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ROAD INFRASTRUCTURE CONSTRUCTION DYNAMICS: CAUSES OF DELAYS AND ITS EFFECTS ON PEDESTRIANS’ SAFETY IN GHANA

BY

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DECLARATION

I hereby declare that this research is the result of my own field work towards the completion of my Master of Arts degree in Development Studies and that to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any degree of the University or elsewhere, except where due acknowledgement has been made in the text.

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ABSTRACT

The purpose of the study is to research into road infrastructure construction dynamics with focus on causes of delays and its effects on pedestrians’ safety in Ghana. Using a comparative analysis to examine dynamism in road infrastructure construction delays and its effects on pedestrians’ safety, Lapaz (N1) and Madina (N4) highways in Accra Metro and La-Nkwantanag Madina Municipality respectively were selected for the study because N1 was successfully completed on time while N4 is suffering delay. The study looked at pedestrian safety on the two highways. These roads were constructed within the last 10 years. The objectives of the study were to examine the causes of delays in road infrastructure projects and road construction project cycles on the Lapaz (N1) and Madina (N4) highways that accompany the construction of footbridges, zebra crossings and street and traffic lights, to identify the effects of the road construction delay on government, contractors and pedestrians on the Lapaz (N1) and Madina (N4) highways, and to identify measures adopted by both contractors and government to curbing delay of road infrastructure projects and its effects on pedestrians’ safety on the Lapaz (N1) and Madina (N4) highways. The study employed mixed method approach which consists of qualitative and quantitative methods. In-depth interviews and questionnaire were instruments used for data collection and the sample size was 190 respondents in all. The findings revealed that pedestrians relatively felt safer using the Lapaz (N1) Highway than Madina (N4) Highway. The study confirmed the three main stages in road project construction which are inception stage, construction stage and after construction stage. Delays were found to mostly occur at the construction stage. Also, factors contributing to the delay were found to be financial constraints, politics, and bad weather conditions, land acquisition difficulties, technical and design related causes, utilities and site related causes. The study revealed that, road infrastructure delay affects both government and contractors in terms of time and cost overrun. Other effects were litigation, total abandonment of projects and
company breakdown. These effects were found to have telling effects on pedestrians’ safety because of uncompleted footbridges, zebra-crossings and traffic lights. Pedestrians who ply the road were at risk of getting knocked down by vehicles, died through road accident or injured, fractured and others. All these effects lead to economic and psychological stress on families, loss of productivity, traffic congestion and among others. Financial causes of delay are difficult to curb but other causes of delay such as bad weather, design changes, land acquisition difficulties can be managed and controlled. To avoid delay and improve pedestrian safety, it was found out that enough financial resources and other necessary documents should be in place before construction begins with respect to the weather and the nature of the environment. When road infrastructure delay occurs during highway construction as in Madina (N4) highway, speed ramps should be constructed to reduce drivers speed and allow pedestrian time to cross safely.
ACKNOWLEDGEMENT

To God be the Glory
DEDICATION

This work is dedicated to Almighty God, my lovely father Akwesi Gyimah Acheampong who has been my pillar through the conduct of this research. This work is also dedicated to my mother, Matilda Konama for her unrelenting support and prayers towards a successful completion of this project. I equally dedicate this work to a loved one Desmond Kwame Nkansah for his immense contribution towards the completion of this work. This dream also would not have been realized without the help of my supervisor Dr. Andrew Agyei-Holmes, his constant guidance, patience, gentleness, careful suggestions and helpful corrections made it possible for the successful completion of this work.
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CHAPTER ONE

GENERAL INTRODUCTION

1.0 Background of the study

Road network is a prime index of development (Rawat & Sharma, 1997), and insufficiency and inefficiency of road infrastructure pose a great risk on the economies and health of people of sub-Saharan African (SSA) countries (World Bank, 2007). While these road networks make immense contribution to several sectors of the economy, these roads when poorly managed cause great loss to lives and properties (Rawat & Sharma, 1997). For example, the World Health Organization (WHO) reported in 2013 in World report on road traffic injury prevention that road traffic injuries were major health challenges but were not paid much attention to (WHO, 2013). Also, it was made known in the report that 1.2 million people are killed in road crashes every year and 50 million people are injured and disabled (ibid). Interestingly, children, pedestrians, cyclists and older people were identified to be among the most vulnerable of road users (ibid) and people aged between 5 and 29 years are leading when it comes to road traffic injury (WHO, 2018). The projection is that these figures are going to increase by 65% within 20 years. Further, Global status report on road safety 2018 confirmed that the problem is getting worse. Deaths from road traffic crashes have increased to 1.35 million a year which implies that 3,700 people are dying on the world’s roads every day (WHO, 2018). Tens of millions more are injured or disabled every year. Some people suffer life-altering injuries with long lasting effects (ibid). These losses take a huge toll on families and communities and the cost of emergency response, health care and human grief is immense (ibid).
Further, the United Nations Road Safety Collaboration (UNRSC) pointed out the risk factors that make pedestrians more vulnerable. These factors are driver behavior in terms of speeding, drinking, disrespect for pedestrians and tiredness as well as road infrastructure lacking dedicated facilities such as sidewalks, raised crosswalks, zebra crossings, footbridges and others (WHO, 2018). In Ghana, one of the major means of transportation is by road. It forms an important part of the social safety net that facilitates the distribution of wealth through trade and employment opportunities in both urban and rural communities (Brew et. al, 2018). Therefore, the vulnerability of the pedestrians should be of a great concern to all and must be a prime motivator for both government and contractors to speed up any road construction work so that delay would not increase pedestrians’ vulnerability.

Delays in the construction of these road projects have become a global phenomenon (Thorat, 2017). The timely completion of a highway construction project is considered to be one of the most important factors to the project’s success, as well as its quality and safety (Remon F Aziz & Abdel-hakam, 2016). According to the World Bank 2014 report on infrastructure assessment in Sub-Saharan Africa, most construction projects suffer delay which exceeds the agreed completion time stated in the contract. The construction industry in both developed and developing countries faces some delays during construction of road infrastructure (Memon et al., 2011; El-Razek et al.,2008; Aziz, 2013; Alaghbari et al.,2007; Ren et al 2008). Also, in Ghana, delays in the construction industry is a well-known endemic phenomenon that threatens the socio-economic growth of the country as well as the health of the people (Fugar & Agyakwah-baah, 2010). This suggests that road construction projects are no exception, hence, delays in the completion of road infrastructure such as footbridges, zebra crossing, pavements, street and traffic lights inhibit pedestrian’s safety. Therefore, road user behavior then comes with negative effects. Some road users, such as pedestrians who take risks by
crossing the high-speed road at undesignated locations, are hit by vehicles traveling at high speeds. Several casualties have been reported in this respect.

Pedestrian safety, however, is influenced by both human behaviour and physical or environmental factors (Poudel et al., 2006). According to Vogel et al (2005), pedestrian crashes can be associated with multiplicity of factors. Pedestrian crashes may be due, in part, to inappropriate pedestrian behavior and poor physical road crossing infrastructure. Every pedestrian will invariably have to cross a street or a highway at one point in time. As identified by Silva & Shah (2010), pedestrian paths are often narrow, with irregular surfaces and poor maintenance. In addition, sidewalks are repeatedly occupied by other activities, such as convenience stores, bars, restaurants and gas stations. This why Global status report on road safety 2018 cited rapid urbanization, poor safety standards, lack of enforcement, people driving distracted or fatigued, others under the influence of drugs or alcohol as some reasons for the increasing trends of the phenomenon under discussion (WHO, 2018). At signalized intersections, pedestrian travel is very high in highly populous cities with least amount of safety measures provided to them. (Marisamynathan & Perumal, 2013).

The unending delays in the road construction sector seems to have grave impacts on the safety of pedestrians in Ghana. For example Madina (N4) highway has suffered delay which led to uncompleted footbridges, pavements, traffic lights and marking of zebra-crossings. These facilities are supposed to aid and improve pedestrians’ safety during crossing of the road. Their absence or incomplete nature left pedestrians at the mercy of the drivers who ply this road. And also has given pedestrians the chance to cross the road at any point convenient to them. This exposes the pedestrians to frequent accidents, injury, fracture and death. The pain associated with these happenings leads to mob actions against the drivers and their vehicles. These phenomena on Madina (N4) highway is to be compared with similar phenomena on Lapaz (N1)
highway which was successfully completed on time. This study, therefore, seeks to establish the link between delayed road projects and pedestrians’ safety by comparing pedestrians’ safety on a delayed road project to a road project that was completed on time.

Roads are public goods that facilitates the economic and social activities, as well as serving transportation needs of people who are the pedestrians; therefore, their safety in the use of the road must be of great importance. Hence, the delay of road construction might interfere with these activities negatively and the safety of the pedestrians.

1.2 Problem statement.

Road construction projects play vital role in the socio-economic development of many countries including Ghana. However, one major challenge to road construction projects is delay (Akomah & Jackson, 2016). When delay occurs, both government and contractors run at a loss in terms of time and resource. Moreover, a study conducted by Sambasivan and Soon (2007) shows that delays can lead to many negative effects such as lawsuits between clients and contractors, increased costs, loss of productivity and revenue, and contract termination. A research conducted by Akomah & Jackson, in 2016 on the contractors’ perception of factors contributing to road project delay also identified; extension of time, cost overrun, and damage to company’s reputation as the main effects of road projects delay. These scholarly works do not pay much attention to the effects that road construction delays have on pedestrians’ safety. Notwithstanding, pedestrians who ply the roads have their lives at risk when road and its infrastructure construction delays.

Several studies have been conducted by Peden et al. (2004), Tay et al. (2009), and Brew et. al (2018) which separately addresses issues on causes of road accidents and pedestrians’ safety while Akomah (2016), Chileshe & Berko (2010), Frimpong and Oluwoye (2003) researched on road infrastructure construction delay in Ghana. Madina (N4) highway has suffered delay
which led to uncompleted footbridges, pavements, traffic lights and marking of zebra-crossings. These facilities are supposed to aid and improve pedestrians’ safety during crossing of the road. Their absence or incomplete nature left pedestrians at the mercy of the drivers who ply this road. And also has given pedestrians the chance to cross the road at any point convenient to them. This exposes the pedestrians to frequent accidents, injury, fracture and death. The pain associated with these happenings leads to mob actions against the drivers and their vehicles. These phenomena on Madina (N4) highway is to be compared with similar phenomena on Lapaz (N1) highway which was successfully completed on time in order to establish a relationship between road infrastructure delays and the safety of pedestrians in Ghana. In the light of this, therefore, this research seeks to establish that relationship at the Madina-Pantang stretch of the N4 highway and the Lapaz – Mallam Junction section of the N1 highway. This study, therefore, seeks to establish the link between delayed road projects and pedestrians’ safety by comparing pedestrians’ safety on a delayed road project to a road project that was completed on time. Hence the hypothesis is that road construction delays negatively affects pedestrians’ safety. This relationship is to help stakeholders in road construction projects to know the damage that road construction delay causes to pedestrians and also to help design strategies to curb road construction delay.

1.3 Research objective

The main objective of this work is to research into road infrastructure construction dynamics with focus on causes of delays and its effects on pedestrians’ safety in Ghana by comparatively analyzing how delay in road infrastructure construction influences pedestrians’ safety on the Lapaz (N1) and Madina (N4) highways in La- Nkwantanang Madina Municipality and Accra Metropolitan Assembly
1.3.1 Sub objectives

1. To examine the causes of delays in road infrastructure projects and road construction project cycles on the Lapaz (N1) and Madina (N4) highways that accompany the construction of footbridges, zebra crossings and street and traffic lights.

2. To identify the effects of the road construction delay on government, contractors and pedestrians on the Lapaz (N1) and Madina (N4) highways.

3. To identify measures adopted by both contractors and government to curbing delay of road infrastructure projects and its effects on the Lapaz (N1) and Madina (N4) highways.

1.4 Scope of the study

This study focused on the N4 (La-Nkwantanag Municipal Assembly, specifically Madina to Adenta) and the N1 Highways (from Lapaz Flatop to Nyamekye.). These locations were chosen because of the relatively high road accidents on both highways and the delay in the construction of infrastructure on them. The respondents involved in this study were representatives from four (4) construction companies, Ghana Police Service, National Road Safety Commission, Heads of Departments of Urban Roads and Municipal Assembly, Ministry of Road and Highways, students from 4 selected schools, Out Patient Departments of 2 hospitals, residents and workers on the N1 and N4 Highways, families of accident victims. These respondents were purposively selected for in-depth interviews to gain deeper understanding of the how road infrastructure delays affect pedestrian safety.

1.5 Limitations of study

Access to data faced some challenges. In terms of delay in road construction, the government officials were reluctant to give out information relating to causes of delay. This was because of political influence and the respondents did not want to commit themselves. The contractors
on the other hand, blamed it on the government therefore biased in their responses. In relation to data on pedestrians’ safety, data on accident cases on most of the victims or their families were difficult to get because of geographical dispersion. Moreover, some of the expected respondents were not residents but just visitors or passers-by who got involved in accidents on the highways under study. The reliance on self-reports of respondents also resulted in some inaccuracies and some inconsistencies although some triangulation through multiple sources of information helped to address some of these inconsistencies.

Again, the researcher was faced with some difficulties in obtaining data from the Ghana Police Service and the Ministry of Roads and Highways due to the bureaucratic nature of the Ghanaian system. This caused delay in providing the necessary data needed to complete the research work. The availability of pedestrian accident cases in the study area were difficult to come by and even when obtained was scanty. Some of the cases were not reported to the police for record keeping. The reported ones were also a mix up of pedestrian knockdowns and car crashes.

1.6 Organization of study

This work is organized into five chapters. The first chapter presents an overview of the study, the statement of the problem, specific objectives, limitations and organization of the study. The second chapter examines the relevant literature. Chapter Three discusses the methodology which includes the theoretical and conceptual framework, research design, population and sampling, study instruments, and the statistical analysis employed in the conduct of the research. Chapter Four present the results of the study and discusses data gathered which answers the research questions and achieves the research objectives. The final chapter present the summary of findings, conclusions and some recommendations for policy.
1.7 Chapter summary

This Chapter discussed the general introduction to the research. It begun with a brief introduction of what the present research seeks to do. The problem statement identified the research problem and literature gap to be filled. The chapter also introduced the research objectives which are; To examine the causes of delays in road infrastructure projects and road construction project cycles on the Lapaz (N1) and Madina (N4) highways that accompany the construction of footbridges, zebra crossings and street and traffic lights, To identify the effects of the road construction delay on government, contractors and pedestrians on the Lapaz (N1) and Madina (N4) highways, To identify measures adopted by both contractors and government to curbing delay of road infrastructure projects and its effects on the Lapaz (N1) and Madina (N4) highways.

The scope of the study, the limitation t and the organization of the entire study were dealt with in this chapter.
CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction
This chapter seeks to highlight on the numerous studies regarding project construction cycle and the length of delay, causes, effects and measures taken to curb road infrastructure delays and measures adopted to ensure pedestrians’ safety. Project cycles and length of delay were looked at while the causes of infrastructural delay and its effect on pedestrians were also given an attention. Lastly, pedestrians’ safety was also reviewed on in this chapter.

2.1 Project cycles in road construction projects
Delay can be explained as expanded circumstances in which the contractor and the owner of the project jointly contribute to its untimely completion as against the original or agreed contract period (Assaf & Al-hejji, 2006; Durdyev, Omarov & Ismail, 2017; Aibinu & Jagboro, 2012). Delay is also defined by Kikwasi (2012) as a prolonged construction period and disruptions. Ghana is characterized with several road construction projects that are either delayed or uncompleted (Gomelesio, 2013). The timelines of these projects are mostly unknown to the citizens, consequently, they bear the effects of these delay sometimes in the form of accidents.

2.1.2. The construction cycle
The road infrastructure construction cycle is divided into three phases (Kumar, 2016). These phases are conception of the project, designing of the project and construction of the project. On the other hand, the work of Chileshe & Berko (2010) identified four phases of construction cycle which are seen to be interconnected. These four phases are conception or initiation phase, the planning or growth phase, the production or execution stage, and the completion and
handover phase. The conception phase is the time the idea of the project is conceived and discussed as a proposal and then finally accepted to be a project that must be executed. It is followed with the planning or growth phase which is the construction and the designing stage of the project. In this stage, various designs and plans are drawn, documents are prepared and signed. All these processes are mostly done by consultants. The production or execution phase takes into consideration the project implementation which starts with commencement of the project and continues with the construction activities until the project is completed. The completion or execution phase completes or ends the project.

Similarly, a study conducted by Birgisdottir (2005) identifies four stages that define the cycle of a road construction: design stage, construction stage, operation and maintenance stage and demolition stage. At the design stage, the lifetime and length of the construction, width of road elements and thickness of all layers in the cross-section are defined. Further, the materials for the road construction are chosen at this stage. The construction stage consists of three sub-phases that describe the activities related to the establishment of a new construction in a terrain. The sub-stages involve earthworks, construction of pavement and additional work. The next stage is the operation and maintenance stage and it is divided into four sub-stages that describe the most important activities related to keeping the construction in an acceptable condition during its lifetime and the environmental impacts related to leaching from materials. The other four sub-stages are regular maintenance, pavement maintenance, winter service and leaching aspects. The final stage is the demolishing stage which occurs when a road construction reaches its end in its service life, and a decision is made to demolish the road and dispose of or recycle the materials (Birgisdottir, 2005, p. 21-22).

Another author, Mohammed (2012) identifies the first stage of projects as the project initiation. Here the project is identified and a feasibility study carried out to establish the viability and business case is built. The next stage is the project planning stage. During this stage, the project
design is carried out, resources and finances allocated. The final stage is the project execution stage which involves implementing the designs within the allocated resources in the set duration and to the set specification and quality.

A study conducted by Kerzner (2001) identifies five phases of construction process which are conceptual, planning, testing, implementation and closure. This differs from the work of Alshubbak et al, 2009, who categorizes project life cycle of infrastructure construction into five phases, which are feasibility phase, design phase, construction phase, exploitation phase and dismantling phase. In another study conducted by Saad (2011), project life cycle was grouped into five phases; conceptual planning and economics phase, engineering and functional design phase, construction and completion of the project phase, and operation and utilization phase.

Project construction goes through several phases before its completion. Different authors have researched and come up with different processes that construction projects go through. Again the various researchers give different names to the various stages in the construction cycle but the components are the same. Examples of common stages that runs through literature are; inception stage, construction stage and after construction stage. Now that the various stages of project are known, the length or duration these construction process takes to be completed is discussed in the next subsection.

**2.1.3 Length of delays in road infrastructure construction**

In most developing countries, there are delays in infrastructure construction and government projects of which road construction is no exception (Kaliba, Muya, & Mumba, 2009). Aziz & Abdel-hakam (2016) emphasize on the fact that time is money. He explained that delay in construction projects tends to have negative effects on time and money, which is the backbone of any economy. Completion of highway construction projects and its infrastructure on time leads to project success, as well as the quality of road and safety of road users. Pathiranage &
Halwatura (2010) indicate that the local road construction projects experienced 56% to 88% of average time overrun compared to the original (planned) project duration.

2.2 Causes and factors which delay projects

In road infrastructure construction, there are several factors that contribute to its delay. There are mostly a lot of complaints received for the poor performance and delays in relation to government projects from the general public but in most cases, very little is done to address these concerns. These delays could be the fault of any of the parties normally involved in the contract and these parties are government, consultants, and contractors.

2.2.1. Contractors and owners of projects causes

Assaf & Al-hejji (2006), conducted a research on causes of delay on large projects and concluded that the most frequent causes of delays are related to both contractor and labourers. Slow decision making, bureaucratic and organizational lapses, inadequate planning and scheduling of the project and design change by engineer which can come from either the contractor or owner of the project leads to the untimely completion of the project (Seboru, 2015). This research is in line with Odeh et al. (2002) who found that, both contractors and consultants agreed that owner interference, inadequate contractor experience, labor productivity, slow decision making, improper planning, and subcontractors are among the top ten most important causes of construction delay in Jordan for instance. Additionally, Kumar, (2016) in his research titled “causes and effects of delays in Indian construction projects” analyzed 103 causes of delays from literature and categorized them into 8 different groups, that is contractors, owners, consultants, equipment, external factors, material, labour and designer contributing factors. Using a relative index method, the most significant factor causing delays in the Indian construction industry was; inadequate contractor's work experience resulting in their poor risk management abilities and ignorance.
Also, a study carried out in Nigeria by Mansfield, Ugwu and Doran (1994) cited in Seboru (2015) highlights poor contract management and material shortages as causes of delay of projects. Again, poor monitoring and control as a result of incompetent and unreliable supervisors are other causes of delays (Alinaitwe, Apolot and Tindiwensi, 2013). Further, mismanagement by the contractors, improper planning, and late delivery of materials were identified to be causes of delay in Ethiopian construction sector (Zewdu, 2016). Chabota et al., (2009) also identified changes in scope, schedule, strikes, and technical challenges as causes of delay and lead to cost escalation as noticed in Zambia’s road construction projects. Moses and Wynand (2013) and Seboru (2015) separately conducted study on factors that cause delays in road infrastructure projects in Malawi and found out that; shortage of fuel, shortage of foreign currency for importation of materials and equipment, insufficient equipment, delay in relocating utilities, shortage of technical personnel, and delay in site mobilization are causes of delays in road construction projects in Malawi. Most of the causes of delay mentioned above are confirmed in a study carried out in Ghana by Chileshe & Berko (2010) and their findings are that, schedule slippage and lack of project knowledge are factors contributing to delays in project completion.

In all the delay caused by contractors and owners of projects can be summarised by stating Najafabadi & Pimplikar (2013) nine points which are contractor’s improper planning, design changes, contractor’s poor site management, mistaken decision in changing managers, inadequate contractor experience, problems with subcontractors, and lack of communication between parties, construction mistakes and defective works.

### 2.2.2 Financial constraints

Another reason identified as the cause of delays is the contractors’ or the owners’ inability to make funds available when needed. The financial constraints can result from inflation and
interest rates, and contractor’s cash flow (Seboru, 2015). For instance, failure to provide adequate funding resources to contractors for a job done makes it difficult for contractors to meet project objectives in any new contract (Frimpong et al 2003, Pathiranage & Halwatura. 2010). A recent study conducted by Nyoni and Bonga (2017), stated that delay in progress payment by owner, waiting time for approval of tests and inspections, finance and payment of completed work contribute to the delays in timely completion of projects.

Similarly, in relation to financial causes of delays, delay in payment of compensation to land owners was also identified to cause delay in road construction (Moses & Wynand, 2013). Frimpong and Oluwoye (2003) cited in Gomelesio, (2013) found four causes of delay which are project financing, economic factors, natural conditions and material supply. Furthermore, Fugar et al. (2010) cited in Gomelesio, (2013) ranked financial delays as the topmost cause of delay. This financial delay results from delay in honouring payment certificates, difficulty in accessing credit as well as volatility of borrowing costs. A similar study conducted by El-Razek et al. (2008) concludes that, the most important causes of delay are financing by contractors during construction, delays in contractor’s payment by owner and partial payments during construction. A survey conducted by Abdul-Rahman et al. (2006) revealed that, lack of funds may affect the project’s cash flow and lead to delay in site possession, which in the end leads to delay in the project as a whole. Factors likely to cause insufficient financial resources are first of all, difficulties in obtaining loan from financiers and allocation of government budget not in place.

In Malaysia, Alaghbari et al. (2007) indicated that, financial problems were the main factors that caused delay in the construction sector while in Egypt, Aziz (2013), through the use of relative importance index, ranked financial group causes seventh in the causes of delay in the construction industry. Ren et al (2008) through the use of questionnaire survey and interviews conducted a research in Dubai to identify root causes of construction project delays. The results
showed that, many provisional sums and prime cost and client’s irregular payment to the main contractor were part of the top five causes of delay contributed by the client while ill-financed project was included in the top delay causes contributed by the contractor. Haseeb et al (2011) studies examined the construction delays in Pakistan’s large construction projects. Questionnaire survey was used to get the data on the causes of delay and 16 important causes of delay were revealed based on relative importance index (RII), which included finance and payments and delay in payments to supplier and subcontractor.

Financial cause is no different in the Ghanaian construction sector as Fugar and Agyakwah-Baah (2010) investigated the causes of delay of building construction projects in Ghana to determine the most important cause to the project participants. All the participants agreed that; delay in honoring payment certificates, underestimation of the cost of project, difficulty in accessing bank credit, fluctuation of prices/rising cost of materials were among the top ten most important factors causing delay in Ghana. Again, Chileshe & Berko (2010) conducted a research on causes of project cost overruns within the Ghanaian road construction sector, concluded that, delays in payment and inflation are factors contributing to delays in project completion.

2.2.3. Politics

The construction of a road is a political task and issues of political patronage affect road construction just as community dynamics may shape local use and access to roads (Wales, 2012). There is always government influence in terms of mobilization of resources and document preparation (Wales 201). Mahamid, Bruland, & Dmaidi (2012), conducted a survey to investigate the time performance of road construction projects in the West Bank of Palestine to identify the causes of delay and their severity from contractors and consultants’ perspectives. The survey concluded that delay is caused by political situations. According to Chabota et al.,
(2009) local government pressures is one of the political causes of delayed projects. As stated by Wales, & Wild (2012) political imperfections and corruption on the part of politicians who are in charge of the road sector lead to its delay. Also, low levels of performance oversight and monitoring sometimes are politically motivated (ibid). Williams (2016) argues that in the political environment, projects are unfinished because someone stole the money. Again, non-completion of projects results from clientelism, a way by which politicians deliberately leave projects unfinished to increase voters' desire to re-elect them (Robinson and Torvik 2005 cited in Williams, 2016).

Another way through which delays occur is the situation whereby a contractor is to be paid partly for finishing a particular stage or phase of the project. When the first stage is completed, partial payment is to be made by government after inspecting and satisfied with work done. Government sometime due financial challenges and bureaucratic processes delays payment to the contractor for the continuity of the project. On the other hand, it is the contractor who fails to complete one of the stages of the physical construction on time which then leads to stopping of the project due to challenges best known to the contractor (Williams, 2016).

2.2.4. Natural and environmental phenomena as a cause of construction delays

Chabota et al., (2009) identified that poor or bad weather as a result of rains and floods, and environmental protection and mitigation costs are causes of delay and lead to cost escalation in Zambia’s road construction projects. Frimpong et al (2002) identified bad weather and unfavourable geological conditions as causes of delay which are difficult and are unknown factors which cannot be controlled. Further, Hasseb et al., (2011) identified natural disasters, unforeseen site conditions and others as natural and environmental causes of delay in Pakistan large construction projects.
2.3 Effects of road infrastructure construction delay

There are several effects of delay in road infrastructure construction. Issues such as litigation, abandonment of projects, cost overrun, and time overrun among others (Abedi, 2011; Sambasivan & Soon, 2007). This section groups time overrun and cost with other effects consisting litigation, abandonment of project and company breakdown.

2.3.1. Time and cost overrun

Aydin & Mihlayanlar (2018), in their reviewed literature note that time and cost overrun were the common effects of project delay that affect construction companies worldwide. Oladinrin, Adeniyi & Eboreime (2013) argues that project delay leads to extension of time and waste of contractor’s time which could have been used to undertake another project, hence loss of money. For Aibinu & Jagboro (2002) time overrun is the elongation of project duration. According to Haseeb, Bibi, Dyian & Rabbani (2011) delay causes loss of wealth, time and capacity. The owner of the construction project is faced with loss of income and unavailability of facility for use. The contractor is also faced with loss of capital for the extra spending on equipment and materials damaged by the weather or expired and loss of skilled employees. According to Mbachu and Nkado, (2004) cited in Gomelesio, (2013) cost overrun is the cost in excess of the estimated project cost which causes inconvenience to all stakeholders of the construction project. In this vein, government and taxpayers do not get value for their money, contractors experience abnormal losses and cash flow crisis while other stakeholders suffer reputation crisis and clients lose confidence in their products. Since construction projects are often financed with loans, time overrun increases the finance cost of the client or contractor. Time and cost overrun also occurs when there is lack of communication between parties. Earlier studies conducted by Ellicott (1994), states that, lack of communication and collaboration between designers and constructors, most of designs needed to be modified or
reworked during construction due to its unfeasibility are some causes of delay by owners and clients of project.

In clear terms, delays are costly to projects when time lapse occurs. Further, projects that are delayed beyond the time specified in the contract lead to hardship, loss of revenue, bad reputation and increase in avoidable cost (Clough, 1986 cited in Gomelesio, 2013). Also, there are other consequences that result from the delay of a project in terms of its cost. Some of these consequences are labour cost of non-productive workers, supervisors, leased equipment, material delivery schedules and additional overhead costs (ibid).

2.3.2. Other effects- litigation, total abandonment and company breakdown

Kikwasi (2008) identified negative social impact, idling resources and disputes as effects of delay in construction sector. Najafabadi & Pimplikar (2013) also identified disputes, litigation and arbitration as other effects. Negotiations, court cases and disputes were identified as effect of infrastructure delay (Haseeb et al., 2011). Again delay in project construction, leads to litigation, disputes as well as abandonment of projects (Sambasivan and Soon, 2007 cited in Gomelesio, 2013). Kaliba, Muya & Mumba (2009) revealed in their work done in Zambia that poor quality and project abandonment are other effects of project delay. Abandonment of projects increases unemployment rate, slows down economic activities, loss of revenue and foreign aids in the economy (Gomelesio, 2013).

Moreover, Ojoko et al., (2016) identified claim, arbitration, dispute, and loss of profit as part of the leading six effects of delay in the building industry which is similar to the research conducted by Pourrostam & Ismail, (2012) who found six major effects in the Iranian construction sector. For the purpose of this section, the relevant effects are disputes, total abandonment, arbitration, and litigation. The research of Aydin & Mihlayanlar (2018), revealed that projects delay causes damage to the construction company’s reputation and erodes
people’s confidence in the company which can lead to company’s breakdown. In essence through out literature, time overrun and cost overrun were identified as significant effects of delay in projects construction followed by arbitration, litigation, total abandonment of project and among others; (Memon, Rahman, Abdullah, Asmi, & Azis, 2011; Kikwasi, 2008; Sambasivan & Soon, 2007)

To prevent these effects Najafabadi & Pimplikar (2013) recommended in their study that when the causes of delay are addressed the effects would be minimized. Therefore, complex designs should be made simple, contractors should study and be conversant with the designs before commencing work so that they can do away with a lots of mistakes.

2.4 Road construction delays and pedestrian safety

Road construction zones present a deadly hazard for workers, motorists, and pedestrians. Pedestrians are one of the victims of car accidents especially in countries with poor road traffic laws and policies to improve pedestrian safety. According to the Federal Highway Administration (FHWA), the annual number of persons killed in motor vehicle crashes in work zones in the US has increased 45 per cent over the last 10 years. The majority of these fatalities are drivers or occupants; however, 15 per cent are non-motorists - including pedestrians, bikers and construction workers (www.arrivealive.co.za). According to Bilton, (2012) understanding how to quantify and mitigate risks to pedestrian safety is an important part of construction traffic management. Annually many pedestrians face injury and death from road traffic accidents and road fatalities which account for 22% of the pedestrians’ death globally (Hashemiparast, Negarandeh, & Montazeri, 2017). There is limited information on how to manage and assess risks to pedestrians in urban areas during construction. Hence this section discusses pedestrians’ safety in relation to their crossing behavior and measures to protect pedestrians.
2.4.1 Pedestrian crossing behavior

Concerning pedestrian safety, most literature focus on signalized intersections and overpasses. It has been noticed that interactions of gender, age, and vehicle position, items carrying, group size have significant effects on safety margin. Overpasses are designed for pedestrians to avoid pedestrian-vehicle interactions. But in most cases pedestrians cross at street level to save time and this may lead to risky situations (Alver & Onelcin, 2018).

Pedestrians crossing lanes that are clear are not exposed to great danger. But streets with high traffic volume, it is not expected that pedestrians wait for the lanes to be clear before crossing especially where the speed is low (Brewer, Fitzpatrick, Whitacre, & Lord, 2006 cited in Alver & Onelcin, 2018). Hence, busy streets pose great danger to pedestrians. To substantiate this, at the global level it is estimated that 270,000 pedestrians die annually as a result of road traffic accidents (Toroyan, Khayesi & Peden, 2013).

Further, pedestrian behaviour and non-adherence to road traffic regulations could predispose them to unsafe condition and crash with vehicles. Overpasses are constructed to prevent interruptions to vehicular traffic and to reduce the delay of passing vehicles; hence to allow vehicles to move at high speeds. However, the noncompliant behavior of pedestrians disrupts the ideal conditions. Pedestrians become impatient and would like to cross the road where there is available gap and this may force a driver to slow down or knock the pedestrian down (Alver & Onelcin (2018). In Ghana it has been reported that there are frequent accidents involving pedestrians on the newly opened N1 Highway (Ghana News Agency, 2010) and this might be due to this impatience and noncompliance behavior as well as the delay of completion of footbridges.

But several factors have been attributed to road accidents in Ghana. Some of these include lack of pedestrian zebra-crossings, inadequate road signs, few or no footbridges, drunk driving, and
lack of knowledge on road traffic regulations. Road safety remains a serious public health challenge and the safety of all categories of road users is a major concern to all key stakeholders in Ghana (Ghana News Agency, 2010).

Despite efforts by the National Road Safety Commission, the Police and the media to promote, co-ordinate and develop national road safety strategies to reduce or eliminate road fatalities, pedestrian road traffic accidents are still on the increase signifying that a lot remains to be done on the part of pedestrians and other road users. On the streets of Accra, it is easy to see pedestrians crossing the road, with little consideration for their safety. The worrying pedestrian death tolls are attributable to several factors including pedestrians’ behavior and knowledge on road safety regulation (Malik, Alwi & Gul, 2015).

Pedestrian safety is dependent mainly on people taking responsible decisions while crossing the road. As well, drivers must be careful and be vigilant to easily perceive danger in order to avoid crashes. Despite the responsible decisions that pedestrians may take and the vigilance of drivers, some pedestrian facilities provided along some roads have rather become places of criminal activities where pedestrians are more unsafe. For example, on some footbridges people are being robbed so pedestrians worry about their safety especially when crossing at night (Malik, Alwi & Gul, 2015). This causes some pedestrians to involve in indiscriminate crossing (ibid). This is highlighted by Noora et al. (2015) in their study that 1,856 pedestrians crossing the N1 highway did not use the approved route. Therefore, indiscriminate crossing poses a significant threat to pedestrians on the N1 highway.

On the other hand, driver related factors such as drunk driving, over speeding and non-maintenance of vehicles are thought to be contributing to the situation of pedestrian fatalities (Sisiopiku & Akin, 2003). In developing countries, pedestrians face difficulties when attempting to cross the street due to the drivers’ behaviour towards them (Bargi et al., 2017).
Longer waiting times on the shoulders of the roads cause pedestrians to lose their patience while waiting to accept safe gaps (ibid). According to Demiroz, Onekcin & Alver (2015) 46% of pedestrians do not patronize the overpass provided across roads in Turkey rather they preferred making illegal crossings than using safe routes or they preferred crossing outside the overpasses in order to minimize their walking distance and time making the use of the overpass less effective and then exposing them to danger and accidents.

Providing safe environments for pedestrians require many factors to be considered - the sight distance and visibility for motor vehicles and pedestrians. In using engineering modifications for countermeasures consists of three broad categories which are: measures that separate pedestrians from vehicles by time or space, measures that increase the visibility and conspicuity of pedestrians, and measures that reduce vehicle speeds (Retting, Ferguson & McCartt, 2004). In ensuring pedestrian safety, reducing pedestrian exposure needs to be taken into consideration. Accidents involving pedestrians mostly arises by the increased exposure to vehicular traffic hence a need to reduce pedestrian exposure to vehicular traffic.

2.4.2 Measures to ensure pedestrians safety

Measures to reduce exposure can be done in many ways and it includes providing walkways, sidewalks, and curb ramps. Pedestrian refuge islands and raised medians can be constructed to provide pedestrians a safe stopping point on wide roads (Zegeer et al., 2004). Traffic and pedestrian signals should be increased. This may help remedy the situation by extricating the pedestrian from the vehicles by time. Signal enhancements such as automated pedestrian detectors, countdown signals, and signal placement may be installed to improve crossing at intersections.

Moreover, increasing the drivers’ visibility may go a long way to help ensure pedestrian safety. A way to escalate the driver’s visibility of pedestrians is to increase the roadway lighting
intensity. Previous works has shown that roadway lighting can significantly reduce the night
time crash rate. The majority of these crashes occurred when street lights were illuminated;
therefore, an increase in the intensity of lighting may be warranted (Zhou, Miller & Hsu, 2011).
Vehicular speed, in a way or the other, contributes to the high rate of pedestrian accidents and
slides. Also, vehicle speeds increase both the severity and occurrences of pedestrian crashes.
According to the National Highway Traffic Safety Administration (NHTSA), crash data from
Florida shows that 36% of pedestrian accidents involving cars going at speeds above 46 mph
resulted in fatalities, as opposed to approximately 12% for speeds of 31-35 mph (Leaf &
Preusser, 1999).

Likewise, adopting access management techniques can boost the safety of pedestrians. The
techniques to be adopted may include reducing the number of driveways, turning radius,
adhering to a minimum distance between driveways, and providing raised medians for
pedestrian refuge (Zegeer, 1998).

2.5 Summary of chapter

Delay can be explained as the inability of the owner of a project jointly or severally contribute
to the untimely completion of the project within the agreed or original period. Construction
processes can be grouped into 3 main phases and these are – the conception, designing and
construction stages. The conception stage comprises of the idea conception of the project
whereas the designing stage takes into consideration the drawing and designing of the project
on a piece of paper. Finally, the construction stage brings the idea and design to the ground,
that is, construction begins.

Delay in the construction of infrastructure can be attributed to various factors. Among these
factors are; cash flow problems during construction, mismanagement by contractors, improper
planning, slow decision making and late delivery of materials. When delays in infrastructure occurs, several effects on the pedestrian, community and construction companies follows.

Among these effects are abandonment of projects, cost and time overrun, bad reputation to the construction company, loss of capital for the extra spending in equipment.

Delays in infrastructure construction costs the nation greatly as it leads to many fatalities on the road hence the nation losing a lot of potentials. Various road accidents can be traced to the absence of infrastructure on the road and mostly involves pedestrians. The absence of the infrastructure for pedestrians such as zebra crossings, inadequate road signs, few or no footbridges amongst others create the condition for more fatalities. Though these fatalities are usually attributed to the lack of infrastructure on the road they are more linked to the road users’ behaviour. Most of the road users cross the road at the peril of their safety. This behaviour has increased the number of the accidents on highways defeating all the measures implemented by the Road Safety Commission, mass media education and police checks on the roads and the measures taken in developing road safety measures.

The worrying pedestrian death tolls are attributable to a number of factors including pedestrian behavior and knowledge on road safety regulations. Road safety is dependent on people taking responsible decision while crossing the road as well as the need for drivers to be careful and considerate. Measures to reduce exposure can be done in many ways and it includes providing walkways, sidewalks, and curb ramps. Pedestrian refuge islands and raised medians can be constructed to provide pedestrians a safe stopping point on wide roads.
CHAPTER THREE

METHODOLOGY

3.0 Introduction

This Chapter is subdivided into three parts. The first part addresses theories and conceptual framework on how delays in road infrastructure construction affects pedestrian safety. The three groups of delay – critical and non-critical, excusable and non-excusable, compensable and non-compensable, and concurrent and non-concurrent delays are discussed. The second part profiles the two geographical locations of the study – N1 and N4 highways. The final part entails the means of collecting data, types of data, target population, sample selection and framework used for data analyses.

3.1 Theoretical and conceptual framework

Domino Theory is employed to explain the causes of delays in road infrastructure construction projects. In 1929, Herbert William Heinrich Domino developed a theory called Domino theory which basically dealt with the steps of accident causations. The first step is Social Environment and Ancestry which focused on characteristics and traits of person which then expose the person to risk when using the road or when found in construction sites (Sabet et al, 2013). The second step is Fault of Person which results from the first step and it still emphasizes the behavior of the person which then leads to the third step called Unsafe Acts or Unsafe Conditions leading to accident and injury as the fourth and five steps (ibid). The theory at this rudimentary level is behavior centred and focused on the individual as the main factor of road traffic accident and has neglected management and organization (ibid). For this reason, the theory had been revised to include the role of management. Bird and Loftus in 1974 provided the revised model to include the role of management which pointed at lack of control, the process of incidents which looked at events that could cause harm to either people or properties, basic and
immediate causes which addressed personnel and job factors which include inadequate work, normal or abnormal wear and tear, low-quality equipment, and bad design or maintenance as well as unsafe act and conditions. It is believed that the management system mostly fails to pin down the factors so they are left unchecked and uncontrolled hence leading to an incident to happen. So, the revised Domino Theory has the underlying cause of road traffic accident to be management, basic cause to be origins of accidents, immediate cause to be symptoms, incident to be contact and loss to be people

This theory is relevant to this study because causes of delays of road infrastructure construction mostly results from the role that management, both on part of the government and the contractors, plays. Lack of control of factors by government and contractors influencing the road construction creates delays which then generates unsafe conditions and risk for pedestrians and other road users. The unsafe conditions are uncompleted footbridges, lack of zebra crossings and temporal speed ramps. Embedded in the theory is the psychological and behavioral dimensions that result from the pedestrians themselves that is the role of humans or the human factors that are involved.

The Theory of Planned Behaviour (TPB) (Ajzen, 1988). Globally, there are several factors that can lead to delays in the construction sector. Delays were categorized based on the type and extent of the effect that an activity will have on the project and one responsible for the delay among the stake holders. Theodore (2009) classified delays into four groups; critical or noncritical, excusable or non-excusable, compensable or non-compensable and concurrent or non-concurrent. The following types of delay are explained into details in the subsequent sessions. It is written by Theodore (2009) that, delays that affect the project completion time or date are considered as critical delays. On the other hand, delays that do not affect the project
completion time or date are noncritical delays. If certain activities are delayed in the construction project life cycle, the project completion date will be delayed. Critical delays are determined by the project itself, the contractor’s plan and schedule (particularly the critical path), the requirement of the contract for sequence and phasing, and the physical constraint of the project (i.e. how to build the job from a practical perspective). The next category is excusable versus non-excusable delays; Theodore (2009) studies that all delays are either excusable or non-excusable. An excusable delay is a delay that is due to an unforeseeable event beyond the contractor’s or the subcontractor’s control. Excusable delays are further explained as delays caused by owner’s actions or responsibilities. Hence, the contractor is entitled to extension of time. Whereas, non-excusable delays are caused by the contractor’s actions or responsibilities and the client is compensated. Delays resulting from the following events would be considered excusable: general labour strikes, fires, floods, acts of God, owner directed changes, errors and omissions in the plans and specifications, differing site conditions or concealed conditions, unusually severe weather, intervention by outside agencies and lack of action by government bodies. Non-excusable delays are events that are within the contractor’s control or that are foreseeable. Non-excusable delays include: late performance of sub-contractors, untimely performance by suppliers and faulty workmanship by the contractor or sub-contractors.

Again in relation to compensable delays versus non-compensable delays, the work of (Trauner, 1990) states that non-compensable delay is caused by third parties or incidents beyond the control of both the owner and the contractor where the contractor is normally entitled to a time extension but no compensation for delay damages and the owner or the owner’s agents cause compensable delay. A compensable delay is a delay where the contractor is entitled to a time extension and to additional compensation such as payment for the delay. Relating back to the excusable and non-excusable delays, only excusable delays can be compensable. Non-
compensable delays mean that although an excusable delay may have occurred, the contractor is not entitled to any additional compensation resulting from the excusable delay. Furthermore, concurrent delay is defined by Rider and Long (2013) as two or more parallel and independent delays to the critical path of a project.

The second theory, the Theory of Planned Behaviour (TPB) (Ajzen, 1988) is one of the leading theories used for explaining risky behaviour or violations in traffic and is also applied frequently to designing campaigns and educational measures. This theory focuses on decision making to carry out a certain behaviour considering e.g. the social context. According to the TPB, the intention for a behaviour is based on the combination of three factors: attitudes toward the behaviour, subjective norms and perceived behavioural control. The intention then again is the strongest predictor of the actual behaviour. An example for a favourable road safety attitude can be: crossing at the red light is safer”. The perceived behavioural control can be described as the individual perception of one’s ability to perform the intended behaviour. Over time, the TPB was extended with several factors including habit, motions, and descriptive norms.

The TPB is used to investigate pedestrian behaviour when road infrastructure delay. The theory helps understand the crossing behaviour of pedestrians when crossing roads. Pedestrians adopt coping mechanisms such as - crossing in groups at a zebra crossing, using the traffic light, attempting to cross with force, crossing by seeking help from the police or national road safety commission if available. These mechanisms however could be effective, somehow effective or ineffective. These measures are adopted to reduce risk and ensure the safety of pedestrians.
3.2 Conceptual framework

Figure 1: The Conceptual Framework (Source - Author’s construct; April, 2019)

Figure 1 presents the conceptual framework within which the effects of delays in road infrastructure construction are assessed. It can be inferred from the figure that, causes of road infrastructure delay are grouped into underlying causes which deals with delays resulting from managerial and procedural issues, basic and immediate causes, physical and human factors. These causes of delays generate both effects and unsafe conditions which are loss of lives, properties, time and cost overrun, litigation as well as lack of footbridges, lightening, pedestrian...
(zebra) crossing, traffic lights, pavements or sidewalks respectively. These effects and unsafe conditions together with the causes need to be addressed concurrently through the measures adopted in order to improve pedestrians’ safety. These are some of the infrastructure on highways that promote pedestrians’ safety and when these infrastructure delays, pedestrians adopt the following coping mechanisms - crossing in groups at a zebra crossing, using the traffic light, attempting to cross with force, crossing by seeking help from the police or national road safety commission if available.

When these infrastructure construction delays, and coping mechanism become ineffective, they affect the government and contractors. For example, they cause cost and time overrun, litigation, total abandonment of project. The pedestrians also face challenges of getting knocked down by cars, affected families bear unplanned costs, loss of productivity, psychological stress, and economic loss. The company running the project will be left in debt as most of the projects are started with loans from banks. Other effects on the company are time overrun, litigation and loss of confident in company. Figure 1 shows the conceptual framework on road infrastructure delays and pedestrians’ safety.
3.3 Profile of study area

This section presents a brief profile on the Lapaz (N1) and Madina (N4) roads. The section captures the date the roads construction begun, project completion schedule, contract amount and other important aspects related the roads. The section also contains a map of the two roads.

3.3.1 Profile of N1 road

The N1, also known as the George Walker Bush Highway, is a 14 km long highway in Accra, Ghana’s capital. It stretches from Tetteh Quarshie to Mallam Junction. This road was built with funds from the Millennium Challenge Corporation (MCC), a bilateral United States foreign aid agency created by the ex-President George W. Bush’s administration in 2004 after the U.S had called for a new compact for development with accountability for both rich and poor countries.

In 2007, Ghana received the sum of US$ 547 million, representing its first tranche of funds from the facility, part of which was used for the construction of the highway. The contractor for the construction of the highway was Sonitra Construction company. The highway was opened in February 2012 by late President John Evans Atta Mills. It is a six-lane highway divided thoroughfare with six footbridges, one elevated circle interchange, street lightening, drainage, bus stops, extra-wide sidewalks with graded ramps, pedestrian walkovers, and stoplights at all major intersections. Major towns on the N1 road highway are Dzorwulu, Lapaz, Akweteman, Kwashieman and others. For the purpose of this study, a 2km portion was selected, that is, from flattop to Nyamekye Junction.

3.3.2 Profile of N4 road

The N4, specifically the Madina- Pantang road project, is a 5.6 km long highway with three lane and service lane. The contractor to whom the contract was awarded was China
International Water and Electricity Corporation. The supervising consultant was Dar Al-Handassah. This project was funded by the Saudi Fund from Saudi Arabia government, Badea and Government of Ghana. The project contract was awarded on 18th January, 2008 but construction begun in July the following year.

The expected date for the completion of this road project and its pedestrian infrastructures was 18th July, 2011. The total cost of the project in foreign currency was $25.75 million and the local cost was GHS 35.85 million. The road was supposed to have six footbridges constructed to assist pedestrians using it. These ancillary infrastructure were delayed, and reconstruction begun in December, 2018 after series of pedestrian accidents. Six different contractors have been awarded the project to ensure timely completion of the project. Some major towns along this N4 road are Atomic junction, Madina, Adenta and others.

![Map of study area](http://ugspace.ug.edu.gh)  
Figure 1: Map of study area (Source - Author's construct; April, 2019).
3.4 Research methodology

This section is grouped according to research objectives the researcher seeks to answer and the type of data needed, target population, sample size and method of analysis.

3.4.1 Duration of delays and project notches

The data needed to answer this research question were information on project cycles and the stages involved in road infrastructure construction. Data pertaining to time within which to complete the road construction project and actual time used to finish projects and also secondary data from journals and Department of urban Roads publications. The target groups were; contractors, department of urban roads of Municipal Assemblies of study area, Ghana Highway Authority and Urban Roads Ghana.

The researcher purposively selected six contractors and conducted one on one in-depth interviews with them to gain knowledge on project cycles and duration normally involved in delays. Same sampling approach was used to conduct an unstructured interview with heads from department of urban roads of municipal assemblies, Ghana Highway Authority. Most of the interviews were recorded to get exact words of the interviewee. These records were transcribed and analysed using thematic analysis.

3.4.2 Causes of delays

With the causes of delays, the following data were needed: factors that influenced delay, what caused other projects to be completed on time. The researcher used purposive sampling to select representatives from Department of Urban Roads of La-Nkwantanag Madina Municipal and Accra Metropolitan Assemblies, Ghana Highway Authority, Urban Roads Ghana, contractors and sub-contractors. The researcher used structured interview through stratified sampling method to assess road users’ knowledge on causes of delays in road projects.
Thematic analysis was used to analyze the unstructured interviews while relative importance index\(^1\) was used to analyze and rank causes of delay stated in the structured interview.

### 3.4.3 Effects of delays on government, contractors and pedestrians.

This research question assess how pedestrians are affected when infrastructure such as crossings, footbridges and lightening, are delayed on roads. It also addresses the effects of these delays on the society, contractors and the government. With road users, a thorough literature search was conducted to get some effects of delays in road infrastructure which helped in the designing of a questionnaire guide for them to rank the effects of road infrastructure in which relative importance index was used in the analysis. The sampling approach adopted to collect this data was stratified sampling. In-depth interviews were conducted with these key informants to also know how they are affected by delays in road infrastructure; contractors, sub-contractors, Ghana Police Service (MTTU), La-Nkwantanag Madina Municipal Assembly, Accra Metropolitan Assembly, Ghana Highway Authority, national road safety commission, drivers, two families of victims of accidents caused by infrastructural delays in Lapaz and Madina, OPD\(^2\) department of Kekele Madina and Lapaz community hospital and school children from 4 selected schools. The obtained data was analysed through case study, narrative analysis and thematic analysis. Observations were used as means of obtaining data.

### 3.4.4 Measures taken to curb delays

Data was needed on types of measures to speed up infrastructure projects, how successful they were and why, failed measures and why they failed. The following people who are key in speeding up government projects were interviewed; contractors, La-Nkwantanag Madina Municipal Assembly, Accra Metropolitan Assembly, Ghana Highway Authority. Purposive

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1. Refers to the applying of weight to indicators under study and ranking them accordingly.
2. Out-Patient-Department
sampling was adopted as the sampling technique for this research question. Purposive sampling can assume that, to efficiently discover, understand, gain insight in a situation, one needs to select a sample from which one can learn the most (Merriam, 1988, p. 48).

### 3.4.5 Measures adopted to reduce effects of delays

The following are the information used to answer this research question; measures by Ghana Road Safety Commission, Ghana Police Service, La-Nkwantanag Madina Municipal Assembly, Accra Metropolitan Assembly to ensure pedestrian safety, have these measures been successful or failed? Information on coping mechanisms adopted by pedestrians for safe crossing of roads were also considered. This data was collected through a survey questionnaire which contained both open ended and closed ended questions. This ensured that appropriate information was gathered to prevent the study missing out on some of the responses which can help address the objective. The target population was; police departments in various locations; road safety commission; road users, drivers and municipal assemblies. The in-depth interview was analysed through narrative analysis. The questionnaire was analysed using relative importance index. Table 1 shows the summary of the methodology adopted for this study.
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<td>b. Stratified sampling</td>
<td>b. focus group discussion</td>
<td>b.</td>
</tr>
<tr>
<td>c. Contractors view</td>
<td>c.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Causes of delays</td>
<td>Journals</td>
<td>Department of urban roads of municipal Assemblies, Ghana Highway Authority</td>
<td>Purposive sampling</td>
<td>Unstructured interview, interview transcription, thematic analysis</td>
<td>Thematic analysis</td>
</tr>
<tr>
<td>a.</td>
<td>a.</td>
<td></td>
<td>a.</td>
<td>a.</td>
<td></td>
</tr>
<tr>
<td>b. Publications from urban roads</td>
<td>b.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. what influences the delay</td>
<td>d.</td>
<td></td>
<td>b. stratified sampling</td>
<td>b.</td>
<td>b.</td>
</tr>
<tr>
<td>e. Factors involved in projects finished on time</td>
<td>e.</td>
<td>Road users</td>
<td>a.</td>
<td>a.</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>b. contractors, sub-contractors</td>
<td>a.</td>
<td>a.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>c. Police Division (MTTU)</td>
<td>a.</td>
<td>a.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Municipal Assembly</td>
<td>d.</td>
<td></td>
<td>c. focus group discussion</td>
<td>c.</td>
<td>c.</td>
</tr>
<tr>
<td>e. Families of victims of accidents caused due to delays</td>
<td>e.</td>
<td></td>
<td>d. documents and records review, thematic analysis</td>
<td>d.</td>
<td>d.</td>
</tr>
<tr>
<td>f.</td>
<td>f. Drivers</td>
<td></td>
<td>e. observations</td>
<td>e.</td>
<td>e.</td>
</tr>
<tr>
<td>g.</td>
<td>g. Ghana Highway Authority</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. National road safety commission</td>
<td>h.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i.</td>
<td>i. OPD of hospitals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Failed measures and why</td>
<td>c. Municipal Assembly Urban roads department</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>d. Ghana Highway Authority</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Have these measures been successful?</td>
<td>b.</td>
<td>Road Safety Commission</td>
<td>b. Focus group discussion</td>
<td>b. Narrative analysis</td>
<td>b. Tabulations</td>
</tr>
<tr>
<td>d.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Municipal Assemblies</td>
<td>e.</td>
<td>Municipal Assemblies</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.5 Summary of methodology

This section presents the summary of the methodology adopted for this study. This includes the quantitative and qualitative aspects.

3.5.1 Qualitative aspect

A qualitative approach was adopted to fill the gap left by generalization and quantification. Creswell (2009) asserts that qualitative interview and focus group discussions are well suited when the goal is to gain an in-depth understanding of a phenomenon and that is the main goal and objective for this study. For the qualitative aspect to answer the above research questions, in-depth interview and focused group discussions were conducted among contractors, Ghana Highways Authority (Hereafter GHA), drivers, 2 hospitals, students from 4 schools within the locations, 2 families of victims, police departments, municipal assemblies and road users.

These target populations were selected purposively for achieving the objective of the study. Also, in conducting focus group discussions, six students were selected each from four schools located on the N4 and N1 roads. This was to get an in-depth understanding on the impact of uncompleted road infrastructure on them and to also ascertain their coping mechanism. Narratives and quotations were used to make emphasis on certain comments and validate the results of the survey (Kemp-Benedict, Bharwan, De La Rosa, Kristtasudthacheewa & Matin, 2009).

3.5.2 Quantitative aspect

Questionnaires were administered to road users in these locations to quantitatively analyze their perception on causes of delay, the effects it has on them and measures adopted by stakeholders to reduce infrastructure delays and the effects these delays pose on them.

---

3 Generalization and quantification is mostly the outcome of quantitative analysis
3.5.2.1 Sampling method

The target population were purposively selected for the study. With the quantitative aspect of the study, the population in both locations were divided into strata; traders and residents. Also, in selecting residents on the N4 road, using the google map, houses and shops on the right side of the road from Madina firestone to Adenta Barrier were considered. In all, 520 houses and 450 shops were counted. Similarly, on the N1 road, starting from Flattop to Nyamekye, structures located in the first lane were shop and on the second lane were houses. 570 houses and 400 shops were considered on the N1 road. In calculating the sample size, the statistical sampling formula below is used:

\[
n = \frac{Z^2 \times p(1 - p)}{e^2}
\]

\[
Z^2 \times p \times (1 - p) \times \frac{e^2}{N}
\]

N = 1940, n = Sample Size, Confidence level (Z) = 95%, P= 0.5, Error (e) = 0.04, Z score = 1.96.

Table 2: Sample Size determination

<table>
<thead>
<tr>
<th>Roads</th>
<th>Houses on the second lane</th>
<th>Shops on the first lane</th>
</tr>
</thead>
<tbody>
<tr>
<td>N4</td>
<td>520 = 520/1940*190 = 50</td>
<td>450 = 450/1940*190 = 45</td>
</tr>
<tr>
<td>N1</td>
<td>570 = 570/1940*190 = 56</td>
<td>400 = 400/1940*190 = 39</td>
</tr>
<tr>
<td>Total Sample Size</td>
<td>106</td>
<td>84</td>
</tr>
</tbody>
</table>

4 Purposive sampling was adopted because of the researcher focus on particular characteristics of the population that are of interest which will enable the researcher to answer the research questions.

5 Meaning of symbols; Z is Z score, p is confidence level, e is error, N is population size, n is sample size.
Table 3: Profile of Respondents

The table below presents a summary of respondents’ profile selected for both qualitative and quantitative purposes.

<table>
<thead>
<tr>
<th>Qualitative Analysis</th>
<th>N1 road</th>
<th>N4 road</th>
</tr>
</thead>
</table>
| Focus Group Discussion | • 3 Private school students  
• 3 Public school students | • 3 students from Private school  
• 3 students from a Senior High school |
| In – depth Interviews | • Commander of MTTU Tesano Police station  
• Commander Lapaz Police station  
• Director of Roads at Accra Metro  
• A family member of a victim on the road  
• 3 traders by the roadside  
• 3 residents on the road  
• 2 drivers  
• 2 motorists  
• 2 Policemen deployed to direct traffic  
• Lapaz Community Hospital | • Commander for MTTU Madina  
• Head of Urban Roads Department at La-Nkwantanag Assembly  
• A family member of a victim on the road  
• 3 traders by the roadside  
• 3 residents on the road  
• 2 drivers  
• 2 motorists  
• 2 policemen deployed to direct traffic  
• Kele Madina Polyclinic |
| Key informant interview | • Representative from Ghana road safety commission  
• Director of Road contract at Ghana Highway Authority | |
| | • Chief Engineer Ghana Highway Authority  
• 4 construction companies | |
| Quantitative Aspect | 95 participants | 95 participants |

3.5.2.2 Data analysis

Their opinions on the causes, effects of the delays, their coping mechanisms due to the delay were ranked in order of importance using the Relative Importance Index technique. Kumar (2016) adopted a similar approach in his assessment of the various causes and effects of delays in Indian construction industry. Throughout literature, it is the most used technique in analysing and ranking causes and effects of delays in the construction sector. The responses on the causes
of delay were measured on a five-point scale starting from 1 (Very Low) to 5 (Very High) and transformed to relative importance index (RII) for each factor using the formula shown below:

\[
RII = \frac{\sum w}{A \times N}
\]

Where,

W is the weighting given to each factor by the respondents starting from 1 to 5,

A is the highest weight in the scale which is 5,

N is the total number of respondents (which is 95 people in each location).

The RII is the yard stick that was used to rank the identified causes and effects of delays as seen in several literatures. The respective RII's perceived by the respondents were used to judge the overall rankings to give a better view of the big picture of causes and effects of road infrastructure delays in the Ghana. These quantitative issues were presented in quantitative forms using tables, graphs and figures to interpret them effectively.

3.6 Chapter summary

The chapter three firstly discussed the theoretical and conceptual framework on which the research is based. The theories emerged were classification of delays based on; critical versus non-critical delays, excusable versus non-excusable delays, compensable delays versus non-compensable delays and concurrent delays. The conceptual framework was shown in a diagram which depicts the main concept of the research. The chapter three provided profile of the study area which showed a map of the two locations under study; Madina (N4) Lapaz (N1). Further details on the history and construction of the roads were discussed. The research methodology in the chapter were grouped according to research objectives the researcher seeks to achieve which included the type of data needed, target population, sample size and method and the data
analysis method. Chapter four, the next chapter reveals the results, findings and discussion of the research.
CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Introduction

This chapter presents the findings and discussions of the survey and interviews conducted on the N1 and N4 road to study how dynamism in road infrastructure construction delay affects pedestrian’s safety.

4.1 Demographic characteristics of respondents.

Table 4 indicates that, there were 190 respondents involved in this study out of which 50.5% were males and 49.5% were females. In relation to the locations used for this study, there were 95 participants each on the N1 (Lapaz) and N4 (Madina) roads with 51.6% males and 48.4% females and 49.5% males and 50.5% females on the N1 and N4 roads respectively. Moreover, the average age of respondents on the N1 was 34.2 years whereas that of those on the N4 road was 34.8 years with both averages incidentally falling within the working population; which is between 16 and 65 years. Regarding their educational background, majority of the respondents (46.32%) at Madina (N4) had secondary level as their highest form of education and it was not different at Lapaz (N1) where the highest form of education of most of the respondents (44.21%) was the secondary level. The study further revealed that trading is the major occupation in both areas as most of the respondents (29.47%) in Madina (N4) and 33.68% in Lapaz (N1) were traders which makes it obvious that trading activities are predominant in these areas hence many people troop in and out to transact businesses always. As a result, any delays in pedestrian infrastructure construction might cause a greater harm. The above characteristics are detailed below;
Table 4: Demographic characteristics of respondents.

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th>Madina (Freq)</th>
<th>Madina (%)</th>
<th>Lapaz (Freq)</th>
<th>Lapaz (%)</th>
<th>Total (Freq)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>47</td>
<td>49.47</td>
<td>49</td>
<td>50.53</td>
<td>96</td>
<td>100</td>
</tr>
<tr>
<td>Female</td>
<td>48</td>
<td>50.53</td>
<td>46</td>
<td>49.47</td>
<td>94</td>
<td>100</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Age</td>
<td>34.8</td>
<td></td>
<td>34.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational background</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal education</td>
<td>10</td>
<td>10.53</td>
<td>7</td>
<td>7.37</td>
<td>17</td>
<td>17.9</td>
</tr>
<tr>
<td>Basic</td>
<td>28</td>
<td>29.47</td>
<td>25</td>
<td>26.32</td>
<td>53</td>
<td>55.79</td>
</tr>
<tr>
<td>Secondary</td>
<td>44</td>
<td>46.32</td>
<td>42</td>
<td>44.21</td>
<td>86</td>
<td>90.53</td>
</tr>
<tr>
<td>Tertiary</td>
<td>13</td>
<td>13.68</td>
<td>21</td>
<td>22.11</td>
<td>34</td>
<td>35.79</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>17</td>
<td>17.89</td>
<td>15</td>
<td>15.79</td>
<td>32</td>
<td>33.68</td>
</tr>
<tr>
<td>Public servant</td>
<td>13</td>
<td>13.68</td>
<td>15</td>
<td>15.79</td>
<td>28</td>
<td>29.47</td>
</tr>
<tr>
<td>Trader</td>
<td>28</td>
<td>29.47</td>
<td>32</td>
<td>33.68</td>
<td>60</td>
<td>63.15</td>
</tr>
<tr>
<td>Driver</td>
<td>9</td>
<td>9.47</td>
<td>16</td>
<td>16.84</td>
<td>25</td>
<td>26.31</td>
</tr>
<tr>
<td>Hawker</td>
<td>2</td>
<td>2.11</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2.11</td>
</tr>
<tr>
<td>Other, specify</td>
<td>26</td>
<td>27.37</td>
<td>17</td>
<td>17.89</td>
<td>43</td>
<td>45.26</td>
</tr>
</tbody>
</table>

Source: Fieldwork (April, 2019)

4.1.1 Respondents’ purpose and length of stay at the location

Table 5 shows that, 53.7% of the respondents reside at Madina (N4 road) and the remaining 46.3% work and/or school there whereas 58% and 42% of the respondents at Lapaz (N1 road) reside and work and/or school there respectively. Furthermore, it was realized that majority of the respondents (35.8%) have been along the N4 road (Madina) for more than 15 years; that is, prior to the construction of the highway. This aided the researcher in obtaining detailed and accurate information on the impacts the construction of the highway had on people, since more
than a quarter of the respondents had resided at the area under study prior to and after the construction of the highway. Also, 34.7%, 17.9% and 11% of the respondents have been at the location for 1-5 years, 6 to 15 years and less than a year respectively. On the N1 road (Lapaz), most of the respondents (35.8%) have been there for 1 to 5 years with 29.5% being there for more than 15 years, 27.4% have been there for a period of 6 to 15 years and 7.4% have been there for less than a year.

**Table 5: Respondents’ purpose and length of stay at these locations**

<table>
<thead>
<tr>
<th>Location</th>
<th>Purpose</th>
<th>Residence</th>
<th>Work</th>
<th>Length of Stay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Less than 1 year</td>
<td>1 to 5 years</td>
<td>6 to 15 years</td>
</tr>
<tr>
<td>Madina</td>
<td>Residence</td>
<td>51 (53.7%)</td>
<td>44 (46.3%)</td>
<td>11 (11.6%)</td>
</tr>
<tr>
<td>Lapaz</td>
<td>Residence</td>
<td>55 (58%)</td>
<td>40 (42%)</td>
<td>7 (7.4%)</td>
</tr>
</tbody>
</table>

Source: Fieldwork (April, 2019).

**4.1.2 How often and reasons for crossing the road**

Figure 4 and Table 6 shows the responses from respondents on how frequent they cross the road and for what reason respectively.
Figure 3: Frequency in crossing the road (Source – Fieldwork; April, 2019).

Table 6: Reasons for crossing road

<table>
<thead>
<tr>
<th>Reasons for Crossing road</th>
<th>Madina</th>
<th>Lapaz</th>
</tr>
</thead>
<tbody>
<tr>
<td>To transact business</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td>Church</td>
<td>9.4</td>
<td>20</td>
</tr>
<tr>
<td>work</td>
<td>23.2</td>
<td>32.6</td>
</tr>
<tr>
<td>Run errand</td>
<td>26.3</td>
<td>13.6</td>
</tr>
<tr>
<td>Visit someone</td>
<td>15.8</td>
<td>10.5</td>
</tr>
<tr>
<td>Go to town</td>
<td>12.6</td>
<td>8.4</td>
</tr>
<tr>
<td>Go to school</td>
<td>2.1</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Source: Fieldwork (April, 2019).

From Figure 4, it was observed that a higher number of the respondents ply the Madina (N4) road (53.7%) than the Lapaz (N1) road (49.5%). This shows that the respondents using the Madina road face a higher risk when pedestrian infrastructure constructions are delayed than those on the Lapaz road. Various reasons were linked to the respondents crossing the road as seen in Table 6. These are for the purposes of business transactions, going to church, work,
school, town, visiting people, running errands and others. It is worth noting that many people (32.6%) crossed the road on Lapaz (N1) to work compared to 23.2% on the Madina (N4) road.

A female respondent who owns a shop at the Madina (N4) road narrated her story as follows;

“I do cross the road uncountable times within the day. I stay at the Zongo and have to cross to the other side of the road every day because of my business. Also, the church I do attend is located at the opposite side of the road and I must be there every evening to worship. So, I cross this road a number of times for different reasons, there are days where I even have to rush home during business hours to cook meals for my family” – she said.

Another woman who owns a shop along the N1 road in Lapaz recounted that;

“I use this road on countless number of times. Our shops are located on both sides of the road and there are times that customer demands, when not met in one shop it is met in the other. This requires crossing the road to the other shop to get what the customer needs. On a busy day, you can imagine the number of times I had to cross the road. Also, I live on the other side of the road to my place of work and had to report to work every day.”

4.2. Causes of delays in road infrastructure construction

This section focuses on causes of delays in road infrastructure construction delay which is the first objectives of the study.

4.2.1. Project cycles

The construction goes through some phases or cycles before its completion. Themes and sub-themes that emanated from the study suggest three phases. Phase 1 which is before the
construction; Phase 2, during the construction and the third and last Phase is after the construction.

4.2.1.1 Phase 1: Inception stage

The Ghana Highway Authority (GHA), the Department of Feeder Roads (DFR) and the Department of Urban Roads (DUR) are charged with the responsibility for the administration, planning, control, development and maintenance of trunk roads, feeder roads and urban roads respectively in the country. All these are departments at the Ministry of Roads and Highways in Ghana. The Chief Engineer at the GHA indicated that, at the pre-construction phase, feasibility studies are conducted to examine existing roads, traffic volumes, estimated population growth and then a decision will be made to construct new roads with infrastructures to avoid all the aforementioned problems to promote free movement of people, freight and information.

Following this process, the Ministry of Roads and Highways mandates the GHA to go ahead with the road construction. The department in charge of the road construction then advertises the project in the media for contractors to bid and be awarded the contract. Generally, after inviting the applications and receiving them, the evaluation team assesses the works of the various contractors whose applications have been received and award the contract to the best among them to execute the project. Then, the contractor who is chosen to undertake the project receives an authorization from the GHA. The construction company is then required to prepare a “certificate” which is signed by both parties. Most of the construction projects in Ghana are pre-financed by construction companies after which they submit their certificates for payment. This phase is followed by the construction stage.
4.2.1.2 Phase 2: Construction stage

The contractor moves to the site allocated for the project immediately after obtaining the mandate to execute the task. The construction begins with the ridding of the land of any impediments such as properties and structures. As a result, there is a need to compensate property owners before demolishing begins. The next action involves the earthworks; excavation, removal of vegetation, topsoil and others. This finding agrees with (Birgisdottir, 2005) that “in the construction stage, the terrain of the road alignment is prepared in terms of removal of buildings, vegetation, topsoil and unqualified soil for the road (such as soft soil)”.

Afterwards, the road is formed into a desirable shape suitable for the road design, concrete work, and pouring of gravels. Sample of these gravels must be tested first before they are used. Then, the final base is where asphalt is used to seal the road construction. The road construction stage is finalized by adding road infrastructures such as road signs, lighting, traffic lights, pavement, zebra crossings, pedestrian footbridges and safety fences if necessary. The contractors agreed that the construction phase is summed in three bases; lower sub-base, sub-base and base. This finding is expatiated in a research conducted by Mroueh (2014) that states what is located in all these bases; embankment materials - sand, crushed rock, blast-furnace slag, lower sub-base sand, blast-furnace slag; sub-base - fly-ash, fly ash and cement (mixed), crushed concrete, air-cooled blast-furnace slag (crushed and uncrushed), granulated blast-furnace slag, gravel, crushed aggregate; and base course - crushed concrete, crushed blast-furnace slag, crushed aggregate, bitumen stabilization.

4.2.1.3 Phase 3: After construction

This stage deals with the aftermath of the road construction. The Road Safety and Environment Department of the Ghana Highway Authority visits the road construction site for evaluation of the project. Certificates are presented by contractors to receive payment
arrears. This stage also involves the operation and maintenance stage - all possible activities and regulations to serve the purpose of maintaining the road construction in safe and acceptable condition during its life span. These activities imply maintenance of the pavement and road equipment, cleaning and maintaining the road. This duty is mostly the responsibility of the regional highway authority as the road is handed over to them for maintenance after construction.

The in-depth interview revealed that there are three main phases in the construction industry. The first phase which is the inception stage is where the idea of constructing road is conceived with all the necessary paper works done. The second stage is the construction stage where the actual works begin. It involves the earthworks; excavation, removal of vegetation, topsoil and among others. This is the stage the road construction begins. The final stage is the after construction which is mainly maintenance stage. This research finding agrees with Kumar (2016) who categorized the construction cycle into three phases. These phases are conception of the project, designing of the project and construction of the project. However, the findings digress from the researches of (Alshubbak, 2009; Saad, 2011; Kerzner, 2001) in their works identified five phases in the construction life cycle.

The study also revealed that the stage most affected with delays is the construction stage where the physical action starts. This leads to the deterioration of the already constructed sections of the project, requiring extra resources to fix. The finding agrees with (Ismail, Rahman, & Memon, 2013) conclusion that the construction phase is a major contributor to time and cost overrun in construction project.
4.2.2. Length of delay

There are apportioned times for completion of various road construction projects. The study found that, there are three categories into which projects can be classified based on their expected times of completion and they are as follows:

Small contracts: These small contracts have duration between 3 to 18 months to be completed and consist of projects such as 2km roads and 3 to 4km roads with drainage works.

Medium contracts: These contracts are supposed to be completed within 1 to 24 months. Example of projects within the medium contracts are 6km roads, 8km to 10km roads and 3 to 4km storm drains work.

Bigger and large contracts: Bigger and large contracts normally are supposed to last for years due to their nature of construction. They can last for 3 to 5 years or more. 20km roads, cluster of footbridges of about 10 pieces are all examples of bigger contracts.

An example of medium contracts is the N4 (Madina to Pantang) road project. It was supposed to have been completed within 2 years (24 months). Though the road itself was completed within the set period, the construction of the footbridges on the road to ensure pedestrians’ safe crossing of the road was delayed until recently when construction resumed. On the contrary, the N1 (Lapaz) project was supposed to have been completed within 30 to 36 calendar months. The road did not experience much delay as all infrastructure that were supposed to be constructed on the road saw about 90% of them completed on time. The reason given for the difference in time completion of the two roads with their corresponding infrastructure was the source of funding which will be elaborated in the causes of delay sub-section.

The findings suggest that there are different lengths in delays in road construction and all the respondents came to a conclusion that, about 80 to 90% of road projects are not completed
within the time frame which is consistent with the assertion of Pathiranage and Halwatura (2010) that, local road construction sector experiences about 56% to 88% of average time overrun compared to the original (planned) project duration.

4.2.3 Causes of delay

In order to critically assess the causes of road infrastructure delay, views from contractors, government officials in charge of road construction and road users in the study area were sought.

The interview with the contractors, Chief Engineer at the Ghana Highway Authority, Head of Urban Roads at the La-Nkwantang Madina Municipal Assembly and Head of Roads at the Accra Metropolitan Assembly revealed that causes of delay can be grouped under the following themes; financing, politics, weather conditions, technical and design causes, land acquisition difficulties, utility and other site issues.

4.2.3.1. Financing

In relation to financing, it was deduced from all the interviews conducted that financing is very important in the construction industry. There were two views expressed during the interview - the government representatives’ view and the contractors’ view on finance. During the interview, the government officials made it clear that there are two main sources of funding for road infrastructure projects. These sources are government’s own funding and donor funding from any donor country in the form of loan or grant. Road projects mostly financed by the Government of Ghana are delayed due to insufficient funds and the high expenditure designated for road construction. Government revenue for these road infrastructure constructions are based on projections of cash inflows expected from import duties, taxes and
other government revenue sources. The chief engineer at the Ghana Highway Authority expressed this by saying:

*Road constructions are very expensive than we think. Government of Ghana does not have money to pay for road construction at once since it costs a lot. Therefore, contractors are always asked to pre finance and they will be payed afterwards but there are always delays in refunding due to inefficient flow of money from the Government to the Ghana Road Fund to finance road projects. Therefore, contractors decide to stop working on these road projects irrespective of the level of completion due to delay in payment.*

Donor funded projects are mostly completed on time since these funding agencies give advance mobilization because of availability of resources. Contractors who are supposed to undertake this project only need to submit bank guarantee. The Head of Roads at the Accra Metropolitan Assembly pointed this out in the statement below:

*Donor funded projects are always completed on time except for some site challenges which may cause delay. When agencies like World Bank, African Development Bank fund a road project, it is mostly completed within the anticipated time frame. For example, the N1 highway from Lapaz to Mallam junction was funded from the Millennium Challenge account, a grant received during the late president John Evans Atta Mills of blessed memory era and this contributed to the timely completion of the road and all the pedestrian’s infrastructure.*

These views buttressed the assertion of Sambasivan and Soon (2007) that construction work involves huge sums of money and most of the contractors find it very difficult to bear the heavy daily construction expenses when payments are delayed.
Again, the contractors interviewed also confirmed the financial challenge that the government faces. All the contractors stressed that financing is the biggest challenge they face in the road construction sector. Besides, they made it clear that this challenge mostly leads to delay in the completion of the road construction and their pedestrian infrastructure. In fact, an official at Justmoh Construction Company said:

“There was a road that we were working on and due to delay in cash flow, we evacuated the site and till now, the work is not completed. It is about 2 years since we left that site and the government has not made any effort to refund the money for continuation of the project”

Most Ghanaian road projects are pre-financed by contractors and the contractors produce their certificates for payments. Usually, these certificates are presented immediately to the government, but payments are delayed which prevents them from paying their employees to continue working. Also, delay in payments leads to increase of the interests on loans that they accessed from the banks to pre-finance the road constructions. Due to the delay in paying the loans, the banks refuse to give them any additional financial assistance to finance new projects. A construction firm’s official expressed this by saying that, “there are some road construction projects that we have worked on, but we are yet to receive our payment. Currently, banks are not willing to help us in pre-financing our projects so without the refund from the government, we cannot resume work” (Justmoh Construction Company, April 2019). Therefore, ongoing construction tends to cease since there is no cash flow. This view agrees with Laryea (2010) who said that, in the year 2007 alone, the Government of Ghana owed road contractors 61,446,957.25 Ghana Cedis and this debt was later paid in 2008 when the government borrowed money from SSNIT. This will cause delays since contractors may have no money to fund the projects to the end. Abdul-Rahman et al. (2006) also agrees with the above as they opine that lack of funds may affect the project’s cash flow and lead to delay in site possession,
which in the end leads to delay in the entire project. From the above analysis, it can be realized that financing is the major factor when we talk of project delay.

4.2.3.2 Politics

The participants acknowledged that the construction industry is influenced by politics. Whenever there is a change of government, the road construction industry gets affected as the new political party that assumes power may not be interested in those road projects. They also get suspicious of the contract awarded and hence suspend or abort the project altogether. Mostly, the ruling parties pursue their own and new projects with the intention of scoring political points and to promote their political interests. Wales, J. & Wild, L (2012) asserts that, political imperfection and corruption on the parts of politicians who are in charge of road sector lead to delay. Also, new governments delay or halt payments of ongoing road constructions which leads to delay in the completion of the road infrastructure. This is expressed by one respondent who said:

“You see; our country does not need to suffer certain things but our mentality about politics is a big problem for our projects. Whenever there is change in government, projects are stopped anyhow, hmm... it’s a pity. Look, road projects that could be finished if there is continuity are mostly left hanging when new government assumes office. This then drags the work past the completion date and sometimes it never gets done at all”.

Roads are assets to the country and hence road construction projects must not be soiled with politics. This is corroborated by Mahamid et al (2012) and Chabota et al (2009) who said that delay of projects is caused by political situations and by local government pressures respectively,
4.2.3.3. Weather conditions

The respondents pointed out that weather is very important in the construction industry. They said that weather conditions such as rains and winds cause destruction to a project under construction. Also, in the rainy season, workers are unable to work efficiently so work is mostly stopped during this period to be continued later. This delay causes the estimated time for the completion of projects to be extended. A contractor from First Sky Construction Company had this to say;

“Madam, this our work when it starts raining you can’t do anything especially when heavy winds blow you cannot even go to the construction site because you might not leave there alive. This causes delay since we put all construction to a halt in bad weather conditions. Sometime back, we were constructing a road somewhere in the Northern region and though it was windy we still decided to work and one of our workers almost died as a tree fell suddenly. Only God saved him that day”.

These conditions make the road project to be delayed. This finding agrees with Aziz & Abdelhakam (2016) which ranked weather condition first in their work that explored the causes of delay of road construction projects in Egypt. But, this deviates from Kikwasi (2012) whose work did not list bad weather among the causes of project delay in Tanzania.

4.2.3.4. Technical and design related causes

Both the contractors and government officials agreed that technical and design related factors also cause delay. With regards to the technical issue, some equipment and machines used for these constructions are difficult to operate which sometimes causes work to be ineffective. Some equipment breaks down during constructions and must be fixed before resuming work.
Some of these machines and equipment sometimes take months before being repaired or serviced. This causes extension to the project completion date.

In the design-related problems, the designs of some road projects which are halfway through must be altered to fit the site or other challenges that come up during the construction. The time involved in redesigning and continuing with the work tends to cause delays.

This finding aligns with a research conducted by Odeh and Bataineh (2002) which identified that equipment allocation problem is a factor in construction delays. Also, change in design was ranked as one of the relative important index scale with 0.91 being the highest (Kikwasi, 2012).

4.2.3.5. Land acquisition difficulties

Land acquisition is another factor that causes delays as roads are constructed on lands and these lands are owned by individuals and groups who may sometimes have their structures already on them. The respondents agreed that acquiring lands for road construction or expansion is a serious challenge. Most roads constructed in rural areas are on the farmlands of people and these people must be compensated prior to the start of the construction. Sometimes, even after compensating them, conflicts and litigations arise about the actual owner of the land which hinders the construction process only to be continued after settlement.

In addition, road expansion done in the urban centers faces huge financial challenge in terms of compensating property owners and demolishing expensive properties which become extra financial burden on the government. A respondent from Ghana Highway Authority shared an experience on the construction of the N4 Madina-Pantang road project;

*When we planned to construct the N4, we visited the location and wanted to expand the lanes equally at both sides of the road. We saw that it was going to cost a huge sum of*
money to compensate and demolish structures that falls within the planned area. After experts visited the site, they suggested we shifted the road more to the left side since there are huge and expensive structures on the right but the left side that extends to the Zongo does not have such. The people of the left side protested to it that the people on the right side had paid a bribe to Highway Authority which was not so. They, therefore, took the matter to court which delayed the time the road construction was supposed to have begun and the court ruled in our favor and construction began. When construction began, we got to a point where a woman said she wouldn’t leave her house to be demolished to pave way for the road construction and that also caused a delay as road works were paused till the woman was finally moved from the location.

Ram & Paul (2015) ranked delay due to land acquisition as one of the top ten significant causes of construction delays with regards to road infrastructure projects.

4.2.3.6. Utility and material causes

The research revealed that utilities such as electronic, telecommunication and high-tension cables and equipment found on site of road construction cause disruptions to work. When construction is ongoing and gets to these points, work must be paused for the people in charge to work on them before construction continues. This leads to delay as those in charge of such works sometimes do not report and complete their work in time for the construction to continue.

Also, materials such as gravels must be taken to the laboratory to ensure its suitability for the road construction and those which turn out to be unsuitable have to be discarded for new materials to be tested and all these processes affect the completion time of a project. Addo (2015) ranked the following material-related factors: shortage of construction materials, poor quality of construction materials, poor procurement of construction materials, importation of
construction materials, and escalation of material prices as causes of delay in his work titled “delay and its effect on the delivery of construction”.

Figure 4: shows how electric cables are disrupting the construction of footbridges on the Madina to Pantang highway (Source – Fieldwork; April, 2019)

4.2.4. Road user’s perception on causes of road infrastructure delay

The researcher sought to know the perceptions of road users on the causes of road infrastructure delay. Therefore, a questionnaire was administered to 95 respondents at Madina (N4) and 95 at Lapaz (N1) to rank the causes of infrastructure delay. The ranking starts from 1 to 5 with 5 being very high and 1 very low. The responses are presented in table 7.
### Table 7: Ranking using Relative Importance Index.

<table>
<thead>
<tr>
<th>Perception Cause of delay</th>
<th>Madina</th>
<th>Lapaz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weight</td>
<td>Rank</td>
</tr>
<tr>
<td>Insufficient funds from Government</td>
<td>1.02</td>
<td>1st</td>
</tr>
<tr>
<td>Delays of compensation to affected property owners</td>
<td>0.89</td>
<td>2nd</td>
</tr>
<tr>
<td>Change in Government</td>
<td>0.83</td>
<td>3rd</td>
</tr>
<tr>
<td>Bad weather conditions</td>
<td>0.61</td>
<td>4th</td>
</tr>
<tr>
<td>Problem with sacking hawkers and traders</td>
<td>0.56</td>
<td>5th</td>
</tr>
<tr>
<td>Conflicts and discontentment from the General Public</td>
<td>0.49</td>
<td>6th</td>
</tr>
</tbody>
</table>

Source: Fieldwork (April, 2019).

From Table 7, a critical observation shows that insufficient funds from government ranked first with the weight of 1.02 at Madina (N4) and 1.04 at Lapaz (N1) but the weight in Lapaz is higher than that of Madina. Therefore, this is perceived to be the most important cause of infrastructure delay which supports the key informant interview conducted that emphasized that funds are very instrumental in the construction industry and can cause a delay. Delay in payment of compensations to property owners was ranked second with a weight of 0.89 in Madina (N4) and 0.95 in Lapaz (N1). The difference between the weights between these two locations is wide. That of Lapaz is higher than that of Madina, which is demonstrating that
most people at Lapaz are of the view that delay in payment of compensations to property owners causes delay even though it was ranked second in both locations. In-depth interviews with some of the respondents revealed that compensating property owners is a major factor that contributes to delay as property owners who spent a huge sum of money in constructing their structures have to be compensated first. They also stated that, it is mostly cumbersome moving and demolishing some of these affected properties since most owners are reluctant to move because they do not know if they would enjoy same benefits enjoyed at their current locations after moving to new places.

In the breakdown, the respondents ranked change in government as the third factor that causes delay in road infrastructure projects at Madina and Lapaz with the weights 0.83 and 0.86 respectively. The respondents believed that change in government always affect road projects. The political party in power always pursues projects that can enhance their chances of upcoming elections.

Respondents ranked bad weather conditions, the problem with the sacking of hawkers and conflicts and discontentment from the general public as the lowest ranks among the factors that cause delays to projects because they are believed to be factors that can be managed and not major contributing factors to delays of road projects. This is consistent with studies conducted by the following researchers; Assaf & Al-hejjji (2006), Haseeb et al. (2011), Frimpong, Oluwoye, & Crawford (2007), Ram & Paul (2015) who agreed that the above mentioned factors are the causes of delay in construction.

From the foregoing analysis, both qualitative and quantitative data emphasize that insufficient funds from government is the main cause of delay in road construction projects due to the late payment to contractors and delay of payment of compensations to affected property owners. This finding is similar to causes of delay in Malawi as Seboru (2015) pointed out that,
insufficient contractor cash-flow, shortage of foreign currency for importation of materials and equipment, slow payment procedures adopted by the client in making progress payments and delay in paying compensation to land owners are the major causes of delay in the construction industry of Malawi.

Furthermore, the qualitative data highlights politics which constitute change in government and political influences as another cause of delay which agrees with change in government in the quantitative data that ranks it as the third major cause. This finding supports the study done by Mahamid, Bruland, & Dmaidi (2012) which explored the timeframes of road construction projects in the West Bank of Palestine and to identify the causes of delay and their severity from the perspectives of contractors and consultants. The survey concluded that delay is caused by political situations.

The contractors interviewed in qualitative data opined that bad weather is a major cause of delay, but it was among the least ranked by respondents as they perceived it to be a minor factor and suggested that the contractors are rather lazy and try to attribute it to bad weather. This contradiction may be due to lack of technical or experiential knowledge on the part of the respondents. Again, during rainy seasons, the heavy trucks that contractors use for work get stuck in the mud and holes for bridge and others get filled with water as well as strong winds that accompany rains may cause trees and heavy objects to fall which can harm the workers. Another interesting finding is that, the respondents at Madina (N4) road revealed that the delay in completion of infrastructure was as a result of change in government. They strongly believed that the road project delayed because a new government replaced the government that started the project. Nevertheless, an interview with a key informant from Ghana Highway Authority suggested that, source of fund for the road project causes delay in its completion since the N4 road was funded by Government of Ghana. This indicates that what the people perceive to be the cause of delay is different from what is the actual cause of the delay. Notwithstanding,
change in government could lead to delay but that is not the cause of delay in the N4 road construction.

In sum, the main causes of road infrastructure construction delays identified are insufficient funds-finance issues, change in government and political influences-nature of politics, and bad weather respectively.

4.3. Effects and challenges of road infrastructure delay

This section seeks to address the second objective which looks at the effects and challenges faced when road infrastructure is delayed. The researcher found out that the effects of road infrastructure delay can be grouped in three categories; effect on government, contractor effect and effect on pedestrians.

4.3.1. Effect on government

From the perspective of the respondents who serve as government officials in charge of road construction, a major effect faced by government is cost when road infrastructure is delayed, and this cost can be expressed in many forms.

4.3.1.1 Cost overrun

Road construction is capital-intensive; therefore, any further delay leads to extra cost due to high inflation, increase in interest rate and foreign exchange rate as well as depreciation of efficiency of road construction equipment. Also, it can lead to judgement debt that will increase the cost of the construction when aggrieved contractors sue the government in court.

A respondent from Ghana Highway Authority argued it this way;

“Delay in road infrastructure construction causes a huge financial loss to the government. You know, let’s ask ourselves, when projects are delayed and contractors resume work, who pays the cost incurred, is the government? Cost overrun is one of
the major effects faced when road infrastructure is delayed. Let me give you one example; the reconstruction of the uncompleted Madina footbridges has cost the government more than what was supposed to cost at the initial construction stage.”

Another respondent also adds;

“Delay in road infrastructure construction causes a huge financial loss to the government. As I elaborated earlier, road and its infrastructures are very expensive to construct. A huge sum of money must be paid to property owners for example during the construction of the Elubu to Agona Junction, a sum of 100 million dollars was paid to people who owned farms, structures, and other properties. Imagine we pay these huge sums and infrastructure delays; all these monies will be wasted”.

4.3.1.2. Other costs

It had been realized that, when infrastructure on the road that must ensure pedestrians’ safety are delayed, it can lead to pedestrians’ accidents and knockdowns. Most of the people involved are the working age population and hence reducing the productivity of the country. Again, in-depth interview with some health professionals in Madina Kekele Hospital revealed that the government spends a lot on pedestrians who are accidents victims.

A lamenting health professional had this to say;

“We are tired of these accidents, today accident, tomorrow accident, in the night accidents. We are indeed tired! This is because of the uncompleted footbridges that is forcing people to cross this dangerous road. These accidents are draining our medical resources. The government must buy more medicines and equipment for the emergency unit; but unfortunately, it is our internal generated funds that are used to buy these. The government has to bear most of the cost”.
Table 8: List of Roads in Ghana showing cost overrun

<table>
<thead>
<tr>
<th>Region</th>
<th>Road Name</th>
<th>Length (KM)</th>
<th>Contractor</th>
<th>Funding source</th>
<th>Start date</th>
<th>Intended com date</th>
<th>Contras. Duration (Mons)</th>
<th>Actual completion date</th>
<th>Contract amount(FC(M))</th>
<th>Total amount certified to date (FC(M))</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UER</td>
<td>Bawku- Polimakom Road</td>
<td>116.1</td>
<td>Construtora Queiroz Galvao</td>
<td>GOG</td>
<td>7-Dec-16</td>
<td>7-Jun-19</td>
<td>30</td>
<td>-</td>
<td>612.744</td>
<td>182.85</td>
<td>Work still</td>
</tr>
<tr>
<td>VR</td>
<td>Construction of Ho-Fume Road</td>
<td>18.4</td>
<td>Rolider</td>
<td>GOG</td>
<td>14-Jul-10</td>
<td>31-Aug-12</td>
<td>63</td>
<td>17-Feb-16</td>
<td>41.211</td>
<td>77.319</td>
<td>Work stalled due to non-payment of contractor</td>
</tr>
<tr>
<td>BAR</td>
<td>Brekum-Sampa road</td>
<td>56.0</td>
<td>J.Adom Limited</td>
<td>GOG</td>
<td>05-Feb-07</td>
<td>05-Feb-10</td>
<td>69</td>
<td>2-Nov-12</td>
<td>41.541</td>
<td>51.53</td>
<td>Contractor has abandoned work</td>
</tr>
<tr>
<td>ASHR</td>
<td>Bomfa Junction-Asiwa-Bekwai</td>
<td>36.2</td>
<td>Usaya Ghana Ltd.</td>
<td>GOG</td>
<td>3-Jun-08</td>
<td>30-Jun-10</td>
<td>84</td>
<td>-</td>
<td>21.471</td>
<td>34.590</td>
<td>Works are currently ongoing after contractor abandoned work for sometime</td>
</tr>
<tr>
<td>GAR</td>
<td>Tetteh Quarshie-Madina</td>
<td>4.6</td>
<td>Sonitra</td>
<td>GOG</td>
<td>17-Nov-06</td>
<td>24-Jan-12</td>
<td>78</td>
<td>-</td>
<td>$21.15 5</td>
<td>$45.50 1</td>
<td>Works have completed. A date yet to be fixed for substantial taking over inspection.</td>
</tr>
<tr>
<td>ER</td>
<td>Nsawam-Apedwa Road, Kwafokrom</td>
<td>31.7</td>
<td>China Int. Water and Elec.Corp</td>
<td>GOG</td>
<td>17-Dec-08</td>
<td>14-Mar-12</td>
<td>72</td>
<td>-</td>
<td>$116.9 23</td>
<td>$13.82 85</td>
<td>Work substantially completed</td>
</tr>
<tr>
<td>GAR</td>
<td>Tetteh Quarshie-Mamfe Road Project, Madina- Pantang Section</td>
<td>5.6</td>
<td>China Int. Water and Elec.Corp</td>
<td>GOG</td>
<td>29-Jul-09</td>
<td>18-Jul-11</td>
<td>40</td>
<td>-</td>
<td>$25.75 0</td>
<td>$32.20 1</td>
<td>Delayed payment stalling substantial completion of project</td>
</tr>
<tr>
<td>WR</td>
<td>Sefwi Bekwai-Eshiim-Asankragwa</td>
<td>46</td>
<td>Midwest Co</td>
<td>GOG</td>
<td>11-Sep-08</td>
<td>23-Sep-11</td>
<td>87</td>
<td>-</td>
<td>43.149</td>
<td>51.815</td>
<td>Works have been standstill since October,2016 due to non-payment.</td>
</tr>
</tbody>
</table>

Source: Ghana Highway Authority (Status report on development projects, March, 2018).
Table 8 shows that some road construction projects executed by Ghana Highway Authority have elapsed their completion dates and others are still uncompleted up to date. The table also shows contract cost and amount certified up to date. The construction of the Ho-Fume roads which spans approximately 18.4 kilometres started on 14th July 2010 supposed to have been completed by 31st August 2012 which was 63 months’ contract duration was completed on 17th February 2016. This project was completed 4 years after the contracted completion date. The initial cost of the contract was 41.21 million Ghana Cedis but after completion of the road, the total amount certified by the contractors had exceeded 77.32 million Ghana Cedis as cost overrun. This delay causes huge financial loss to the country as the difference of 36.108 million Ghana Cedis could have been used to construct a new road or be used to construct other important infrastructural projects in the country.

4.3.2. Contractor effects

An interview with the contractors revealed that, they are also mostly affected when the construction of road infrastructure delays and these effects are grouped under the following themes; cost overrun, time overrun, litigation, company breakdown.

4.3.2.1. Cost overrun

The contractors experience cost overrun in the sense that, most road projects in Ghana are pre-financed by these contractors. Construction companies usually secure loans from banks with high interest rates to undertake these projects. Therefore, when delay sets in the road construction, there is also a delay in paying the contractors for their work done which causes bank interests to accumulate. Therefore, the money refunded to them eventually is used to pay the loans and their accumulated interests leaving the contractors with little or nothing at all.
Also, some delays in construction works lead to their abandonments and the construction companies mostly do not receive their initial funds invested into the project. One of the contractors said,

“Hmm…. I have been in the construction company for more than 13 years and worked with several construction companies in Ghana. When you secure loan from banks to pre finance a road contract, madam when delay occurs, the government will tell you that the contract has not ended so they won’t pay you meanwhile the banks are also pressuring you to pay back the loan and the interest rate keeps accumulating.”

Another contractor confirmed this by saying;

“If I should tell you the debt that my company is in due to delay in constructions we pre-financed, you will be amazed”.

The work of Memon, Rahman, Abdullah, Asmi, & Azis, in 2011 confirmed that, contractors bear extra cost such as wages, bills and penalties due to extension of time or delay in the construction of the project. The results are also supported by the findings of Abedi (2011) who concluded that cost overrun is a frequent effect of construction projects’ delays.

4.3.2.2. Time overrun

The research revealed that when project delay occurs, there is time overrun. All the contractors interviewed agreed with the fact that time is money and is expensive. Delay in projects is tantamount to waste of time as the time after the set completion date could have been used in the construction of other projects to promote national development.

A contractor said:

“Look my sister, you spend about five to six months on a project and then you must pause, thinking is just a short period but before you realize, it has taken a very long
time. Time that one hasn’t planned for. Whatever the cause is we don’t know but is a problem to us and a cheat on our time. The equipment and tools we use are already on the site, we cannot carry them to a different site. We have to wait all this time while doing nothing. As a businessman, this is money! this is money! This could have fetched the company money if we completed the work quickly and proceeded to a different project”.

This reflects the position of Najafabadi & Pimplikar (2013) in their study where they argued that time overrun is one of the effects of project delay just as Kaliba et al. (2009) and Kumar (2016) asserted that time overrun is an major effect of road projects’ delay.

4.3.2.3. Litigation

Litigations are always the last resort to settle disputes of delays. Many construction companies take government on when delay occurs for payment. This leads to litigation and dispute between the two parties (the government and the contractors). Most of these contractors explained that these litigations sometimes cause them to be sidelined by government and not to be given contracts again. This causes a great loss to the company. This is consistent with a work done by Addo, (2015) where identified litigation as one of the three common effects of project delay. Again , the work of Alfakhri & Khoiry (2018) also confirms litigation as an effect of delay.

4.3.2.4. Company breakdown

Delay in road projects sometimes causes loss of confidence in a construction company. This finding aligns with the research of Aydin & Mihlayanlar (2018), which revealed that projects delay causes damage to the construction company’s reputation and erodes people’s confidence in the company which can lead to the collapse of the company. Also, the delay in projects render most of these construction companies bankrupt which leads to their breakdown. When
payments delay, banks seize or confiscate the companies’ equipment and materials having used them as collaterals in securing loans for the projects. Eventually, this causes the companies to collapse because they are unable to operate effectively without their equipment and materials.

A contractor gave an account of a former company he worked with that collapsed because of debt:

“I have worked with two construction companies after completing school in 2008. The first company I worked with collapsed in 2012, four years after joining the company. It was in debts and collapsed due to delay in the road contract and its payments. The company pre-financed most part of the project and due to delay of project completion, the company could not pay loans secured from the bank. The company’s expensive equipment and tools used for construction were all seized by the bank. Herh! It wasn’t easy oooo. We the workers became jobless until 2014 that I joined this new company”.

4.3.3. Perceived effect on pedestrians

The researcher further enquired the infrastructure delay on the road and the ensuing challenges faced by road users before tackling perceived effects of road infrastructure delay on the people.

4.3.3.1. Infrastructure delay on road

All the respondents in Madina affirmed that pedestrian footbridge was delayed on the N4 road whilst respondents answered otherwise on Lapaz road. 77.9% of respondents in Madina believed that streetlights were enough on the road whereas 98.9 % believed that streetlights were completed at Lapaz. Concerning zebra crossing, more than half of the respondents on the N4 road believed that it was completed on the N4 road whereas 94.7% respondents at Lapaz confirmed that the zebra crossing was completed on the N1 road.
Pertaining to pavements, 94.7% respondents affirmed its completion on the road while the remaining responded otherwise though all the respondents at Lapaz confirmed the timely completion of pavements on the N1 road. Again, 56.8% respondents in Madina believed that traffic lights were completed on the road with 43.2% saying the contrary. Traffic lights on the Lapaz road are completed as indicated by 98.9% of the respondents as seen in Table 9.

**Table 9: Infrastructure completed on roads (Freq. and %)**

<table>
<thead>
<tr>
<th>Road Infrastructure</th>
<th>Madina</th>
<th>Lapaz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian Footbridge</td>
<td>0 (0%)</td>
<td>95 (100%)</td>
</tr>
<tr>
<td>Streetlight</td>
<td>74 (77.9%)</td>
<td>94 (98.9%)</td>
</tr>
<tr>
<td>Zebra Crossing</td>
<td>49 (51.6)</td>
<td>90 (94.7%)</td>
</tr>
<tr>
<td>Pedestrian Pavement</td>
<td>90 (94.7%)</td>
<td>95 (100%)</td>
</tr>
<tr>
<td>Traffic Light</td>
<td>54 (56.8%)</td>
<td>94 (98.9%)</td>
</tr>
</tbody>
</table>

Source: Field work (April, 2019).

### 4.3.3.2. Road infrastructure delay and its effect

Table 10 shows that most of the respondents said the pedestrian footbridge is the one among the road infrastructure that is likely to have a major effect on the people when delayed. Traffic light and zebra crossing, according to the respondents, also had effects on pedestrians but not as high as the footbridge. Throughout the interviews and focus group discussions, people viewed delay in footbridge as the major threat to pedestrian safety as it protects them from knockdowns on the highways.
Table 10: Road infrastructure delay and its effect

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Madina%</th>
<th></th>
<th></th>
<th>Lapaz%</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very low</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>Very low</td>
<td>Medium</td>
</tr>
<tr>
<td>Pedestrian footbridge</td>
<td>0</td>
<td>0</td>
<td>1.5</td>
<td>27.4</td>
<td>71.6</td>
<td>0</td>
</tr>
<tr>
<td>Street Lightings</td>
<td>16.8</td>
<td>12.6</td>
<td>33.7</td>
<td>27.4</td>
<td>9.5</td>
<td>0</td>
</tr>
<tr>
<td>Zebra Crossing</td>
<td>1.1</td>
<td>1.1</td>
<td>13.7</td>
<td>38.9</td>
<td>45.3</td>
<td>0.00</td>
</tr>
<tr>
<td>Pedestrian Pavement</td>
<td>10.5</td>
<td>21.1</td>
<td>30.5</td>
<td>24.2</td>
<td>13.7</td>
<td>0.00</td>
</tr>
<tr>
<td>Traffic Light</td>
<td>0</td>
<td>1.05</td>
<td>19</td>
<td>39</td>
<td>41.1</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Fieldwork (April, 2019)

4.3.3.3. How infrastructure delay affects pedestrians

The main perceived effects of delays mentioned in the questionnaire are pedestrian knock down, traffic congestion, loss of productivity, economic stress on affected family and society, environmental challenges, ruin of community beautification and psychological stress. These effects emanated from the literature reviewed in the Second Chapter and information gathered during pilot testing. From the list of effects of infrastructure delays on pedestrians, an overall ranking of these factors was done to ascertain their pervasiveness.
Table 11: Ranking of effects using Relative Importance index

<table>
<thead>
<tr>
<th>Effect</th>
<th>Weighted Average</th>
<th>Rank</th>
<th>Weighted Average</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian knockdown</td>
<td>1.06</td>
<td>1st</td>
<td>1.07</td>
<td>1st</td>
</tr>
<tr>
<td>Economic Stress</td>
<td>0.91</td>
<td>2nd</td>
<td>0.79</td>
<td>3rd</td>
</tr>
<tr>
<td>Traffic Congestion</td>
<td>0.88</td>
<td>3rd</td>
<td>0.90</td>
<td>2nd</td>
</tr>
<tr>
<td>Psychological Stress</td>
<td>0.78</td>
<td>4th</td>
<td>0.69</td>
<td>6th</td>
</tr>
<tr>
<td>Ruin of Community Beautification</td>
<td>0.76</td>
<td>5th</td>
<td>0.75</td>
<td>5th</td>
</tr>
<tr>
<td>Loss of Productivity</td>
<td>0.72</td>
<td>6th</td>
<td>0.55</td>
<td>7th</td>
</tr>
<tr>
<td>Environmental Challenges</td>
<td>0.66</td>
<td>7th</td>
<td>0.78</td>
<td>4th</td>
</tr>
</tbody>
</table>

Source: Fieldwork (April, 2019).

Table 11 indicates that, pedestrian knockdown ranks first as the highest effect of infrastructure delay in both locations with a weight of 1.07 in Madina and 1.06 in Lapaz. Interviews and responses were aligned with these findings as most of the participants attributed increase in pedestrians’ knockdown in Madina to delay in infrastructure (footbridge). Traffic congestion was ranked 2nd in Madina but unpredictably, respondents in Lapaz argued that economic stress was the next effect of infrastructure delay. Economic and psychological stress on family with victims involved in knockdown at these locations were also ranked 3rd and 4th in Madina which is different from Lapaz where respondents ranked traffic congestion and psychological stress as the 3rd and 4th effects respectively with environmental challenge, ruin of community beautification and loss of productivity perceived as rare effects in both locations.
To further understand how delay in road infrastructure affects pedestrians, in-depth interview and focus group discussion were held. The following are direct quotations from some participants in Madina. A woman in her forties said:

“The footbridge is the infrastructure that has been delayed on the road and due to that, one has to cross this dangerous highway. To me there has been an increase in pedestrian knockdown which has caused fear and panic among us. Hum! Is not easy for me when I wake up and think of crossing this road again. There is always a fear of being knocked down. You see, I too am a trader and it wastes my time when crossing the road. I can stand there for a very long time to make sure there are no cars before I cross because the drivers will never stop for you to cross the road.”

Moreover, a man in his mid-thirties also said:

“These footbridges which have been delayed is causing us a lot of harm. When you wake up in the morning and you know, you must cross this road, you get scared with the mindset that, you might not come back. The drivers and motorists also will never stop for you to cross and there’s always a probability of you being knocked down by a speeding vehicle. Pedestrian knockdown has increased, and the family of victims face financial difficulties when they must buy medications, hospital bills, and those who lose their lives could be bread winners for their family. My daughter this family will always go through economic hardship and never recover from the psychological trauma.”

Focus group discussions with students to find out how delay in these road infrastructure has affected them revealed significant effects.
A sixteen-year old WASS\(^6\) student responded,

“I cross the road twice at both Adenta and Madina when coming to school every day. The drivers over speed and do not consider us as students to stop for us to cross. I can stand by the roadside for a very longtime before I cross as my mother has warned me to make sure there is no vehicle before I cross the road. It wastes my time sometimes I stand for 30 to 40 minutes before I can cross. I quite remember a day I stood by the road for almost an hour since all vehicles were speeding. This makes me tired! I mostly don’t feel like going to school as there’s always a dangerous road to cross.”

This observation was corroborated by another student in a separate focus group discussion from a different school in the same location.

A fifteen-year old Faith Baptist student also said:

“My school is located at Zongo junction and this place seems to be the central point of Madina therefore is very dangerous to cross here. The students in the primary school closes early before us therefore there are security men who help them cross the road and there are school buses that takes them home. Those of us in junior high close very late and by that time the security men would have closed. The whole place looks crowded with vehicles, motorists, hawkers and people. This makes it very difficult to cross the road. It is very difficult to even get a good place to stand to cross as loading “trotro”\(^7\)” occupy the whole space. I always fear to cross the road due to uncompleted footbridge.”

---

\(^6\) West African Senior High School; one of the schools purposively selected for this research

\(^7\) Trotro ; local name for passenger transport service in Ghana
This finding confirms Alver & Onelcin (2018) claim that, pedestrians who cross when the lanes are not clear are exposed to great danger."

In the research, families who have had relatives as victims of knockdown on these roads were interviewed from both locations. The results of the interview are shown in the following boxes:
Box 1: Story of a mother who lost her daughter in a knockdown on the Madina Highway

Background:
A 62-year-old woman shares her painful story on the fateful Thursday when she lost her 36 year old daughter who left behind her children, two boys and a girl. They are 8, 5 and 3 years old now. When the mother died, the youngest child was about 8 months and their grandmother have taken care of them to date.

Narration: “I will never forget this date, 16th August 2017 when my daughter, who was 36 years at the time of the accident, who was a seamstress by profession and had her store in front of our house. She was short of zip to fix someone’s dress; therefore, she decided to cross to the Zongo side where a wholesale fabric shop is located. After buying the zip and crossing back home to continue with her work, a speeding vehicle from nowhere came to crash her and that was it. She didn’t even sustain injury and die later to say goodbye to me. My only child died on the spot leaving behind three children with the last child being just 3 years old now. I have not been working and my daughter had been the one working to support me and her children throughout.

Effects: “Her death, I must say, really affected me psychologically. People advised me to be strong because of my grandchildren. If not, I would have died and followed her because I couldn’t contain it. It was very painful, and I wouldn’t wish it for even my enemy. Economically, we were burdened since I am not strong enough to work and with all the funeral expenses and taking care of these little ones. It has not been easy. I miss my daughter every day and these children will grow up without their mother.

Cause: I believe the cause of her death is due to the infrastructure (footbridge) delay. I think if it was completed, my daughter would have walked across on it without crossing this dangerous highway which led to her death.
Box 2: A story of a young lady who lost her brother on the Lapaz highway.

| **Background:** | This lady lost her biological brother on the Lapaz road in 2018. He was crossing the highway but didn’t use the footbridge or cross at the traffic light since their distance was far from where he crossed. He was a young gentleman in his early 30’s who was engaged and preparing to get married in three months’ time. |
| **Narration:** | “My brother named ‘Kofi Nti’ but popularly known as ‘Kay’ lost his life last year. My brother owns a boutique inside the Lapaz station where he’s doing quite well because he was very hardworking and focused in life. It was one fateful Sunday that this unfortunate incident happened. We had all returned from church and my brother was about to get married. So, his fiancée had visited us, and we were cooking together. He had a call that someone wanted to buy something from the shop. Therefore, he left us to go take the item and give to the person. I remember I insisted on going with him but he asked me to be with his fiancée as she might be alone so he will rush to the shop and come back soon. We finished and started eating but realized he was taking long which was unusual of him. But we continued eating since we thought market had come so he wanted to make sales before coming home. It was some few minutes after we heard people coming to our house with tears that, Kay had been knocked down by a speeding car when trying to cross back home. Trust me at once an electric shock passed through me and I felt as if the world had become a standstill and not moving”. |
| **Effects:** | “Words cannot tell the pain I went through. Our mother hasn’t recovered from the shock and so is his fiancée. He was the breadwinner of the house and provided for all of us. I am in Ghana Telecom University and he was paying my fees, so we went through a lot and we still going through that pain. |
| **Cause:** | “I cannot link it to any cause but as for those of us in Lapaz, we don’t have any footbridge here unless you walk a very far distance to either flattop or Nyamekye to cross which is very far. |
The stories in both box 1 and 2 summarizes interviews conducted with families that have relatives as victims on the roads (N4 and N1). This is a painful story of what these families had to go through and the effects it had on them due to pedestrian safety infrastructure that was delayed pertaining to the road at Madina and that was not used by the victim in relation to the road at Lapaz. On the N4 road, the absence of these crossing assistance leaves pedestrians to cross at risky places at the peril of their lives. Those on the N1 had most of these infrastructures completed but those who refuse to use it are also at risk of knockdown. Therefore, through these stories, we get to know the effects of infrastructure delay and not using those completed.

The foregoing discussions presented both qualitative and quantitative analyses on the effects of road infrastructure delay on all relevant stakeholders: taken together, government, contractors and the road users have a fair share of the effects of delays. The results showed that, cost overrun in the qualitative data was an effect on both government and the contractor. Addo (2015), for example, concludes that cost overrun is a common cause between the client and owner of the contract. Time overrun came out as an effect on contractors as time that can be used for other projects are wasted during delays. Time is also very precious and must not be wasted. Litigation as another effect as all parties involved are not ready to accept risk and faults therefore engage in litigation when things go wrong (Amoatey et al., 2015).

Company breakdown results in the end when Construction Company is in total debt and must shut down. The company’s reputation is mostly at stake as Akomah & Jackson (2016) suggests that, a good reputation is very critical to the health of a company but a bad one is a serious threat to the existence of any business. Thus, delay in construction projects will ultimately affect the reputation of any company directly or indirectly [(Akomah et al., 2016) cited in (Murray, 2003)].
To identify effects of delay in road infrastructure construction on pedestrians, the researcher sought to identify infrastructure constructions that have delayed. Generally, footbridges were the most common infrastructure delayed on the Madina (N4) road but the construction of footbridges at Lapaz (N1) road have been completed. Some respondents in both locations agreed that infrastructure delays which has the most effect on them is the pedestrian footbridges though other infrastructures such as streetlights, zebra crossing, traffic light and pavements also have effects but on a minimal level. Respondents perceived pedestrian knockdown to be the severest effect of road infrastructure delay. There were other effects, but pedestrian knockdown received the highest rank in both Madina (N4) and Lapaz (N1). Traffic congestion as another effect of delay referenced from Table 10 was ranked 2nd in Madina (N4) and 3rd in Lapaz. This could be attributed to road infrastructure still not completed on the N4 to be the difference as they experience traffic disruption.

Again, evidence from literature shows disruption to traffic movement as an effect of road infrastructure delay. Aboubaker et al., (2018) concludes in their work that disruption in traffic flow and other effects are as a result of road infrastructure delay. Furthermore, a case study was built among two families who lost relatives due to infrastructure delay. On the N4 road, the study revealed pedestrian knockdown which led to the death of a mother who was also a breadwinner. This could have been avoided if pedestrian footbridge was completed on the road. The study on the N1 road also showed how a young man also lost his life when he refused to use the pedestrian’s footbridge and crossed at the peril of his life. This finding shows that, pedestrians are put at risk when infrastructure supposed to help them cross safely are not used (Anciaes & Jones, 2018).

The next subsection gives an account of pedestrians’ safety in both locations as various questions concerning safety and their varied related mechanisms together with other factors were discussed.
4.3.4. Pedestrian safety in both locations

Probing farther, the researcher would like ascertain the level of pedestrians’ safety in both locations. Therefore, the researcher asked if pedestrians knock down is rampant in these two locations, general safety of the people, age distribution of people involved in knock downs, measures to ensure pedestrian safety and pedestrian coping mechanism when infrastructure delays.

4.3.4.1. Situation of pedestrian knockdown and their safety in Madina (N4) and Lapaz (N1) roads.

From Table 12, about three quarters of the respondents (74.7%) in Madina strongly agreed that there has been an increase in pedestrian knockdown due to delay in road infrastructure construction. This suggests that delay in road infrastructure on the N4 road affects the respondents negatively.

<table>
<thead>
<tr>
<th>Response</th>
<th>Freq.</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree</td>
<td>2</td>
<td>2.11</td>
</tr>
<tr>
<td>Neutral</td>
<td>8</td>
<td>8.4</td>
</tr>
<tr>
<td>Agree</td>
<td>14</td>
<td>14.7</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>71</td>
<td>74.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>95</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Fieldwork (April, 2019)

This was contrary to findings in Lapaz, as the rate of pedestrian knockdown has reduced due to the completion of road infrastructure construction on the road. From Table 13, majority of the respondents 15.8% and 55.3% strongly agreed and agreed respectively that, there has been a decrease in pedestrian knockdown due to completion of road infrastructure especially
pedestrian footbridge. It was revealed in an in-depth interview that, the completion of the footbridges which is an important infrastructure to them has reduced the rate at which vehicles knocked down people.

A trader in Lapaz (N1) recounted,

“Oh, now people don’t really die as they used to compare to when they began the road construction and the various pedestrian infrastructure were still under construction.”

Again, there is a non-negligible proportion of pedestrians 16.8% who disagrees with the statement. The conduct of in-depth interview revealed that some pedestrians are still knocked down at locations on the road where there are no footbridges.

**Table 13: Decrease in pedestrian knockdowns on N1 road**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>1</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Disagree</td>
<td>16</td>
<td>16.8</td>
<td>17.9</td>
</tr>
<tr>
<td>Neutral</td>
<td>10</td>
<td>10.5</td>
<td>28.4</td>
</tr>
<tr>
<td>Agree</td>
<td>53</td>
<td>55.3</td>
<td>84.2</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>15</td>
<td>15.79</td>
<td>100</td>
</tr>
</tbody>
</table>

*Source: Fieldwork (April, 2019)*

To know in general how safe people are on Madina (N4) and Lapaz (N1) roads, the researcher collected some data from the respondents and the result is presented in Table 14. From the table, it can be inferred that more than half of the respondents strongly disagreed that pedestrians are safe on the road unless infrastructure such as streetlights, zebra crosses and footbridges are improved and completed in Madina (N4) road. But the case was different on Lapaz (N1) road where they believed that pedestrians were safe on the road though about 3%
strongly disagreed. Respondents were asked to explain their answer. Those who said that pedestrians were not safe on the road explained that because “they didn’t site these footbridges at the right places to create convenience when crossing”. Another respondent said that because “most of the traffic lights are faulty and the motorists always evade traffic rules and therefore, how can we be safe? Tell me, how safe are we?” Table 14 sums the responses received for pedestrian safety.

**Table 14: Pedestrians safety**

<table>
<thead>
<tr>
<th>Response</th>
<th>Madina</th>
<th>Lapaz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>51</td>
<td>53.7</td>
</tr>
<tr>
<td>Disagree</td>
<td>29</td>
<td>30.5</td>
</tr>
<tr>
<td>Neutral</td>
<td>10</td>
<td>10.5</td>
</tr>
<tr>
<td>Agree</td>
<td>5</td>
<td>5.3</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>95</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Fieldwork (April, 2019).

**4.3.4.2. Age distribution in pedestrian knockdown**

The researcher sought to find out age groups that are mostly affected in pedestrians’ knockdowns on these roads. Figure 5 shows that in both location, people between the ages of 26 to 50 years were the most affected in pedestrians’ knockdown on the road. This age group also constitute the working population of the country hence poses a great threat to the nation. This findings is consistent with Anciaes & Jones (2018) and Demiroz, Onelcin, & Alver (2015). In Madina, it was found out that school children were mostly affected by these knockdown than school children in Lapaz. This is because most schools in Madina are located along the roadside while most schools in Lapaz are located inside the town. Older people above
50 years accounted for the lowest pedestrian knockdown as confirmed by Hamid (2001) who indicated that older people normally get assistance when crossing road or are less likely to cross at risky places.

Figure 2: Age distribution and pedestrian knockdown (Source - Field data; April, 2019)

In sum the main effects of road infrastructure construction delays are huge financial and time loss to the state and the contractors, pedestrian knockdown, and traffic congestion.

4.4. Measures adopted to ensure safety of pedestrians

The researcher enquired from the respondents the actions and measures taken by Ghana Police Service, Ghana National Road Safety Commission, Municipal Assemblies and other stakeholders in ensuring their safety. From Figure 6, both Madina and Lapaz, 25% and 36% of the respondents respectively agreed that the afore-mentioned institutions have not put any measure in place to protect them. 20% of the respondents in Madina were also of the view that, measures such as traffic regulation, police and road safety representatives standing by road side to aid them cross the road, provision of middle barricades to prevent pedestrians from crossing at unauthorized places were put in place to ensure their safety but it was a smaller proportion
of them. 18% of these respondents also answered that traffic regulation, standing by roadside are some measures adopted to ensure their safety. Interestingly, this finding was similar in Lapaz as 18% of the respondents agreed that same measures were put in place while some respondents singled out traffic regulation, provision of middle barricade and standing by roadside to aid pedestrians cross as measures taken to ensure their safety.

![Lapaz Pie Chart](image)

![Madina Pie Chart](image)

Figure 3: Action taken to protect pedestrians in Lapaz and Madina (Source – Fieldwork; April, 2019)

Still in relation to measures, interviews conducted with key informants such as police, national road safety commission and municipal assemblies contradict responses obtained through the questionnaire.
Interview with the police at various locations revealed that, there are a lot of measures put in place by the MTTU\textsuperscript{8} Division of the police department. Measures such as directing traffic when traffic lights are faulty, arresting drivers and motorist who evade traffic regulations, standing by roadsides especially at major crossways to assist pedestrians especially school children to cross the road.

The director at Madina MTTU exclaimed in anger that;

“Most of the pedestrians are recalcitrant and stubborn! Young lady, hmm, it is unreasonable, you stand at a point to assist them cross the road, some of them feel lazy to come to your end and therefore they cross at unauthorized places at the peril of their lives.”

Similarly, the Chief superintendent of Tesano police station also was of the same view and he remarked that,

“I don’t know what is wrong with the people, they see footbridge, but they cross the highway right underneath the footbridge without climbing and if you are knocked down by a speeding vehicle, whose fault is it?”

Again, the two municipal assemblies also aired their views on the measures to protect pedestrians and they said protecting pedestrian is very dear to the heart of the municipal assembly. The finding shows that, places in the municipalities where speeding becomes rampant, the assembly makes speed ramps to check speeding of vehicles especially where schools are located. The assembly sees to it that enough zebra crossings are on the road, traffic lights and enough streetlights to make it visible when crossing road at night. They also provide

\textsuperscript{8} Motor Transport and Traffic Unit (Ghana Police Service).
middle barricades to block the middle lanes to ensure that pedestrians cross at designated places.

A respondent from Madina Municipal Assembly said that,

“If you have taken notice, the stretch from Zongo Junction towards RIIS Junction did not have any middle barricade to block it to prevent pedestrians from crossing there. We recently provided some to ensure that they all cross at an authorized point but human nature some people still jump over it and cross. Hum!”

The National Road Safety Commission also added that, as their core mandate is to protect the lives of pedestrians, drivers and all road users, they collaborate with the police and municipal assemblies to protect citizens.

4.4.1. Pedestrians coping mechanisms

Respondents in these locations were asked how they cross the highway since some infrastructure to assist them were not completed in the case of Madina. They suggested several means such as crossing at zebra crossings, asking police or road safety personnel for assistance in crossing, crossing in groups, using traffic light regulation to cross and use of footbridges if they exist. The researcher further asked the respondents how effective these measures were.

From Table 15, the result shows that crossing at zebra is not effective as indicated by 55.8% of the respondents in Madina (N4) and the reason given is that in Madina on N4 road drivers do not stop or slow down at zebra-crossings for pedestrians to cross. The participants shared their experiences where drivers were over speeingd and were not considering pedestrians. Motorists, on the other hand, were worse off as they seemed invisible but just cross you when you attempt to cross at the zebra-crossing.
Table 15: Coping mechanisms and their effectiveness in crossing road

<table>
<thead>
<tr>
<th>Crossing Mechanism</th>
<th>Madina %</th>
<th></th>
<th></th>
<th>Lapaz %</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross at the Zebra</td>
<td>55.8</td>
<td>31.6</td>
<td>10.5</td>
<td>2.11</td>
<td>32.6</td>
<td>50.5</td>
</tr>
<tr>
<td>Seek police or road safe personnel assistance</td>
<td>36.8</td>
<td>37.9</td>
<td>19</td>
<td>6.3</td>
<td>27.4</td>
<td>55.8</td>
</tr>
<tr>
<td>Cross in Groups</td>
<td>3.16</td>
<td>11.58</td>
<td>27.37</td>
<td>57.89</td>
<td>0</td>
<td>6.32</td>
</tr>
<tr>
<td>Obeying of traffic Regulations</td>
<td>18</td>
<td>21.05</td>
<td>54.7</td>
<td>6.3</td>
<td>0</td>
<td>30.53</td>
</tr>
<tr>
<td>Use of footbridge</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4.2</td>
<td>6.3</td>
</tr>
</tbody>
</table>

Source: Fieldwork (April, 2019)

“The drivers do not stop at zebra crossing. You can stand there and turn into statue they would not mind you and these motorists on the other hand are worse than the drivers as they speed and pass. It is only few drivers who finally have mercy on you and stop, and even then if care is not taken, they might knock you down by another on-coming car.” - lamented by Rukaya, a trader in Madina.

Moreover, in Lapaz majority of the respondents 50.5% said it was somehow effective to cross at the zebra crossings.

From Table 15, just a little above 6% in Madina agreed that asking police or road safety personnel for assistance in crossing the road is effective and it was a surprise to realize that this measure is not effective at all at Lapaz. The interview result showed that, in Madina, the road safety personnel and police were not around to assist pedestrians until a demonstration aroused in the location. This led to these personnel being assigned on to the road to assist pedestrians which has somehow proved effective. In Lapaz, the presence of police and road safety
personnel on the road is absent because of the completion of footbridges and other pedestrian infrastructure.

The statistics from the Table 15 shows that crossing in groups tends to be the most effect strategy adopted by pedestrians in crossing the road since majority of the respondents 57.9% said it is very effective. During the focus group discussion, all the participants seemed to cross in groups. They explained that, they wait for others to join and when they gather and are many, then that they attempt to cross the road and the drivers stop for them to cross. A respondent who is a student at the West Africa Senior High School expressed this by saying “trust me, if you are alone the drivers will never stop even if you beg them or attempt to cross, so I always look for where people have gathered and cross with them.”

 Majority of respondents (54.7%) in Madina admitted that using traffic regulation to cross the road is effective comparatively. A higher percentage of the respondents (61.1%) in Lapaz agreed that crossing with traffic regulation is very effective. This shows that traffic regulations are effective in Lapaz compared to Madina. Surprisingly, no respondent in Lapaz agreed that traffic regulation is not effective but a little above a quarter of the population in Madina said crossing at traffic is not effective. The interview revealed that, most of these traffic lights are faulty. Also, motorists do not obey traffic regulation such that when the traffic light turns red, they still pass without stopping which can lead to pedestrian knockdown. It was also revealed that, when there is no electric power due to power fluctuations, these traffic lights do not work which makes crossing the road difficult for pedestrians in the location.

The final strategy in crossing the road in these locations is the use of footbridges. In Madina, all the respondents answered not effective because the infrastructure is absent so it cannot be in place for the people to use. In the interview, the participants expressed grievances and acknowledged that, delay in this infrastructure construction affected them mostly. There has
been recent reconstruction of these infrastructure and it was due to rampant knockdown of pedestrians on the road which caused a rage among the residents at Adenta who embarked on a demonstration. The respondents were asked to rank on a scale of 1 to 5 with 5 being the highest how the demonstration influenced the reconstruction of the footbridges. From Table 16, half of the respondents rated 5th scale to mean that the demonstration has a high impact on the reconstruction of the footbridges.

Table 16: Scale of 1-5 Impact of demonstration on reconstruction of footbridge

<table>
<thead>
<tr>
<th>Scale</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale 1</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Scale 2</td>
<td>6</td>
<td>6.3</td>
</tr>
<tr>
<td>Scale 3</td>
<td>9</td>
<td>9.5</td>
</tr>
<tr>
<td>Scale 4</td>
<td>32</td>
<td>33.7</td>
</tr>
<tr>
<td>Scale 5</td>
<td>48</td>
<td>50.5</td>
</tr>
<tr>
<td>Total</td>
<td>95</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Fieldwork (April, 2019)

In relation to the use of footbridges in Lapaz, it was realized that this infrastructure was completed in the location. Therefore, the researcher wanted to seek the respondents’ views on how effective it is to use it. A little above half of the respondents said it was very effective to use the infrastructure. About two quarters of them said it was effective to use it and the remainder answered that it was not effective to use it. The interview revealed that though the construction of this infrastructure is completed on the road, most of the people still crossed the highway without using the footbridge and reasons given were time, convenience and distance. The findings of pedestrian not using the infrastructure are in line with a research conducted by Densu, Salifu, & Attafuah, in 2014 on the same N1 road which revealed that the footbridges on the road were the least patronized as just 18% of the people patronized it and the reason was accessibility of the footbridge. They further argued that, when pedestrians have to walk for
long distances to use footbridge, then they are more likely to adopt other alternative routes that present them with relatively shorter walking distances to enable them to cross the highway even at the peril of their lives. The above statement also supports the view that people willingness to cross using the footbridge is dependent on time, convenience and gap acceptance (Bargi et al., 2017; Alver & Onelcin, 2018; Demiroz et al., 2015; Theofilatos & Efthymiou, 2012).

However, further questions were asked to understand respondents for not effectively using the footbridges. Several concerns were raised. Most of the participants argued that the footbridges were far apart and therefore walking to it to cross was difficult and hence their reason for directly crossing the highway. The researcher asked if they think the footbridges were properly sited in Lapaz; and Figure 7 shows the result. Majority of the respondents (34%) strongly disagree and 50% disagree that these footbridges have not been properly situated.

![Footbridges properly sited](image)

Figure 4: Proper citation of footbridge (Source – Fieldwork; April, 2019).

The researcher further asked the reason for such a response through interview and it was realized that, places where these footbridges have been situated are less populated areas that pedestrians cross. Places with a lot of pedestrians crossing lack these footbridges.
participants also added that the footbridges were not enough on the road. Through observation by the researcher from 9:00 am to 11:00 am on Tuesday and the same time and day the following week, it was observed that, a lot of pedestrians of about 300 crossed the road at the main Lapaz station within the two-hour period of observation. This place is the centre of Lapaz but there is no footbridge there. However, making the same observation within the same period at Nyamekye where a footbridge is located, only 15 pedestrians crossed the road using the footbridge because that place is not as busy as the main Lapaz station area. This proves that, the footbridges have not been properly sited

![Observation of crossing at Lapaz and crossing at Nyamekye using footbridge](image)

Figure 5: Observation of crossing at Lapaz and crossing at Nyamekye using footbridge (Source - Fieldwork; April, 2019)

From the above analysis on pedestrians’ safety on the two roads. It was realized that there was an increase in pedestrian knockdown due to infrastructure construction delays on the road in the case of Madina but in the case of the Lapaz as the respondents said though there are still some pedestrian knockdowns witnessed on the road it was minimal and it was due to pedestrians’ behaviour. The reason for pedestrian knockdown still happening at Lapaz was as
a result of some people crossing the highway without using the necessary infrastructure provided.

The general question to find out how safe the road users are showed that, people in Lapaz were safer compared to those in Madina due to uncompleted road infrastructure at Madina. This finding agrees with Goniewicz, Misztal-okońska, & Rzońca, (2018) whose research shows that people not feeling safe with Polish roads are as a result of bad road, recklessness of drivers, maladjustment of driving style due to bad weather, driving under influence of alcohol and lack of attention of pedestrians. The analysis points out that, students in Madina were at risk in terms of knockdown compared to those in Lapaz. This was because most schools are located along the roadside in Madina while schools in Lapaz are situated inside the township.

Again, the people who are affected most or more likely to be involved in knockdown falls within the ages of 26 and 50 years. This result was consistent in both locations and this was because people in these ages have risky crossing behaviors. This finding agrees with several research works with the conclusion that adolescents engage in risky behaviors on the roads and that these behaviors, along with the failure to engage in personal protective behaviors, increase the risk that they will be killed or injured as Brake, 2004; Sullman, (2009) suggested. Considerable similarities of both locations showed that older people above the age of 50 years are mostly not involved in knockdowns. This is because older people are less likely to cross the highway as Holland & Hill, 2007 as cited in Hameed, (2001) suggested. Again, Bernhoft and Carstensen, (2008) also pointed it out that older pedestrians appreciate sidewalks and crossing facilities much more than younger pedestrians which agrees with the findings. Both quantitative and qualitative data were presented to discuss measure to ensure pedestrian safety.

The quantitative data suggests that less effort has been adopted by police to ensure the safety of pedestrians. But the qualitative data suggests otherwise. From the interviews with the
personnel in charge of pedestrians’ safety it was found that a lot of efforts have been put in place to ensure that pedestrians are safe on the road, but the stubborn nature of these pedestrians do not allow smooth operation of these measures. So, pedestrians’ behaviours rendered these efforts ineffective.

There are different strategies in crossing road as pointed out by Sucha, (2019). It can be observed from the findings that, people had different ways of crossing the road in both locations. In both Madina and Lapaz crossing in groups due to the absence of footbridges is the best safety measure adopted by pedestrians. They believed that when they gather to cross in groups, there is a lower chance of being knocked down by a speeding vehicle. Interestingly, crossing using the footbridge is the safest way of crossing the two roads. This validates the results of Hasan, Napiah, & L, (2017) that footbridges are the safest facility to be used when crossing roads. On the other hand, some significant number of people crossed the highway without using the footbridge and reasons given were time, distance gap, comfort and convenience. This is in line with the findings of Alver & Onelcin, (2018) and Hasan et al., (2017). Crossing at zebra-crossing were observed not to be effective in Madina but somehow effective in Lapaz as drivers and motorists do not stop at zebra crossings to allow pedestrians to cross. The study shows that crossing using traffic regulation is effective as most respondents wait and cross at the red light. However, there is non-negligible proportion of the pedestrians who think traffic regulation is not effective as most of the traffic lights are faulty, motorists evade red signals and most traffic lights uses electricity and so they do not work when there is a power cut.
Figure 6: Pictures of coping Mechanisms: showing- pedestrians struggling to cross at zebra crossing; personnel assisting a student to cross the road; pedestrians crossing in group; Faulty traffic lights in Madina. (Source – Fieldwork; April, 2019).

4.4.2. Measures to curb delays in the construction of road projects by government and contractors

This section seeks to address measures taken by client and contractor to curb delay. This was addressed through an in-depth interview with government officials and contractors. It was revealed that, both the government and contractors agreed that when delay is caused due to
financial constraints, there is not much to be done to curb or reduce the delay. The following quotations from key informants reflect the responses on measures to curb delay:

“If the construction delay is not as a result of cash flow problems, then there can be some strict measures to be put in place to speed up the construction process. But if it is by lack of finance then madam, we can’t do anything about it. We have to wait to get cash before the contractors agree to resume works on the projects. As I elaborated earlier, the government does not have fixed income for road construction, government revenue for road construction is through projections. When these projections fail to generate money, then contractors halt projects till they get paid.” - Chief engineer, Ghana Highway Authority.

Another respondent from department of urban roads at La-Nkwantanang Madina Municipal Assembly adds;

“When projects are donor-funded and other factors such as bad weather causes delay; we encourage contractors to work overtime including nights. There are other measures such as providing extra workforce to hasten the project completion”.

The quotes below support the government view on measures to curb delay;

“We try our best to complete every project given to us on time because time and reputation is core to the company’s operations. When there is non-payment, we cannot continue with the projects no matter how hard we try especially after we’ve exhausted all the loans secured from banks to pre-finance the projects”. – A contractor at First Sky Construction Company.

Another respondent from Core Construction Company adds,
“Though other factors cause delay; we can manage those factors. Young lady, look! When the cause of delay is lack of finance, it is beyond our control. We have to leave the project to stand still till we get paid before we can continue. It is not as if we intentionally cause delay or decide to abandon the project site but without cash we cannot continue”.

It is clear from the above findings that, when the cause of delay is finance, much cannot be done to speed up the construction process. Moreover, when projects are donor funded, there are strict measures adopted by both parties to ensure there is no delay in the construction of the project.

To curb delays, Najafabadi & Pimplikar, (2013) recommends that the following actions should be taken to reduce delays in infrastructure construction: when designs are changed, contractors should study all the drawings very carefully before doing anything to make mistakes to curb delays; all corrections on drawings of projects must be done and also contractors should consult engineer and client for start to correct the designs and contractor should consider the delay time in project schedule and sanction and unbelievable price escalation in fixed price contracts can be considered as a force majeure situation.

4.9 Chapter summary.

The chapter presented the findings of the research. It began with the demographic characteristics of respondents in the study areas. Males were dominant in both locations with the average age between 26 and 50 which constitute the country’s working population. People had various reasons for crossing the road and the road was frequently used by the residents. The research identified three stages of project cycle; inception stage, construction stage and after construction stage. The stage that experiences delay is the construction stage which is the physical stage of the construction process. The research shows that there is no fixed length of
delay since there are several road infrastructure constructions that have been abandoned till date. Financial problems emerged as the most important cause of delay. The research revealed two main sources of funds for project construction - the government and donors. Donor funded projects are mostly completed as scheduled but most government financed projects are completed later than scheduled due to financial constraints. Other causes identified in the research are; politics, bad weather conditions, and among others. Similarly, road users perceived financial constraints to be the major cause of delay in road infrastructure construction.

On the effects of delay, the government and contractors both agreed to cost overrun as the severest effect of delay. Table 8 shows some road constructions that have extended completion dates, and some are still not completed up to date. The difference in cost keeps increasing till the project is completed. This shows the adverse financial impact delay has on the Ghanaian economy. The contractors also considered time overrun, litigation, and breakdown of company as other adverse effects of delay. Moreover, the research highlights pedestrian knockdown as perceived highest effect of road infrastructure delay. Other perceived effects are traffic congestion, economic and psychological stress.

Pedestrians in Lapaz (N1) felt safer on the road compared to Madina (N4). The respondents at Madina attributed it to delay in the construction of the pedestrian infrastructure (footbridge). All the respondents agreed that they are the beneficiaries of this infrastructure, so it adversely affects them mostly when the construction delayed. The research also gathered that young people have risky crossing behaviors compared to the aged as the latter are more careful when crossing the road. Respondents in both locations disagreed that the stakeholders involved in ensuring the safety of road users but the stakeholders have disagreed saying they put much effort in place to ensure their safety. Pedestrians adopted several strategies to cross the road
safely with crossing in group emerging as the best way of crossing the road even though the respondents agreed that the use of footbridge was the safest. In relation to measures to curb delay on the part of government and contractors, both parties that when delay is caused by financial constraints, much cannot be done to curb the delay, but the other causes can be managed.
CHAPTER FIVE

SUMMARY, KEY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This final chapter gives a summary of the key findings, conclusions based on the findings and draw some policy recommendations.

5.1 Summary

The purpose of the research was to find out how dynamism in road infrastructure construction delays affect pedestrians’ safety. In order to achieve this, three main objectives were set out to be achieved by the researcher. The objectives were to examine the causes of delays in road infrastructure projects and road construction project cycles on the Lapaz (N1) and Madina (N4) highways that accompany the construction of footbridges, zebra crossings and street and traffic lights, to identify the effects of the road construction delay on government, contractors and pedestrians on the Lapaz (N1) and Madina (N4) highways and to identify measures adopted by both contractors and government to curbing delay of road infrastructure projects and its effects on the Lapaz (N1) and Madina (N4) highways.

5.2 Key findings

This section provides major key findings of the research work and how it is related to literature

5.2.1. Causes of delays of road infrastructure construction project

- The study has been found out that in the project cycle and stages of construction, delays mostly occur at the construction stage where the physical action starts.
• The research found out that, finance is the main cause of delay in road infrastructure projects. The study found out that other factors were bad weather conditions, land acquisition difficulties, technical and design related causes, utilities and site related causes and politics.

5.2.2. Effects of delays

• The study identified cost and time overrun, company breakdown, total abandonment of project, and litigation.

• Pedestrian knockdown was another grave effect identified. Pedestrians are always at risk because of their behavior and road project delay especially when road projects delayed. Other effects perceived were economic stress, psychological stress, ruin of community beautification, and traffic congestion.

5.2.3. Measures taken to curb delay

• The study found out that procuring enough and adequate fund before starting road infrastructure construction is the first measure to be taken to curb delays. The research found out that donor-funded road projects mostly do not suffer delay, they are completed mostly on time as in the case of N1 highway.

• Again, it was pointed out that early completion of pedestrians’ road infrastructure especially footbridges helps to improve pedestrians’ safety and reduces pedestrian knockdown. Comparatively, there is high pedestrian knockdown on N4 highway than N1 highway.

• Further, various stakeholders put in some efforts such as deploying police and road personnel assistants, improving visibility through traffic light installation, middle barricade and others to ensure pedestrians’ safety. But pedestrians’ behavior throws more challenge to these efforts. Comparatively, the delay in pedestrian infrastructure
on N4 is the major cause of unsafe crossing while on N1 it is the pedestrians’ unsafe behavior and improper siting of footbridges.

- At the pedestrian level, group-crossing is adopted as safety mechanism to address the crossing of road challenges posed by road construction delay. But safest measure is the use of the footbridges.
- Finally, pedestrians feel safer using N1 highway than N4 highway because the unsafe conditions on N1 are at minimum level than that of N4.

5.3. Conclusion.

In conclusion, road infrastructure construction delays negatively affect pedestrians’ safety in the use of the road. The delay creates unsafe conditions that encourages already innate negative behavior of pedestrians that expose them to risk in the use of the road. The delays in road infrastructure construction from the study is caused primarily by lack of finance, politics in terms of change in government and bad weather conditions. Once the delay occurs some negative effects such as cost and time overrun, traffic congestion and pedestrian knockdown are generated.

To curb the causes and their effects, financial adequacy is required as the first measure follow by ensuring timely completion of pedestrian’s road infrastructure especially footbridges and the temporal measures taken by various stakeholders to ensure pedestrians’ safety should be intensified and be improved upon especially on roads that are suffering from delays. Also, pedestrians should adopt safety measures that work for them most for example group-crossing as discovered in the study.

Finally, the study has shown that donor-funded road projects usually complete on time as in the case of N1 highway which causes reduction in pedestrian knockdown, improves their
feeling of being safe to use the road as compared with N4 whose uncompleted nature leads to increase in pedestrian knockdown and causes them to feel unsafe to use the road.

5.4. Recommendation

On the basis of the findings, the following recommendations are made:

That government should design comprehensive road funding policy that would enhance revenue mobilization and investment in the transport sector and also encourage private sector road adoption for construction policy—that is, a private company would adopt unconstructed road, develop it and mobilize revenue from it for some number of years that the company makes its profit and finally give it to government. Also, the government should have a long-term plan for road construction policy. This will help the smooth flow of road construction projects and prevent abandonment of projects on the arrival of a new political leadership.

5.4.2 Technical and design related problems

There should be enough time to facilitate proper design in road project execution to avoid spending additional time in reviewing, amending and accepting for constructional works to commence. This proper design will avoid temporary suspension when errors are observed. The contractors responsible for the road project should prepare adequate plans and schedules during execution of road projects. Government officials in charge of giving out road contracts should make sure these contractors have a well-planned design which will need little amendment or correction.

5.3.3 Bad weather conditions

There is a need to have a well-established project management organization that possess requisite skills and experienced contractors/consultants to manage natural disasters such as frequent rainfall and account for weather projections in their project implementation plan.
Thus, during the rainy season, contractors should plan to execute activities that are not normally affected by the rain in order to mitigate delays and make good use of the dry season to try as much as possible to finish projects within that season.

5.4.4 When delay occurs

When road construction begins and the project delays, government and other stake holders such as Municipal Assemblies, Ghana Police Service, and Ghana National Road Safety Commission should adopt strict measures and policies to ensure pedestrians safety. Measures such as blocking of all middle spaces in roads with fences and barricades is to ensure pedestrians safety. Speed ramps should be constructed on highways to reduce drivers speed to allow pedestrians cross safely. Police and road safety personnel should be placed at vantage road crossings to assist pedestrians cross especially school children and the aged and also plead with drivers and motorists to stop at crossings for pedestrians to safely crossroads.

Although most of the needed infrastructure on the Lapaz road had been provided yet there is a record of pedestrian accidents. However, respondents suggested various measures that can be adopted to eradicate pedestrian knockdown. Some of the suggestions are construction of footbridge constructed at main Lapaz station; more footbridges needed to close the gap in-between these footbridges to make it easier to cross. Again, during construction of these infrastructures, feasibility studies should be done with the participation of the people to help know the best place for such important infrastructure. Sensitization and public education should be conducted to let the people know the risk and dangers in crossing at unauthorized places.

5.4 Considerations for future research

A further work on when the completion of infrastructure on N4 road and its effect on the lives of the people is necessitated. This idea came from the in-depth interview conducted with pedestrians who use the completed road infrastructure on the N4 highway. A study on the road
in future after all the infrastructures are completed will further give an idea on how best these infrastructure are affecting pedestrian safety outcomes.
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www.ghananewsagency.org/

www.arrivealive.co.za on Road Safety near Construction Zones / Roadworks
Appendix 1: Questionnaire for Madina(N4) and Lapaz(N1).

QUESTIONNAIRE
INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH (ISSER)
UNIVERSITY OF GHANA (ISSER)
PROFITS OF SPEED: ROAD INFRASTRUCTURE CONSTRUCTION DYNAMICS AND PEDESTRIANS’ SAFETY IN GHANA

ROAD USERS QUESTIONNAIRE
Hello Mr./Mrs./Miss ……………………………………, this guide is aimed at collecting data on road infrastructure construction dynamics on pedestrians’ safety in Ghana. The research work is part of the requirements for the award of Master of Arts Degree in Development Studies at ISSER, University of Ghana. The information provided will be used solely for academic purposes and every information you provide will be held in confidence.

Thank you for your co-operation.

Questionnaire number ………..  

1. Gender:  
   a. Male [ ]  
   b. Female [ ]  

2. Age: ____________________________

3. Educational Background:  
   a. No formal Education [ ]  
   b. Primary Education [ ]  
   c. Secondary Education [ ]  
   d. Tertiary [ ]

4. Occupation:  
   a. Student [ ]  
   b. Public Servant [ ]  
   c. Trader [ ]  
   d. Driver [ ]  
   e. Hawker [ ]  
   f. Others, specify …………………………………………………………………………………………………………

5. What do you do in this location?  
   a. Place of resident [ ]  
   b. Work [ ]  
   c. School [ ]  
   d. All the above [ ]  
   e. None of the above [ ]  
   f. if None of the above, specify what you do in this location ……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………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7. How often do you cross the Highway in a day?

8. Why do you cross the road often?
   1. ________________________________________________
   2. ________________________________________________
   3. ________________________________________________

9. What are some of the challenges faced when crossing the road?
   1. ________________________________________________
   2. ________________________________________________

10. In your opinion, what do you think can be done to address these challenges?
    1. ________________________________________________
    2. ________________________________________________

11. Some of these challenges faced are due to the road infrastructure Delays?

<table>
<thead>
<tr>
<th>Scale</th>
<th>Tick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td></td>
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<tr>
<td>Agree</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td></td>
</tr>
</tbody>
</table>

12. Reasons for your choice of answer in Question 11?
    1. ________________________________________________
    2. ________________________________________________

13. What are some of the infrastructures delayed on the road?
14. Which of the following infrastructure delayed affected you most

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Tick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian footbridge</td>
<td></td>
</tr>
<tr>
<td>Lightings</td>
<td></td>
</tr>
<tr>
<td>Zebra crossing</td>
<td></td>
</tr>
<tr>
<td>Pedestrian pavement</td>
<td></td>
</tr>
<tr>
<td>Traffic light</td>
<td></td>
</tr>
</tbody>
</table>

15. What do you think are some of the benefits after the road infrastructure are completed?

1. _____________________________________________________________________________

2. _____________________________________________________________________________

3. _____________________________________________________________________________

4. _____________________________________________________________________________

16. What are some of the causes of delay in the road infrastructure on the Highway?

<table>
<thead>
<tr>
<th>No</th>
<th>Factors causing road infrastructure delay</th>
<th>Very high</th>
<th>high</th>
<th>medium</th>
<th>low</th>
<th>Very low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Insufficient funds from government</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Change in government</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bad weather conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Conflict and discontentment from the general public</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Problem with sacking hawkers and traders along the stretch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Delays of compensation to affected property owners</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
17. What are some of the effects of the delays in road infrastructure on pedestrians, their families and society? (tick as many as may apply)

<table>
<thead>
<tr>
<th>No</th>
<th>Effects of road infrastructure delay</th>
<th>Very high</th>
<th>high</th>
<th>medium</th>
<th>low</th>
<th>Very low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pedestrian Knocked down</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Traffic congestion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Loss of productivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Economic stress on family, society</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Environmental Challenges (muddy and slippery in rainy season, dusty in dry season)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Ruin of community beautification</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Psychological stress</td>
<td></td>
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18. There has been an increase in pedestrian knockdown due to the delay in the road infrastructure?

<table>
<thead>
<tr>
<th>Scale</th>
<th>Tick</th>
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<tbody>
<tr>
<td>Strongly agree</td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td></td>
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<tr>
<td>Disagree</td>
<td></td>
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</tbody>
</table>

19. Which group of people do you think are affected most in these knockdowns?

<table>
<thead>
<tr>
<th>No</th>
<th>Group of persons affected</th>
<th>Very high</th>
<th>high</th>
<th>medium</th>
<th>low</th>
<th>Very low</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>School children (from 4 to 18 years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Young adults (19 to 25 years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Adults (26 to 50 years)</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>Aged (50 years and above)</td>
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</table>
20. Do you know personally victims of pedestrian knock down on the highway?
a. Yes [   ] b. No [   ]

21. If yes in what way did it affect the family?
1. ____________________________________________________________
2. ____________________________________________________________
3. ____________________________________________________________
4. ____________________________________________________________

22. What are some measures taken by Municipal assembly, Police and other stakeholders in ensuring pedestrian safety that you know of?
1. __________________________________________________________________
2. __________________________________________________________________
3. __________________________________________________________________
4. __________________________________________________________________
5. __________________________________________________________________

23. How effective are these measures?
a. Very Effective [   ]
b. Effective   [   ]
c. Somehow Effective [   ]
d. Not Effective [   ]

24. What are the reason for your choice of answer in 21?
1. __________________________________________________________________
25. How are these Safety measures in crossing the road? (tick where necessary)

<table>
<thead>
<tr>
<th>NO</th>
<th>Safety Measures</th>
<th>Very Effective</th>
<th>Effective</th>
<th>Somehow Effective</th>
<th>Not Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cross at the Zebra Crossings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Ask Police or Road Safety Personnel for assistance in crossing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Cross in Groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Usage of Traffic light regulations to cross</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Other,</td>
<td></td>
<td></td>
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</tbody>
</table>

26. Did you partake in the demonstration that took place sometime ago?
   a. Yes [   ]  b. No [   ]

27. On a scale of 1 to 5 how would you rate the effect of the demonstration on the speed of work in completion of the infrastructure? 1 is low and 5 is high.

<table>
<thead>
<tr>
<th>Scale no.</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
<td></td>
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<tr>
<td>3</td>
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<tr>
<td>4</td>
<td></td>
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<tr>
<td>5</td>
<td></td>
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</tbody>
</table>

28. Pedestrians are safe on the road.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Tick</th>
</tr>
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<tbody>
<tr>
<td>Strongly Agree</td>
<td></td>
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<tr>
<td>Agree</td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td></td>
</tr>
</tbody>
</table>
29. What are the reasons for your choice of answer?
   1. ___________________________________________
   2. ___________________________________________
   3. ___________________________________________
   4. ___________________________________________

30. What are some of the attitudes of drivers towards pedestrians on the road?
   a. Poor [ ]  b. Very Poor [ ]
   c. Good [ ]  d. Very Good [ ]
Appendix 2: Interview guide for road contractors

INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH (ISSER) UNIVERSITY OF GHANA
INTERVIEW GUIDE FOR ROAD CONTRACTORS ON “PROFITS OF SPEED: ROAD INFRASTRUCTURE CONSTRUCTION DYNAMICS AND PEDESTRIANS’ SAFETY IN GHANA”.

Dear respondent, this guide is aimed at collecting data which will help broaden our understanding of how road construction delays in Ghana affect pedestrians’ safety. This study is part of the requirement for the Researchers’ Masters Degree in Development Studies currently being undertaken at ISSER, University of Ghana. The information provided will be used solely for academic purposes. Thank you for your co-operation.

1. Name of Construction Company

2. What is your rank/title/Position?

3. Please what are/is your highest qualification / Education.

4. How Long have you worked in the road construction Industry?

5. How long have you worked in your current position?

6. How many road Projects have you worked on so far?

7. What are the road construction phases that one goes through in Ghana?

8. Which of these phases are you likely to experience delays most in Ghana?

9. What do you think are the major causes of road infrastructure construction delays in Ghana?

10. What are mostly the time frame in constructing a road and its ancillary infrastructure?

11. What goes into the road construction projects that are finished on time – that is what are the factors which influence timeliness of road infrastructure construction?

12. How are road constructions projects mostly financed?

13. What are some of the effects of Road infrastructure delays in Ghana based on your experience?
   a. On government, the public purse and government machinery?
   b. On your construction company
   c. On the people (citizens).

15. What should be done differently to complete the road and Infrastructure construction projects on time based on your own experiences?

16. What does the government do to help speed up road construction and its infrastructures?

17. What measures or efforts do your construction company put in place to speed up road construction projects?

18. Does the community in which roads are being constructed have any role to play in ensuring that roads being constructed are completed on time? What are these roles?

19. During road construction what do you do to ensure pedestrian safety especially when there are delays

20. Do you think road construction firms always take steps to ensure that pedestrian safety is assured when construction is delayed in Ghana? If NO, why? If some do but others don’t why is that so? What can we do to ensure that construction firms take steps to ensure pedestrian safety when construction delays?

21. Do you think pedestrians themselves might be exposing themselves to the dangers of road accidents during road construction/when road construction delays? In what ways are they doing that?

22. What advice do you have for contractors, governments and pedestrians to ensure road user safety when road construction delays?

23. Please is there any other thing that you would like us to know in relation to the discussions we have had so far?
Appendix 3: Interview Guide for Urban Road Department and Ghana Highway Authority.

INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH (ISSER)  
UNIVERSITY OF GHANA  
INTERVIEW GUIDE FOR URBAN ROAD DEPARTMENT ON “PROFITS OF SPEED: ROAD INFRASTRUCTURE CONSTRUCTION DYNAMICS ON PEDESTRIANS’ SAFETY IN GHANA”.

Dear respondent, this interview guide is aimed at collecting data on the research topic: road infrastructure construction dynamics on pedestrians’ safety in Ghana. The research work is an impartial fulfillment of the requirements for the award of Masters in Development Studies in ISSER. The information provided will be used solely for academic purpose.

Thank you for your co-operation.

QUESTIONS ON THE N1 ROAD:

1. In what year was the road construction begun?
2. What was the importance of the construction of the new road and what was supposed to be the purpose?
3. What was the time frame the road were supposed to be completed?
4. How long did it take to finish the road?
5. What was the main source of financing for the N1 road?
6. What are the project cycles and notches in the N1 road?
7. What factors led to the timely completion of the N1 road and its infrastructure construction?
8. What measures did the urban roads or Ministry put in place to complete the project on time?
9. What are some of the effects of road construction delay?
10. What challenges did the Urban road face or Ministry face in completion of the road?

INTERVIEW GUIDE ON THE N4 ROAD
1. In what year did the construction of the N4 started?

2. What was the purpose of the construction of the N4 road?

3. What was the time frame for the complete construction of the N4 road?

4. How long did it take to finish the construction of the road?

5. What caused the delay of the pedestrian infrastructure on the road?

6. How was the road Financed?

7. Do you think the delay in road infrastructure affected pedestrians and in what way did it affect them?

8. What in general are some of the effects of the road construction delay?

9. What measures or effort were put in to speed up the construction of the N4 infrastructure?

10. Since the pedestrian safety infrastructure were delayed, what measures were put in place to ensure pedestrian safety?

11. What are the project cycles or notches in Highway construction?