statements about speeding and driving?

1. Strongly agree
2. Somewhat disagree
3. Somewhat agree
4. Strongly disagree

C35. I enjoy the feeling of speed

……

C36. The faster I drive, the more alert I become

……

C37. I often get impatient with slow drivers

……..

C38. I try to get where I am going as fast as I can

……

C39. I worry a lot about having a crash

……

C40. How often do you see vehicles travelling at an unsafe speeds?

……

C41.What do you consider to be the maximum speed limit for driving on this particular highway?

C42. Do you consider a speed greater than the above to be unsafe?

C43. How often do you drive faster than other drivers when you drive on the road?

.....

.....

C44.What are the most common reasons why you drive at speeds that you consider as unsafe?.....

.....

.....

Drink driving

C45. How many days per week do you drink alcoholic beverages……

C46. In general when you are drinking, how much alcohol do you typically take?.....

C47. How many days per week do you drive after drinking even a small amount of alcohol?

C48. Over the last week how many days did you drive when you may have been over the legal limit of driving?

C49. In general, when you are drinking and driving, what is the maximum quantity of alcohol you take?

People have different opinions about what the blood-alcohol concentration should be.

Which of the following statements matches your opinion?

C50. Do you think drivers should be allowed to drink?

…….

C51. In the last two years, have you been fined or punished in any way for drink driving?

No

Yes, only fined

Yes fined/ any other penalty

Vehicle operation and maintenance

C52. How often do you service (oil and filter change, etc.) your vehicle?

.....

.....

C53. How much do you spend on each service?

C54. How often do you change your tyres?

C55. How many gallons of fuel do you use per day?

C56. How much do you spend each time you change your tyre?

Risk perception and traffic accidents

C57. Among the factors listed below, what do you think are the risk factors that contribute to the severity of traffic accidents? '1' for lowest and '13' for highest [-] tick accordingly.

1. Speeding [ ]
2. Pedestrians [ ]
3. Alcohol and drug abuse [ ]
4. Attitude [ ]
5. Judgment [ ]
6. Impairment [ ]
7. Vision [ ]
8. Physical strength [ ]
9. Unskilled drivers [ ]
10. Disobeying existing traffic regulation [ ]
11. Red-light violation [ ]
12. Fatigued driving [ ]
13. Overtaking in the face of oncoming vehicles [ ]

C58. On a scale of 1 to 10, how serious would it be for you to have a road traffic accident in the next year?

……

C59. How likely do you think it is that you can take actions to prevent road traffic accidents?

a. not at all

b. a little bit

c. quite a bit

d. definitely

e. don't know

C60. How confident are you that you can prevent getting yourself from having a road traffic accident during the next year?

.....

a. Not confident

b. Somewhat confident

c. Quite confident

d. Very confident

C61. Taking all things together, would you say that you are happy with the current spate of road traffic accidents in Ghana?

a. Very unhappy

b. Quite unhappy

c. Not happy

d. Quite happy

e. Very happy

Commercial drivers

C62. Do you own the vehicle you are using?.....

C63. How much in sales do you make a day?.....

C64. How much are you paid a month?.....

C65. Is it adequate for you?.....

C66. Are you paid social insurance? .....

C67. Would you describe the low rate of remuneration as a factor influencing road traffic accidents?……

C68. How in your opinion would you relate the low rate of remuneration as influencing road traffic accidents on this stretch of the road?

.....

C69. What would you say are some of the stress-related factors that will induce road traffic accident causation?

……

……

……

Traffic law enforcement

C70. How much are you concerned about each of the following issues?

1. Very
2. Fairly
3. Not much
4. Not at all

a. Rate of crime…….
b. Pollution……

c. Road accidents…….

d. Standard of health care……....

e. Traffic congestion……

f. Unemployment…….

C71. What are the reasons why you think traffic law enforcement is a problem in Ghana?

.....

.....

.....

C72. How do you perceive traffic law enforcement officers (the Police MTTU)?

.....

.....

C73. On a typical journey, how likely is it that the police will stop and check you for breach of road traffic regulations? ……

C74. On a typical journey, how frequently do the police stop and check you for over-speeding?.....

C75. On a typical journey, how frequently do the police stop and check you for drink driving?.....

C76. What is your general opinion about the performance of the traffic police in the performance of their traffic law enforcement duties?

Appendix 2: Interview guide with accident victims

Dear respondents, you are assured that the information from this interview is needed solely for academic purposes and will be treated as confidential.

1. What do you think are the main causes of accident in Ghana?
2. Was there any possibility to escape the accident?
3. Can you tell us the real situation of the following before your accident?
    a. What was the condition of the vehicle?
    b. What was the condition of the day? rain, wet, dry, wind or fog?
    c. Was the driver drunk?
    d. Was the driver overloaded?
    e. Did the driver follow the road sign when driving?
    f. Did the driver stop for pedestrians when they wanted to cross the road at a pedestrian crossing?
    g. Did you wear your seatbelt?
    h. Did you see any police officer on the road before the accident?
    i. Did the police officer check the vehicle?
    j. How was the situation of the road on the day?
4. Before the accident, did you think there was a possibility of you having an accident when travelling?
5. Just when you started your journey, did you feel a possibility of having an accident on the journey?
6. What kind of safety measures did you take just before you started travelling?
7. What is your recommendation to other people concerning road traffic accidents on this stretch of the road?

8. What kinds of factors do you think facilitate road traffic accidents in Ghana?

   a. In terms of vehicles

   b. In terms of the environment and road network

   c. In terms of the people

   d. In terms of institutions

   e. In terms of legislation and regulations

9. What kind of measures ought to be taken to reduce traffic accidents on the stretch of the road in the district?

10. Who do you think should be responsible for traffic accident management in your district?

11. Are you satisfied with the level of treatment given to you at this hospital?

12. Have you been catered for by the NHIS?

13. What are you recommendations/opinions on how to improve the medical services provided to motor traffic accident victims?

Appendix 3: Interview guide for hospital informants

Dear Respondents

You are assured that the information from this interview is needed solely for academic purposes and will be treated as confidential.

Q1. Do you think motor traffic accidents are an important problem for your hospital?

……

……

Q2. What problems do you have in receiving motor accident victims?

Q3. Do you have enough treatment rooms to accommodate all injured people?

Q4. Given your experience, do you think people fear traffic accidents?

Q5. What factors do you think are responsible for road traffic accidents among the victims brought to your hospital?

a. In terms of vehicles

b. In terms of the environment and road network

c. In terms of the people's behaviour

d. In terms of legislation and regulations

Q6. What kind of measures should be taken to reduce traffic accidents in Ghana?

Q7. Who do you think should be responsible for the accident problem in Ghana?

Q8. Does the National Health Insurance Scheme cater for traffic accidents in Ghana?

Q9. What are your recommendations/opinions on how to improve the medical services provided to traffic victims?

Appendix 4: Interview guide with traffic police officers (MTTU)

Dear Respondents

You are assured that the information from this interview is needed solely for academic purposes and will be treated as confidential.

Q1. Do you think traffic accidents are an important problem in Ghana?

……

Q2. How many traffic accidents did you record in this district last year?

……

Q3. On a day, what are the average number of cases are recorded?

……

Q4. How would you compare the number of motor traffic accidents in your district to that of other districts?

……

Q5. How do you normally get information after a motor accident has occurred?

……

Q6. Are there any problems in getting immediate information after a motor accident has occurred? What are the problems ?

……

Q7. How do you transport injured people from the site of accidents to the hospital?

a. By police vehicle

b. By ambulance

c. By requesting other motorists to help

d. Accident victims hire vehicles themselves

e. Other (specify)

Q8. How do you transport dead bodies of persons who die at the site of accidents?

……

Q9. Where do you send dead bodies found at an accident scene?

……

Q10. Do you encounter problems getting accurate reports/information on motor traffic accidents occurring in your district/region/division?

……

Q11. Do you face problems in keeping motor traffic accident reports in your office?

……

Q12. Is there a separate traffic police division to deal with traffic law enforcement?

Yes [ ] No [ ]

Q13. Do highway patrols operate along all major roads?

……

Q14. Are there regular police courses at police training institutions to train/retrain traffic police personnel ?

……

Q15. Do traffic police (MTTU) have modern enforcement equipments?

Motorcycles ……

Patrol cars ……

Speed radar gun ……

Road side alcohol testers ……

Q16. What is the maximum permitted speed limit?

Urban areas ……Non-urban areas ……

Q17. When the traffic act was last updated? ……

Q18. Do cars have to have seatbelts fitted to them?

a. All [ ] b. Some [ ]

Q19. Is it compulsory to have seatbelts fitted to them? ……

Q20. How often do drivers wear seatbelts?

Q21. Is there an alcohol limit for drinking and driving?

No……. Yes …...

If yes, please specify the limit ……

Q22. Is there a penalty points system used and when was it enacted ?

……

Q23. What are some of the general challenges that you face when enforcing traffic rules and regulations?

……

Q24. How do you intend to resolve these challenges?

……

Q25. Is there a standard pre-printed form in widespread use for data collection?

1. No [ ] 2. Yes [ ] (please attach a copy) ……

Q26 Are accident data sent to National Police Headquarters, the National Statistics Office, or other central location for storage and analysis?

1. No [ ] 2. Yes [ ] (Please specify where) …….....

Q27. How is accident data stored at your office ?

1 Manual files [ ] 2. Micro computer [ ] 3. Mainframe computer [ ]

Q28. Is an annual accident statistics report produced giving accident trend characteristics and analysis?

1 No [ ] Yes [ ]

Q29. Are accident data used to identify dangerous locations on road networks so that engineering implementation can be made at such locations?

1 No [ ] 2 Yes [ ]

Q30. What is the definition of road accident death in your area?

1. At the scene [ ] 2. Within 24 hours [ ] 3. Within 3 days [ ] 4. Within 7 days [ ] 5. Within 30 days [ ] 6. Within 1 year [ ]