UNIVERSITY OF GHANA, LEGON

EXAMINING THE CHALLENGES OF URBAN ROADS MAINTENANCE IN GHANA: A CASE STUDY OF THE ACCRA METROPOLIS

BY

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THIS LONG ESSAY IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT

FOR THE AWARD OF MASTER OF PUBLIC ADMINISTRATION DEGREE

MAY, 2019

DECLARATION

I do hereby declare that this long essay is the result of my own original research and has not been presented by anyone for any academic award in this or any other university. All references used in the work have duly been acknowledged. I bear sole responsibility for any shortcomings.

....

FRANCISCA ACQUAAH DATE

CERTIFICATION

I hereby certify that this long essay was supervised in accordance with the procedures laid down by the University.

……... ……

DR. E. SEIDU DATE

DEDICATION

This long essay is dedicated to my father, Mr. Napoleon Acquaah

ACKNOWLEDGEMENT

To God be the glory for the great things He has done. It would have been impossible to complete this work without God's daily protection, provision and direction.

I am most grateful also to Dr. E. Seidu who diligently supervised the work in addition to his busy schedules. His in depth knowledge about the topic (subject matter) and his constructive criticism were outstanding and extremely useful.

I am also very grateful to the Ministry of Roads and Highways for every support offered to me during my study. I also appreciate my husband and children; Nii, Naa and Manuel for their encouragement and cooperation. Indeed words cannot express my gratitude to my children for understanding my absence in the house most of the time and agreeing to take care of themselves to enable me have enough time to study. God bless you. I love you.

My sincere love to Mr. and Mrs Acquaah, my parents, for their love and encouragement. My acknowledgement would not be complete without thanking my siblings; Ebo, Ato, Fiifi, Bebee, Nana and Ewurabena. Thank you all for the support and love.

I also acknowledge the support and kindness of the Management and Staff of the Ministry of Roads and Highways, The Department of Urban Roads, The Ghana Road Fund Secretariat, The Accra Metropolitan Assembly for granting me interviews and providing information for the research during the data collection period.

To the young and ambitious mates, your enthusiasm was admirable and it served as a motivation in a lot of ways.

Lastly, I express immense appreciation to all those who contributed in different ways to the success of this work, but whose names were not mentioned here. I appreciate your valuable contributions. May God Almighty continue to bless our effort to learn and impact the world.

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ABSTRACT

"Roads, and means of transport, make a crucial contribution to economic development and growth and bring important social benefits Poorly maintained roads constrain mobility, significantly raise vehicle operating costs, increase accident rates and their associated human and property costs, and aggravate isolation, poverty, poor health, and illiteracy in rural communities This study highlights the economic and social importance of regular road maintenance and recommends ways to achieve sustainable road maintenance with scarce public resources Its audience is not specialists but rather people who need to understand road maintenance enough to discharge their responsibilities effectively government, policy-makers, local assemblies, ministry staff, and staff in other critical sectors"

CHAPTER ONE

INTRODUCTION

1.0 Background of the study

"Cities in the world have witnessed tremendous motorisation during the recent century Since 1988 global car population has exceeded 400 million (Walsh, 1990) The reason for this phenomenon, according to Dimitriou (1991) is that in both the developed and developing countries, urban transport is poorly managed Rapid urbanisation is a global phenomenon, and like all human induced changes, it is a response to socio-economic, political or environmental conditions, characterized by an unprecedented concentration of humans in cities (Songsore, 2003) Between 2011 and 2050, the world population is expected to increase by 2.3 billion, passing from 7.0 billion to 9.3 billion (United Nations, 2013) At the same time, the population living in urban areas is projected to gain 2.6 billion, passing from 3.6 billion in 2011 to 6.3 billion 2050 Consequently, demand for services including public transport is rising in response to the quest to meet the growing demands of a continually urbanising population"

"The role of transportation in human life cannot be overemphasized The development of urban road infrastructure systems is an integral part of modern city expansion processes Internationally, roads are dominant transport assets and a valuable infrastructure used on a daily basis by millions of commuters, comprising millions of kilometers across the world. According to The World Road Association (PIARC) (2014), the average length of public roads in developing countries is more than 500,000km and is often the single largest publicly owned national asset. Such infrastructure covers 15–20% of the whole city area and in city centres over 40% of the area (Deluka-Tiblja, 2013) Therefore, the road infrastructure is unarguably seen as a significant and valuable public asset which should be carefully managed during its life cycle

Road transportation is the mode that has expanded the most over the last 50 years, both for passengers and freight transportation Such growth in road freight transport has been fuelled largely by trade liberalization (Rodriguez & Slack, 2009) This is the result of growth of the loading capacity of vehicle and an adaptation of vehicle to freight (e.g. perishables, fuel, construction materials, etc.) or passengers (e.g. school bus) demand for speed, autonomy and flexibility New types of problems such as a significant growth of fuel consumption, increasing environmental externalities, traffic congestion and a multiplication of road accidents have also emerged. Globally transport plays an important role in the socio-economic development of every nation According to Intikhab et al (2008), efficient transportation system plays an important role in catering for the daily necessities in the lives of people. These include access to amenities and services that are central to the lives of all individuals; like employment, education, health services and leisure"

1.2 Problem statement

"Ghana, as a developing country, is facing a lot of rapid urbanization issues in its major cities The city of Accra in the past few years is growing past its boundaries due to the fact that people are migrating from the rural areas of Ghana into the urban areas in search of job opportunities and better living condition Roads are one of the major assets of the country. Road network infrastructure provides economic and social benefits for individuals, groups of people, companies and industries It enables goods and services to be delivered timeously and effectively as well as enhance free movement of people. In urban areas, road networks are particularly important because these areas harbour more than half of the world's population and serve as a centre for businesses and many socio-economic activities which relies predominantly on roads In general, it has been found that maintenance of roads enhances economic growth and social benefits whilst poorly maintained road system destructs mobility, increases the rate of accidents, aggravates isolation, poverty and vehicle operating cost

(Emeasoba & Ogbuefi, 2013) According to the European Union Road Federation (2009), road maintenance is essential short-term transport policy that requires the attention of government and other stakeholder because it enhance road safety and improves social welfare of the citizenry Timely maintenance improves road condition, reduces road deterioration, vehicle operating cost, provides safety, keeps road services continuously and enhances environmental conditions (Robinson et al., 1998)"

"An efficient road transport system is considered an integral part of a country's development Undoubtedly an improved road system brings enormous benefits such as improved access to schools, markets, hospitals, improved comfort, safety and lower vehicle operating costs (Burningham and Stankevich, 2005) Similarly, road maintenance helps to prevent loss of investment made in an initial road construction In order to realize these benefits, road improvements must be supported by a well-designed maintenance regime In the absence of regular maintenance, there is the high risk of road disrepair and total collapse thereby preventing any realization of long-term impacts of road on development such as increased agricultural production, economic growth among others Therefore, the quality of the road transport has several impacts on all sectors of a country. According to Zietlow and Bull (1999) regular and routine maintenance for a road for its entire life span ranges between 2% or 3% of the initial capital invested However, this can increase astronomically if regular maintenance is not followed. For example, Harral and Faiz (1988) underscored that regular road maintenance expenditures of $12 billion in Africa could save road reconstruction costs of $ 45 billion over a decade"

"In Ghana, it is widely believed that the pre-occupation of government has been largely on road construction with little concern for its maintenance (Boamah, 2010) As road networks are broadened and existing roads age, the focus is now shifting from construction towards maintenance Compared with construction, road maintenance usually proves to be more

difficult to do (ibid) This is because the conditions of roads after construction keep changing due to effects of climate, human activities and other environmental factors Again whilst construction may be aptly described as a project with a defined period of start and completion, maintenance on the other hand is a continuous process with no defined commencement or completion timeframe (Robinson et al., 1998)"

Ghana is one of the developing states with fast- growing cities Mobility flow in the country is an important change in its urbanisation process In Ghana, a high percentage of roads including urban roads are described as bad or in a poor state according to the Hon Amoako Atta, Minister for Roads and Highways In 2017, the Minister indicated that there exist about 72,000 kilometres of roads in Ghana of which 23% are asphalted, 39% in good condition and 61% are classified as poor (Amoako-Atta, 2017) Urban road maintenance is a key challenge in both developing and developed countries According to Drakakis-Smith (2003), challenges of urban road maintenance is mostly linked to urbanization, globalization, economic transition and fiscal decentralization In Ghana, the maintenance regime across sectors is generally very poor and road sector is not an exception Urban roads in Accra have been observed to be in poor condition causing havoc to road users. This is mainly due to poor road maintenance According to the Urban Roads Department of the Accra Municipal Assembly (2019), they prepare annual and progress reports on road works and do develop budget for road maintenance within their catchment area If this is the case, then what is the main cause of poor urban road maintenance in within the Accra Municipal Assembly area This study therefore endeavours to examine the challenges of urban road maintenance in the Greater Accra Municipal Assembly"

1.3 Objective of the study

The study aims to examine the challenges of urban road maintenance in the Accra Metropolis. Specifically, the study seeks to

1. Examine the extent of collaboration among key institutions involved in urban road maintenance in Accra Metropolis
2. To examine the constraints the Accra Metropolis faces regarding road maintenance
3. To examine critical success factors to enhance effective urban road maintenance in the Accra Metropolis

1.4 Research question

Questions set to meet the objective of the study include the following

1. What is the extent of collaboration among key institutions involved in urban road maintenance in Accra Metropolis?
2. What are the constraints of urban road maintenance in Accra Metropolis?
3. What are the critical success factors that enhance effective urban road maintenance in the Accra Metropolis?

1.5 Significance of the study

The main purpose of this study is to develop a full understanding of the challenges of urban road maintenance facing Ghana especially the Accra Metropolitan Assembly. This shall help inform policy makers in making decision concerning urban road maintenance in Ghana.

The findings of the study will also inform policy makers, government and the metropolitan assembly as well as agencies responsible for ensuring road maintenance about the challenges confronting urban road maintenance and possible remedies to handling the challenges. Thus, it will serve as an evaluation point in making urban road maintenance decisions. In addition, the

findings of the study will serve as references for practitioners, and students who would want to seek more insight into this area of study.

1.6 Scope of the study

This study focuses on urban road in the Accra Metropolitan Assembly. Specifically, it focused on the challenges confronting urban road maintenance in this catchment area.

1.7 Organisation of the rest of the study

The study shall be developed into five chapters

Chapter 1: Introduction

"This chapter gives the background of the study, the problem statement, spells out the aims of the study, the research questions and significance and scope of the study"

Chapter 2: Literature Review

This section reviews literature, concepts and theories on urban road maintenance and concepts related to urban road maintenance and truck road financing.

Chapter 3: Methodology

This section gives details of the means adopted to understanding the study. It states the research design adopted for the research approach, the population, the sample and sampling technique, the research question, data collection procedure and the analysis used in the study.

Chapter 4: Results and discussions

This section gives thorough presentation of the results and findings of the study

Chapter 5: Summary Conclusion and Recommendations

"This section gives a full summary of the major findings of the study and also provides conclusions and proper recommendations"

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

"This section of the study focuses on the relevant literature covering the concept of urban roads, as well as urban road maintenance and its challenges"

2.1 The Concept of Road Maintenance

"Road maintenance is described by Paterson (1987) as an intervention reducing the rate of pavement or road deterioration Road maintenance is considered as the routine work executed to maintain road surface, shoulders and any other facility offered to road users (The Indian Roads Congress, 2002) To Tiwari (2003) urban road maintenance is vital in obtaining the optimal service from a pavement structure in its life time The basic objective of road maintenance is implicit in the word itself (Pradhan, 2005) It is done to ensure that the road that has been constructed, or improved is to a good extent possibly kept in its original condition All roads require maintenance as they are subjected to traffic and the forces of weather Even with the highest possible quality of construction, maintenance is essential to get optimum service from the road structure during its design life (Pradhan, 2005) By applying preventive maintenance, the deterioration of the road and its components can be slowed down, thus postponing the need for costly investments in rehabilitation and securing the planned design life If not maintained, roads rapidly become impassable to motorised traffic until a point when they are no longer motorable The pace of deterioration largely depends on the quality of initial construction, pavement and surface materials, and drainage measures, levels of traffic and weather conditions Gravel roads deteriorate more quickly than bitumen surfaced roads and their value can often be assumed to be negligible after five years without maintenance Bitumen surfaces may have a marginally longer life without maintenance but are more expensive to rebuild It should also be noted that for urban roads where traffic is sometimes limited, the

critical maintenance interventions are often related to maintaining the drainage system. Contrary to common perceptions, the maintenance priorities on roads are often related to off-carriageway structures and not so much to road surfaces (Zhao, 2011)"

2.2 Purpose of maintenance

" Zhao (2011) outlines five critical reasons for the need to do regular maintenance of roads

First off, road maintenance reduces the rate of deterioration, thereby safeguarding previous investments in construction and rehabilitation

Road maintenance also lowers the cost of operating vehicles on the road by providing a smooth running surface

Again, the maintenance of roads, improves the safety of road users

Road maintenance also improves the reliability of roads allowing it to remain open to traffic on a continuous basis and thus contributes to more reliable transport services

Lastly road maintenance sustains the social and economic benefits of improved road access

According to Watkins (2012) maintenance of road network support sustainable development and for that matter sustainable urban transport by way of minimising casualties on roads, ensuring efficient movement of people and goods, improving social equity, health, resilience of cities, urban rural linkage, and productivity of goods and services Sustainable urban development is an approach that is now receiving much attention in the world and championed by many international organisations including the World Bank and United Nations" "After the Brundtland Commission (WCED, 1987) conceptualised sustainable development to mean" "development that meets the needs of the present without compromising the ability of future generations to meet their own needs (p. 43)", "this ideology have been transferred to achieving sustainability in several dimensions of the world including urban development Dwelling on the

Urban 21 Conference held in 2000 at Berlin, Antrop (2006) defined sustainable city as a city that strives to achieve quality living standards in various components of the city such as economic, social, ecological, cultural, political, and institutional aspect without leaving a burden on future generations Urban form theory which support the realisation of sustainable urban development advocate compact transport system, living styles, and high density energy efficiency as vital requirements of sustainable urban development It further emphasizes that urban sustainability depends on the natural conditions of urban environment such as the urban scale and topography of urban land use and other conditions including the proper functioning and structure of urban land use and road network structure (Zhao, 2011)"

Sustainable urban transport takes greater part in the quest for sustainable urban development as all aspect of urban development to some extent utilises transport network (Barrett, 1996) In the pursuit of sustainable urban transport agenda, emphasis is most often given to public transport system, and measures that favours cycling and walking (Kenworthy, 2006) However, the 2012 world conference on sustainable development dubbed Rio+20 emphasized on the need for various sustainable development agenda to focus much attention on road safety (Watkins, 2012) This is because thousands of individuals are lost each year through road accidents and as a matter of fact road network takes a chunk of the various transport modes in the world with several development activities depending on them This makes it imperative for various countries and cities of the world to embark upon regular road maintenance to keep their road network in good shape to enhance the welfare of the general public"

"In managing road network, Hooper (2001) has pointed out the following maintenance principles as critical that must be taken into consideration to ensure the efficiency of road network Network safety coupling with statutory obligation and meeting user's needs; network serviceability as to ensure availability, achieving integrity, monitoring reliability and enhancing quality; and Network sustainability which includes minimizing cost of overtime,

maximizing value to the community and maximizing environmental contribution" "Road maintenance activities or works have been conceptualised by the World Bank (2011) to generally cover four key activities such as routine, periodic, special and development works The routine works are undertaken very frequently on roads especially on yearly basis and normally takes the form of cyclic and reactive works Works undertaken of roads whose frequency is determined by the maintenance standards constitute the cyclic routine works" "Typical examples of this form of routine maintenance include culvert cleaning and verge cutting which are mostly reliant on environmental effects rather than on traffic levels The reactive works on the other hand cover works which intervention levels defined in the maintenance standards are used as a check to estimate the time maintenance is needed Road patching carried out to address problems of cracks or pot-holes on roads are common examples of reactive works Periodic works as the name suggest are undertaken at relatively longer intervals but on regulated time frame Resealing and overlay works carried out in response to measured deterioration in road conditions offers classical examples of periodic works on roads. Special works which is another category of road maintenance activities are undertaken to address unforeseen problems on roads that demand immediate attention (Emeasoba & Ogbuefi, 2013) In view of this, it is sometimes referred to as emergency works Works which require urgent attention such as removal of fallen trees which destruct free flow of vehicles, destroyed culverts which block roads, broken down vehicles, and road works to address problems of landslide all fall under special/emergency works on roads Development works or activities on the other hand cover all road construction activities that are within the development plan of an area" "All these maintenance activities come together to enhance the safeness of roads and makes roads easily accessible for all manner of activities (economic, social, environmental) to support the sustainable agenda of cities"

“2.3 Types of maintenance”

“The effective organization of maintenance is based upon the concept of damage control With timely interventions based on regular inspections of the road network, works are planned and carried out at an early stage to counter the detrimental effects of traffic and weather” “Maintenance work is classified according to its timing or frequency as well as the scale or complexity of activities. Although emphasis is always on preventive measures, there will still be damages that cannot be prevented Minor repairs are therefore part and parcel of the regular maintenance activities Before rectifying a defect, the underlying cause of the problem should be identified In many cases therefore the corrective activity alone may not be enough, the underlying cause must also be dealt with”

“2.4. Routine maintenance”

“Routine maintenance activities are usually small-scale, widely dispersed, and often performed using manual labour (Liautaud, 2001) The need for routine maintenance can to a large degree be forecasted Routine maintenance activities are further defined as either cyclic or reactive, although the distinction between these terms is not always very clear (Liautaud, 2001) “

“Cyclic activities are performed at predetermined intervals throughout the year purely as a preventive measure because of events we know will occur (e.g. cleaning drains before and during seasonal rainfall), and are scheduled at fixed times during the year”

“Reactive activities are performed in response to a triggering condition that requires action before the problem gets out of hand (e.g. blocked culvert, crack sealing and pothole patching)”

“It is a timely intervention to prevent minor faults from further deterioration which might require costly repair The operations are carried out on a regular or cyclic basis. The frequency may vary in a particular year or season They are small scale but widely dispersed and require

skilled or unskilled manpower Routine maintenance is funded under recurrent budget heads and its application is aimed at achieving savings in delivery costs It is considered to be the most effective use of funds to assist the pavement to remain in sustainable condition for further time before periodic maintenance is applied"

Common routine maintenance activities

"Remove debris from roadway and drains ; clear drains, allowing free passage of water; Clear culverts and other water crossings; Repair shoulders and side slopes; Patch potholes, seal cracks and repair edges of pavement; Cut grass and bush Maintain road signage(Liautaud, 2001)"

2.5 Periodic maintenance

"Periodic maintenance is a major overhaul of the road typically carried out after a period of 5 to 10 years depending on traffic levels, pavement type and geographical and weather conditions The work involved is normally larger and require more equipment and specialist skills As a result, this work is considerably more costly than routine works The most common periodic maintenance activities include renewal of road surface and major repairs of structures Periodic maintenance is planned in cycles covering several years thereby describing when individual roads in the network are due for such a treatment"

"These are operations that are occasionally required on a section of road after a number of years to protect the structural integrity It includes development works to expand the capacity of the network, the provision of stronger pavement and the improvement of the geometric characteristics of the road The timely application of periodic maintenance delays ultimate full reconstruction at higher costs Periodic maintenance activities are funded under capital budget heads They include large scale pavement maintenance such as sealing of cracked surfaces,

resurfacing, overlay, pavement reconstruction or strengthening, maintenance of drains and road shoulders"

2.6 Emergency maintenance

"Emergency maintenance responds to occasional, unforeseen events such as landslides, washouts, large trees or debris on the road and broken drainage structures. Emergency maintenance can be categorised into (i) temporary restoration works, re-opening safe passage on the road, and (ii) permanent restoration, securing the stability of the road and reinstating all its components to its former (or a better) condition. Maintenance activities are also categorised based on where the works are located"

Off-carriageway works

"Consist of maintaining shoulders and drains, clearing of CD structures, removal of debris, cutting of grass and bushes The works also include minor repairs to drainage and other structures in the roadside area, maintenance of road signs and pavement markings, side slopes and all surface areas within the road reserve. Off-carriageway maintenance is normally a routine activity"

"On-Carriageway works relate to road pavement and surface repairs This work mainly consists of maintaining a good running surface on the road, free from any obstructions and damage and with the necessary camber or cross-fall to secure proper surface drainage"

"These include works of any nature which arises out of emergency and requires immediate attention. It normally has a lumped sum budget which may be drawn from a special account set for the purpose. It includes activities such as clearing debris and repairing washouts" (Liautaud, 2001).

Growth: According to Shaw, (2012) "historically, Ghana's construction sector represented 4-6% of GDP, but it has seen increased activity in recent years The industry grew by 20% in 2011 in the wake of the high foreign direct investment (FDI) inflows following the development of the Jubilee oilfield; this slowed to 11.2% in 2012, but it is projected to rise by 12.5% in 2013 The 2012 "Bruce Shaw Handbook", published by the eponymous UK surveying group, estimates construction will represent over 10% of GDP from 2012 onwards, up from 8.1% in 2010, and that output will grow by 12% annually in 2013 and 2014"

Regulation and Oversight: "The main bodies that supervise and oversee construction in Ghana are the Ministry of Water Resources, Works and Housing, which over sees housing infrastructure, and the Ministry of Roads and Highways, which is responsible for civil infrastructure Contractors generally fall under either building or road construction categories, with airports falling under road construction The Ghana branch of the Chartered Institute of Building (CIOB) estimates that there are 1600 active building contractors in Ghana, and the Ministry of Roads and Highways lists 2095 road contractors in good standing as of October 2012 Road contractors falls under four categories: Category A, which includes roads, airports and related structures; category B, which includes bridges, culverts and other structures; category C, which comprises labour based road works, and category S, which is for steel bridges and structures"

2.7 Road Maintenance Intervention Criteria

"The selection of road maintenance interventions are based on two fundamental rules which determines the timing and limits on the works to be carried out The rules ensure that a consistent approach is undertaken to planning and specifying works It also ensures that funds

are spent to the greatest effect, Robinson et al 1988). The two rules are defined as either scheduled or responsive"

"1. Scheduled: Works are fixed at intervals of time or points in time for maintenance and at a fixed time for improvement or construction works"

2. "Responsive: Road works are triggered when road condition reaches a critical threshold known as 'intervention level'. It is considered to be very useful for judicious disbursement of maintenance funds"

2.8 The Road Maintenance Process

The approach involves defining activities, planning, allocating resources, overseeing implementation, monitoring and evaluation of works, (Adair, 1983). It normally contains the following components:

1. "Inventory This is used as the basic reference for planning and carrying out maintenance and inspections. Inspection of road condition is the process of taking physical measurements of defects on the road network in the field"

2. Maintenance needs These are determined by comparing the measurements of road condition with predetermined maintenance intervention levels that are based upon economic criteria.

3. "Costing Unit costs are applied to the identified maintenance tasks to determine the budget required"

4. Priority setting: If the budget is insufficient for all of the identified work to be carried out, it is then necessary to determine priorities to decide which work should be undertaken and which should be deferred.

5." Execution of works: The work identified is carried out through with the assistance of several systems of scheduling and cost-accounting. 6. Monitoring: Monitoring serves two purposes

That is it ensures that work identified has, in fact, been carried out and it also provides data to enable unit cost and intervention levels to be checked and adjusted if necessary (Adair, 1983)

The benefits of road maintenance include the protection of initial capital investment in road construction, reduction in transport costs, traffic safety, environmental sustainability and the facilitation of social and economic development"

Protection of Investments

"Road maintenance prevents the loss of investment made in an initial road construction Routine and periodic maintenance cost for the entire life of a road is estimated to be between 2 and 3 percent of the initial capital investment, (Zietlow and Bull, 1999) However, neglected maintenance could cause this amount to increase. According to Harral and Faiz, (1988) timely maintenance expenditures of US $12 billion in Africa would save road reconstruction costs of $ 45 billion over a decade. A PIARC Publication (1995) estimates the threshold of capital investment which is lost on annual basis from neglected maintenance to be about 1 to 3 percent of GDP of individual countries in Sub Saharan Africa. About 75 percent of this is in the form of scarce foreign exchange. In Latin America and the Caribbean equivalent figures were estimated at $1.7 billion per year in 1992, amounting to 1.4 percent of the individual country's GDP"

will result in the need for new road development. Heggie (1995) estimates that each dollar spent on patching on an annualised basis, saves at least US $3. Robinson, *et al*, (1988) suggests a 10 fold or more returns on each dollar spent on patching"

2.9. Safety

A significant number of road accidents and fatalities can be directly attributed to the state of the road network. For example, inadequate skid resistance on neglected roads can

contribute to traffic accidents. Potholes pose a threat to all road users, particularly to cyclists and motorcyclists. The correction of such defects through road maintenance interventions can reduce the number of road accidents. However, improved riding quality from road maintenance interventions can also have negative impacts from increased speeds which can result in accident fatalities (Boamah, 2018)

2.10 Environmental Sustainability

Road maintenance has a positive impact on the environment. For example, well planned maintenance schemes can have good environmental vehicle performance which can reduce vehicular pollution. "However road maintenance can also cause negative impacts through environmental damage such as water contamination from oil spillage, poor air quality from dust pollution and noise and vibration during construction (Boamah, 2018)"

2.11 Facilitation of Social and Economic Development

"The road network is the only transport infrastructure that reaches virtually any location. Logically a road is the main provider of individual and goods mobility Improvement in the quality of road service therefore increase personal mobility and facilitate economic growth which contributes towards poverty reduction in developing countries (Boamah, 2018)"

2.12 Causes of Road Deterioration

"Road deterioration is caused by the effects of the physical environment, traffic, material properties, quality of road construction, design standards and the age of the pavement The details are discussed in the following paragraphs"

2.12.1Environmental Factors:

"Climatic factors such as rain water, solar radiation, temperature, soil type and terrain may cause roads to deteriorate. Rain water can alter the moisture balance in the sub grade of a road

with clayey and silty soils This may cause swelling and shrinkage resulting in reflective cracking and heaving in the road surface. Sunlight may cause a continuous, slow hardening action on bituminous surfaces This can increase the cracking process of the surface chip seal Seasonal changes in temperature or night and day temperatures may cause expansion and contraction of the carriageway This may progressively cause fatigue, failures and reflective cracks in the road surface, (TRL, Overseas Road Note 31, 1993) The major climatic effects of road deterioration in Ghana include hot equatorial temperatures which cause the rapid formation of corrugations Torrential rainfall also reduces the load bearing capacity of roads if not well drained on the road side, surface or beneath due to the high clayey content of the soil type, (Metrological Services Department of Ghana, 2004)"

2.12.2 Traffic Volume and Loading Roads

These structures basically built to carry and sustain vehicular loads. Therefore traffic is an important factor that influences pavement performance. The impact of traffic on the deterioration of pavements is caused by vehicle loads and volume. Every vehicle, which passes over a road, causes a momentary but significant deformation in the road structure. This is determined by the magnitude of each of its axle loads, the spacing between the axles, the number of wheels, the contact pressures of the tyres and the travelling speed. The passage of many vehicles has a cumulative effect which causes repeated flexing of the pavement leading to fatigue, crazing and structural failure, (Paterson, 1987).

2.12.3 "Material Properties and Composition

The choice of materials used for the construction of pavement layers may also cause road deterioration This is due to inherent variability in the materials used for road construction in terms of soil properties such as strength or load bearing capacity, gradation mix properties, elastic and resilience modulus Poor choice of materials used for pavement layers can have a

drastic effect on the strength of the layers and their subsequent performance, (TRL, Overseas Road Note 5, 1988)"

2.12.4 Construction Quality:

The quality of road construction if not built to the desired specifications can also facilitate road deterioration. For example, failure to obtain proper compaction, improper moisture conditions during construction, poor quality of materials and inaccurate layer thickness (after compaction) all directly affect the performance of a pavement. (TRL, 1988).

2.12.5 Road Maintenance Standards:

The rate of pavement deterioration is directly affected by the maintenance standards applied to repair road defects. When a maintenance standard is defined it imposes a limit to the level of deterioration that a pavement is allowed to attain. Low maintenance standard therefore causes roads to deteriorate at a faster rate. (TRL, 1988).

2.12.6 Age of Pavement:

As pavements age and experience traffic repetitions, pavement distresses begin to accumulate. For example the hardening effect increases the stiffness of asphalt with age making the material more susceptible to thermal cracking, (Yonder, 1975).

2.13 Types of Road Defects

"Pavement deterioration manifests itself in various kinds of distresses Pavement distress is defined as any indication of poor or unfavourable pavement performance; or signs of impending failure or any unsatisfactory performance of a pavement short of failure, (Highway Agency, 1997)

Table 2.1: Classification of Pavement Distress

Mode	Manifestation	Mechanism
Fracture	Cracking	Excessive loading, repeated loading, thermal changes, moisture changes, slippage
Disintegration	Stripping, ravelling, edge break, potholes	Adhesion loss, chemical reactivity, abrasion by traffic, degradation of aggregate, failure of binder, environment
Distortion	Permanent Deformation(Rutting)	Excessive loading, repeated loading, consolidation
Profile	Roughness	Structural deformation surface distresses, age, environment
Friction	Texture depth skid-resistance	Abrasion by traffic, aggregates embedded

Source: Odoki and Kerali (2000)

An overview of the different manifestations characterising each pavement distress mode is also presented below (Odoki and Kerali, 2000).

2.14 CAUSES OF POOR ROAD MAINTENANCE

According to the World Bank (1981), the road maintenance problem in developing countries like Ghana can be attributed to the large size of the road network, the mode of road maintenance management and funding shortfalls.

2.14.1 Road Network Size:

Roads built at the beginning of post-colonial period in most Sub Saharan-African countries have been increased due to increased growth. “Also though roads are designed for a twenty (20) year life they tend to last for only ten (10) years This is attributed to traffic growth and the problem of overloading which causes roads to deteriorate at a faster rate This has resulted in many roads coming to the ends of their design life at the same time, increasing the need for reconstruction, (TRL, 1987)”

2.14.2 Road Maintenance Management:

“Road management is described as the combination of technical and administrative actions for retaining the road in the state that it can perform its required function, (The British Standards Institution 3811, 1984)” “According to Heggie, (1995) the asset value of the road network in Sub-Sahara Africa is in the order of US $ 150 billion which is a huge asset by any standard He indicates that, even though the asset value of roads is huge, they are not subjected to market discipline Most public road administrations responsible for keeping the road networks in good condition do not know the asset value of these roads or the economic consequence of poor maintenance Roads are therefore administered like a small government department with internal planning, contracting, supervision and the actual execution of maintenance works “This creates operational and structural inefficiencies resulting from overstaffing, lack of discipline and control Others are lack of accountability which is a disincentive for good performance, (Robinson *et al* 1998)” Asset management is recommended for effective road maintenance management It is based on enhancing the capital value of the asset The approach combines management, financial, economic, engineering and other practices for effectiveness It requires the use of a multi-disciplinary approach to management to develop and implement programmes for asset creation, operation, maintenance, renewal and disposal, over the life cycle of the asset Performance monitoring is also needed to ensure that the desired levels of

service and other operational objectives are achieved at optimum cost, (Kerali, 2002)" The general direction of the approach includes the following"

1. Establishing a more autonomous road agency.

2. Identifying clear roles and responsibilities between the autonomous road agency and the parent ministry.

3. Streamlining the structure of the road agency and improving terms and conditions of employment for road agency staff.

4. Separating the planning and management of roads from implementation of road works and replacing force account with contracting of work to the private sector.

2.14.3 Road Maintenance Funding

Many countries in Africa and Asia have invested heavily in road construction over the last fifty (50) years with the help of international funding agencies and donors. "Unfortunately, these countries did not succeed in allocating sufficient financial resources of their own to continue the investment in the maintenance of their networks Hau (1992), intimates that the level of road maintenance is way below an economic optimum"

There are different mechanisms for road maintenance funding and these are discussed in the following paragraphs.

This involves road maintenance funding by government tax policies. It is applied from the view that road infrastructure assets are publicly-owned and should be funded through general taxation "It is commonly applied in developed countries especially Europe Most African countries are however moving away from this system to other funding sources due to the following reasons"

1. Different sectors compete for limited Government budget.

2. Tax payers are unwilling to tolerate continual increases in tax rates.

3. Maintenance spending is usually deferred because the road deterioration process is not very visible in the short term.

4. Increased road spending, which has made it impossible for road funds to be fully financed from government budgets, (Heggie and Vickers, 1992).

The introduction of private finance into infrastructure projects is seen as a new way to ease rising fiscal constraints for infrastructure investment "The modalities of its implementation vary depending on the functions given to the private sector, such as designing, constructing, operating, managing, financing, and maintaining the ownership of the asset Many different terms are used for private financed road projects These include the concept of build, own, operate and transfer (BOOT) or build operate and transfer (BOT) in which the private sector finances, designs, builds, maintains and operates a facility for a fixed term before transferring it to the owner (the host government) Sometimes the private sector takes on ownership of the facility in perpetuity, in which case there is no transfer of ownership at a later date but these approaches are less common in the road sub-sector"

"The initial investment can be raised through equity investments at between 10 and 30 percent of project costs It can also be raised through debt financing at 70 and 90 percent of project costs from commercial sources" "They are usually backed by credit guarantee agencies and bilateral or multilateral lenders The return on this investment is made by charging road users a toll during the term of operation It is a requirement for the financial viability of a BOT project over its life to be sufficient to service the project debt It must also provide a return on the equity that is commensurate with the long term risks of the equity investors Therefore the extent to which a project can generate toll revenues is critical The arrangement to increase toll rates with inflation and to deal with the exchange rate risk is also of critical importance" The overall

commercial climate in the country is very important to the viability of setting up a BOT project In this respect industrialised countries are usually in a much better position to adopt BOT type projects. “According to Antonissen, (2000), the major problems relating to its effective implementation are a lack of political will; high construction costs and operating risks; lack of financial viability such as insufficiency of tolling revenue; and lack of experience in the design, construction and procurement of required works on the part of the private financiers Some of the recommended interventions to address these problems include the establishment of guarantee fund, a balanced allocation of economic risks and standardisation for cost savings It is commonly practised in the more industrialised developing countries such as Indonesia, Malaysia and Mexico The concept is not being applied in sub Saharan Africa due to the lack of mechanisms for addressing perceived risks to the private company”

With the PPP, the Government introduces the private sector investor into road maintenance by putting their own capital at risk. “This is because of private sector management efficiencies which are not fully replicated in the public sector The private sector is contracted to deliver road maintenance according to the form of specified output The quality of service is maximised by market discipline or quality standards enforced through regulation or by performance requirements in the contract This improves the value for money, so enabling the Government to provide more public services and to a higher standard within the resources available” They cover a range of business structures and partnership arrangements, from the Private Finance Initiative (PFI) to joint ventures and concessions. Others are outsourcing and the sale of equity stakes in state-owned businesses. “The major limitations are that in order to reach financial balance, governments have often accepted commercial risks that should have been assigned to the private sector This has included not only the foreign exchange risk but also demand/traffic risk At the same time, private parties frustrated with drawn-out negotiations and the continuing renegotiating of clauses have accepted risks that should have been borne by the government,

(Guasch, 2004)" "In developed economies, the problems with this mechanism have included a generous hand of the public sector behind the projects, a variety of subsidies, guarantees, barriers to competition, and contract renegotiation due to substantial errors in demand prediction, (Engel *et al*, 1996) To attract the private sector to projects located in more uncertain environments, there has also been a need for the introduction of risk sharing agreements between the public sector and private concessionaires "Also, governments at times have needed to assume the liabilities of private sector operators" The Mexican government, for example, took on about 2 percent of GDP of private debt in 1994 to resolve problems faced by the concessionaires' creditors, (Ernhardt and Irwin, 2004) The PPP approach is not common in Sub Saharan Africa due to perceived operating risks"

"This relates to funding from multilateral and bilateral financing institutions referred to as donor agencies This process is normally arranged through a formal agreement between the host government, aid donors and officials of the road sector The donors may be interested in a particular area of the country, a particular road or wish to give general institutional support for maintenance or planning" "Often appraisal requirements will be specified and detailed specifications may be made covering how bidding is to take place, how the work is to be undertaken, how the work should be supervised, how accounting is to be done and sometimes technical audits may be requested as the work progresses Robinson *et al*, (1988), indicated that donor support for road maintenance funding had been dwindling in most developing countries over the year. "He explained that increasing pressure on international aid flows to Sub Saharan Africa could mean that the financial burden on local budgets would increase and erosion of capital will increase Though this has been noted since 1988, the trend has continued This is because donors' are increasingly reluctant to finance capital expenditures unless credible arrangements for maintenance are made, Malmberg Calvo (1998)"

Cost Sharing

"This involves supplementing central government funding at the local level with revenues generated at the local government level for their roads The approach is to enable the government not to stretch its budget It includes revenue sources such as local property taxes paid by landowners, since local roads not only benefit road users but also adjoining landowners An example is the octroi system levied on the movement of goods through local government boundaries in South Asia which is known to generate large amounts of funds A private company will bid for the rights to collect the octroi from an area and each time a truck passes through a local government boundary the company will collect the toll based on the cargo, (ILO, 2007) The practice is not very common in Africa due to the weak capacity to generate local government tax revenue"

Cost - Effective Maintenance Practices

"Cost effective mechanisms are also introduced to cut down the cost of maintenance. The options for maintenance are varied according to the type of road and by the type of contracting and procurement systems chosen These include the following"

(i) 'Term Maintenance' This involves outsourcing road maintenance activities to contractors on a long term basis The contractor is paid for agreed work done over a specific term according to contracted unit rates The advantages are that it ensures a more efficient use of available resources, greater flexibility with financing and allows for up front projects to proceed where they have been deferred or delayed under government budgeting It also allows for greater control of cash flow and lower risk to the principal which generates savings which can be invested in other services" However, without the 'right' performance criteria being established this type of contract can fail because performance cannot be measured nor controlled.

(ii) 'Performance Based' maintenance contracts: The contractor makes a bid based on his assessment of the work to be undertaken to keep the road in a specified condition. Provided the road is kept up to standard the contractor will be paid according to the bid irrespective of the work undertaken. Penalties are included if a specified standard is not achieved and special provisions are made for severe road damage due to unforeseen situations such as extreme weather.

(iii) "Labour Based Road Construction Methods According to the International Labour Organisation (1999) comparative studies of employment-intensive and equipment-intensive projects have shown that Labour based methods of road construction are cheaper than equipment intensive methods

Whilst these methods may be cost-effective, they need careful planning, oversight and support from road management organisations for sustenance in the long-term"

The Road Fund Approach

This involves an off-budget road maintenance financing arrangement created as the main source of finance for road maintenance. It operates on a "user charge" system to generate revenues. "It emerged in some developed countries as far back as the early nineties. For example the UK set up a Road Improvement Fund from 1910 to 1920; Japan established the Road Improvement Special Account in 1954; the United States of America (USA) established the Highway Trust Fund in 1956 and New Zealand established their Land Transport Fund in 1953 The advantage is that money can be accumulated and spent over several years on road maintenance without being 31 constrained by the annual government budgeting cycle" However, most developing countries which applied the system could not provide the expected flow of funding for road maintenance for a number of reasons. "This is because according to Richecour and Heggie (1995) the system was purely administrative with no legal backing nor

financial rules and regulations. Eklund, (1967) also indicated that there was a weak correlation between earmarking and the proportion of funds devoted to roads He explained that there was no strict budget discipline and revenues were often not spent on roads but were diverted to other sectors There was no explicit connection between the rates of taxation and the levels of road maintenance provision and regular work schedules were distorted by the erratic flow of funds Thus according to Richecour and Heggie, (1995) it was impossible to sustain road maintenance programmes by this approach"

2.15 THE GHANAIAN EXPERIENCE

"Generally, the Ghanaian transport system has been dominated by the road sector even though other modes such as air, rail, in-land water and marine are equally important A survey conducted by the National Road Safety Commission (2008) suggests that about 22 million passengers are moved by road whilst a total of about 122 million tons of freight is moved per annum So important is road sector to the development of Ghana that, the Ministry of Roads and Highways has been set up for the purpose of planning, construction and maintenance of roads and highways in Ghana The Ministry works through several Departments and Agencies These have been categorised as the Road Infrastructure sub-sector and include the Ghana Highway Authority (responsible for the administration, development and maintenance of trunk roads and related facilities in the country); Department of Feeder Roads (provision of access to rural communities and centres of socio-economic activities through rural roads) and the Department of Urban Roads (responsible for administration, development and maintenance of urban roads and related facilities)" The second group is the Road Transport Services and Safety Sub-Sector and include the Driver Vehicle and Licensing Authority (DVLA), the National Road Safety Commission (NRSC) and the Metro Mass Transit Limited (MMT). "The last group is the Road Transport Training category which includes the Government Technical

Training Centre (GTTC) and the Koforidua Training Center (KTC) All these agencies and departments work together to ensure that Ghana becomes the transport hub of West Africa Besides, emphasis is placed on road transport as the main conduit for showcasing the country in the sub-region It is therefore logical to conceive that urban transport in Ghana 'is synonymous with road transport' (Addo, 2002)"

"Currently, Ghana has a total of about 39,669 km that is in a maintainable state which represents 70 percent of the total network These include trunk urban and feeder roads. Ghana operates a road fund scheme for road maintenance funding The scheme is administered by a member board with an established secretariat which operates with sound accounting principles including technical and financial audits Funds are derived from fuel levy, vehicle licensing, road use fees, road, bridge and ferry tolls and international transit fees"

Method of Road Fund Allocation in Ghana

"In Ghana even though most of the returns from the fuel levies are generated on the highways, the fund is spread to cover all the maintenance needs of all road types The road fund board in consultation with the Ministry of Roads and Transport (MRT) through a sub-committee allocates the fund between the road types The approach is haphazard with no merit It is subjective to political and administrative manipulations The consequent outcome is that the allocation to the competing road agencies fluctuates with each agency not being certain of how much will be allocated to them at different times This results in inconsistent and distorted road maintenance programmes, wastage and neglected maintenance" The major limitations of the approach to road fund allocation in Ghana are lack of uniformity in road maintenance budgeting, lack of investment analysis, and the lack of consideration for government goals and stakeholder preference and the details are discussed in the following paragraphs"

1. "Road Maintenance Budgeting: Different decision support tools are used by each road agency The Pavement Maintenance Management Programme (PMMP) is used for trunk roads; the Maintenance Management System (MMS) is used for urban roads and Maintenance Performance Budgeting System (MPBS) is used for feeder roads Each is based on different work activities, maintenance standards and unit rates and this does not allow for a common basis of comparison"
2. "Investment Analysis: Economic evaluation for roads investment is only undertaken for individual road projects The CBA is applied to trunk roads and some urban road projects whilst diverse appraisal methods are applied for feeder road project selection"
3. "Application of Government Goals Currently there are geographical inequalities in accessibility to motorable roads between the endowed parts of the country and parts lagging behind in road development Appendix 3.3 gives a graphical representation of the distribution of the road network in Ghana and Table 3.5 gives the details of the regional distribution of access to motorable roads However there are no equity considerations in road fund allocation to address the inequalities"

2.16 Theoretical Framework

"The equity theory is based on the view of transport being a merit that should be provided at a minimum level to all citizens to avoid the exclusion of any sector, (Banister, 1994) It is derived from early traditionalist view on transport investment as a development initiator needed at the early stages in the development process for any economy to instigate a market widening effect, (Button and Gillingwater, 1986)" "It is proposed as an antidote for weak regions that lack economic dynamism. The theory is generally classified as utilitarian or egalitarian, (Litman, 2007)"

1. “Utilitarian Equity It is defined as the sum of individual utilities which can be used to measure the quality of resource allocation from the view point of social inclusion, Sandholm (1999) It is based on non-permanent and non-quantifiable social indicators, (OECD, 2005) The methods used utilitarian equity include, decentralisation, impact statements and stakeholder prioritisation Individual preferences could also be mapped with numerical values for objective analysis It is described as lacking precision of coverage with biases, (Valadez, and Bamberger, 1994)”
2. “Egalitarian Equity It ensures equality in resource allocation without necessarily involving stakeholders, (Young, 1994). It is aimed at satisfying the minimum needs of sectors which are worse off The methods for assessing this 49 type of equity include segregation for direct investment, (Pankaj, 2003) the setting of lower decision criteria for target sectors application of mathematical analysis on strategically selected quantifiable indicators such as population and income It also includes rural accessibility models such as the time space geographic representation of human activity pioneered by Hägerstrand, (1989) The segregation of part of the road network from the rest of the network is criticised for not ensuring continuous expenditure and network connectivity”

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

This chapter focuses on the methodological approach adopted for the study. It describes the means through which data was gathered, handled and also employed in meeting the objective of the study. This chapter explains the data analysis method adopted in analysing data, the sample size and sampling technique utilised in the study.

3.1 Research paradigm

"According to Guba and Lincoln (1994:107) a paradigm "represents a worldview that defines for its holder, the nature of the world, the individual's place in it and range of possible relationships to that world and its parts" It is a set of beliefs, values and techniques which is shared by members of a scientific community, and which acts as a guide or map, dictating the kinds of problems scientists should address and the types of explanations that are acceptable to them (Kuhn, 1970). Four paradigms that influence research process are interpretivism or constructivism, pragmatism, positivism and post-positivism. Paradigms in research are guided and shaped by ontology which is about what constitutes reality, epistemology referring to process of knowing reality or existence of phenomenon and methodology which concerns means of finding or establishing reality (Guba, 1990). In this regard, scientists belonging to a particular paradigm are likely to use similar techniques based on their beliefs and values to investigate societal problems and are most likely to come up with similar explanations to the same phenomenon. These basic set of beliefs are expected to guide the actions and inactions of researchers especially in the collection and analysis of their research data.

This study adopted constructivist paradigm which operates on basis that there is no single truth or reality. This therefore posits that meanings people attribute to things are not discovered but are socially constructed. The constructionism/interpretive assumption fits very well into this study to the extent that it enabled the researcher to make meanings out of the interpretations given by the respondents interviewed for the purpose of the study.

3.3 Research design

The study used qualitative research design to examine the challenges of urban road maintenance using the Accra Metropolis as case study. The use of qualitative approach helped the researcher to obtain information in a situation where very little was available or known about the phenomenon understudy. Qualitative research focuses largely on the kind of meanings people bring to bear on the phenomenon and creates opportunity to obtain data in an unbiased manner since it allows flexibility due to open-ended questions it employs (Boateng, 2016).

According to Creswell (2007) with qualitative approach, there is need to allow participants to share their views, hear their voices, and reduce the power relations that often exist between the researcher and the participants. Again it allows researchers to appreciate the contextual underpinnings behind the strategies used by participants in a study to mitigate particular phenomenon. The prime emphasis here is not for generalization but to interpret issues based on their historical and cultural settings. In this sense, respondents to a very large extent dictate the pace as responses the participants offer normally influence how and what questions the researcher will ask. This is contrary to quantitative approach where respondent is oftentimes limited to the dictates of the researcher which is evident in the nature of closed-ended questions it employs. These unique features of qualitative approach justify the researcher's choice of qualitative method as a research approach that guided the conduct of this study.

The study adopted exploratory case study design in qualitative research. The use of a case study offers the researcher the opportunity to discover the interactions of relevant elements about a phenomenon. It helps to bring divergent views and ideas to the phenomenon and therefore gives it more information from different perspectives.

3.4 Population

This is the entire group of objects, institutions, or people having common features and have some certain criteria needed in a research activity. The target population for this study were 30 professionals in the department in charge of urban roads and the Accra Metropolitan Assembly as well as government agencies responsible for urban road development and maintenance.

3.5 Sample size and Sampling techniques

Sample size is a carefully chosen number from a target population in which a study is executed to represent the population of the study. A sample size of 15 respondents was used for the study.

“A purposive sampling method was used in selecting professionals who have in-depth knowledge on the subject matter This method was employed because the respondents are experts in urban road budgeting, maintenance as well as its construction as such responses they give are very relevant to the phenomenon understudy Essentially, qualitative research seeks to go beyond surface understanding of phenomenon to more in-depth meaning given to it. Therefore purposive sampling was very appropriate and applied only to respondents who possess needed information for phenomenon under study Purposive sampling does not operate on principle of availability of respondents but rather key informants that can provide information relevant for the study.

RESPONDENTS	NUMBER

Department of Urban Roads	5
Ministry of Roads and Highways	3
Ghana Road Fund Secretariat	2
Accra Metropolitan Assembly	2
Telecos	2
Ghana Road Safety Commission	1

3.6 Data collection Instruments and Procedures

The main instrument used for the study was interview guide. This research instrument was basically divided into three sections. There is the introductory section, a demographic section and a section purposed to address the main objectives of the study. In view of the qualitative nature of the study, open-ended questions were used. It allowed respondents to express themselves freely without feeling restricted to a particular pattern of questioning. Where responses were not in line with questions asked, the researcher took time to offer clarification. The use of interview guide led to the emergence of issues that enabled the researcher to probe further for responses. To avoid inconveniences and also ensure adequate preparation of respondents for interview, data was collected in their offices, homes and places respondents found suitable to them. Adequate notification was given to respondents before the researcher followed up with further reminders via emails, mobile phone text messages and calls. Before the interviews began, the researcher took time and offered sufficient explanations of what the purpose of study was and also gave background information to enable respondents respond appropriately.

3.7 Source of data

The study used both secondary and primary sources of data. Primary data source used was the interviews. This comprised officials of the Department of Urban Roads. Ministry of Roads and Highways, Ghana Road Fund Secretariat, officials and officials of Accra Metropolitan Assembly Secondary data sources employed include reports, information, books articles, and journal.

3.8 Data handling techniques and analysis

The data obtained was saved in multiple retrieval systems to ensure safety and also to guarantee derivability. Personal computers, email addresses and pen drives were used for this purpose. This meant there were sufficient backups. It also made it possible for cross-checking to ensure data credibility, transferability and reliability. The data was transcribed and analyzed based on objectives of the study and emerging themes from interviews.

3.9 ethical considerations

One key element in academic research is safeguarding the rights of respondents. Respondents were assured information they provided would be treated with strict confidentiality. This was to ensure participants freely expressed themselves. Respondents were assured that information they provided was meant purely for academic purpose. Interview dates were not imposed by researcher but were provided by respondents. The researcher anonymized respondents to guarantee confidentiality.

CHAPTER FOUR

FINDINGS OF THE STUDY

4. 0 Introduction

This chapter presents a detailed analyses and discussions of the findings as pertains in the data gathered from the field work. The discussions are organized along the objectives of the study as well as the themes emerging from interactions with respondents. Respondents are anonymized for purposes of confidentiality.

4.1 Collaboration among key institutions

The significance of collaboration among agencies/bodies involved in urban road maintenance cannot be overemphasized. This is because their work and collaboration impacts greatly on the extent to which roads in the metropolis will be maintained to the highest quality. Commenting on the collaboration among key institutions, the Accra Metropolitan Roads Engineer explained that the major stakeholder is the Metropolitan Assembly. The collaboration with the Metropolitan Assembly has been facilitated following the decentralization of the urban roads department which serves as the main body that is mandated for ensuring matters relating to roads in the metropolis. He further mentioned that agencies such as the physical planning units, town and country planning department play varying roles to support road maintenance in the metropolis. For instance, an official at the urban roads department of the Accra Metropolitan Assembly noted that:

> *"When it comes to the urban road maintenance, there are many agencies involved. Some play very central roles and others play what I will call peripheral roles because it is not all the time that we involve them"*

The study found that the stakeholders can be categorized into two. Those who are directly in charge of the urban roads and those whose activities indirectly are relevant to maintaining the urban roads. Those whose activities are classified as peripheral include the telecos, Ghana

Water Company (GWC) and the Electricity Company of Ghana now Power Distribution Company (PDS). Their activities such as mounting of masts, erection and relocation of electric poles, laying and removal of water pipes and cables are done in collaboration with the urban roads and other relevant bodies so that adequate measures are put in place to ensure that the roads are not unduly put in a state of disrepair. By this collaboration, the damages done to the roads are mitigated, costs and other related factors are noted well-in advance. In response to why the need for collaboration among the key stakeholders, a senior engineer at the Ministry of Roads and Highways submitted that:

> *"Take for instance the mounting of electric poles. The people need both services; good roads and electric power. But we cannot compromise the life of the road for the electricity so when we collaborate we are able to come out with the best strategy so that both services are made available to the people in the best possible ways. Otherwise unnecessary delays can arise due to disagreements among parastatal bodies"*

From the above excerpts, it can be said that collaboration is very crucial to ensuring urban road maintenance in the metropolis and it has been found that indeed such collaboration occurs among key institutions. Equally important to note is that the urban roads department is the agency which co-ordinates the collaboration drive among the other institutions or agencies because it is the main body charged with the responsibility of ensuring road maintenance.

4.1.1 Consensus building among the key stakeholders

One key element that helps to bring the key stakeholders in arriving at decisions relating to the road maintenance activities is consensus building. This is because the agencies involved are many and expectedly there are many viewpoints proposed by these different stakeholders which may not necessarily be in agreement with others. In view of this, the most appropriate pathway to ensuring that disagreements and misunderstandings are resolved in via consensus building. It is worthy of note that, consensus building encompasses many different aspects.

These include agreement in terms of timing of removal or laying of pipes, mounting of masts, payment of cost if necessary, creating alternative routes for vehicles and other road users among others. Responding to how the key stakeholders reach consensus, an official at the Accra Metropolitan urban roads division submitted that:

> *"All the stakeholders make their inputs when there is a project to be done. So at a round table discussions we examine all the issues and reach an agreement on the best approach to take. Some may propose certain ways but when we meet base on the discussions we reach a decision"*

The above response appears to suggest that the notable agencies co-operate with each other in healthy discussions to create the needed understanding and agreement in dealing with road maintenance issues.

Commenting on consensus building, an official from one of the telecommunication networks gave contrary response. He explained that usually what happens is that some agencies who are charged with the responsibility for maintaining the roads take the decisions and they are only passive recipients. He noted for example:

> *"For consensus, it is more of a unilateral decision. We only play the role of recipients of directive. The roads are for the government and so it lies within the power of the state institutions how they do with them. We can't say we agree or we don't agree. The roads are not ours"*

When the question of why some stakeholders may feel side-lined in reaching consensus relating to road maintenance, an engineer at the Metropolitan Assembly explained that:

> *"Bodies like the telecos, PDS, GWC are only brought in when there is need for relocation of their installations and laying of their pipes etc. The work of road maintenance is primarily for the urban roads and the metro planning department so*

the final decision rests with the bodies whose main mandate is about roads. When there is need for them to come in we notify them"

While there is some truism in the claims that consensus is reached among the key stakeholders, evidence gathered from the study show that it is not always the case that consensus are built. Although some institutions' main functions do not directly border on road maintenance, their activities can impact positively or negatively on the roads hence the need to create participatory opportunities. It seems plausible to argue that a better understanding, co-operation and support are engendered if consensus is encouraged.

4.1.2 Ways of collaboration among the stakeholders

Responding to questions on what ways collaboration is undertaken among the stakeholders, officials at the Department of Urban Roads elucidated that because they are the main agency with expertise and training in the field, they always offer technical support to particularly the Metropolitan and other assemblies. A senior official at the Department of Urban Roads asserted that:

"We give the MMDAs technical backstopping. Because of the fact that sometimes we have roads crossing two or more assembly areas and the assemblies do not know who to take care of it so we come in to handle those areas that are technical in nature"

It was also observed that budgets for the purpose of road maintenance comes from the Ministry of Roads and Highways to the Department of Urban Roads. However, the budget funds do not go directly to the Metropolitan Assembly. They are rather given to the Department of Urban Roads who then do disbursement to the assemblies. It therefore becomes very necessary for the Department of Urban Roads to monitor in order to ensure the funds have been utilized for the purpose for which they are given. To this end, there is always a relationship between the

assembly and the Department of Urban Roads concerning road maintenance since the former has to rely on the latter for financial and technical support.

4.1.3 Building ownership culture among the stakeholders

Oftentimes when roads have been constructed, responsibility for care of the roads become unclear or is at best handed over to the community, Metropolitan, Municipal or district assemblies. It is therefore important that after completion of the roads adequate plans are in place so that its care is not endangered. In this regard, there is the need to imbibe the culture of ownership among the stakeholders. This will generate a sense of responsibility to maintain the roads to be in good shape at all times. Officials at the Accra Metropolitan Assembly submitted that although the Department of Urban Roads are basically in charge of the maintenance of the roads but there is a collective responsibility on the assembly to make sure that the roads are in good condition. This the assembly does through its taskforce members by ensuring that the roads are not encroached by traders, inappropriate use of the road by vehicles such as wrong parking, creation of unapproved bus stops, and unauthorized erection of advertisement boards on along the roads etc.

Probing to find out how other relevant stakeholders also buy into the idea of collective ownership, an officer at the Town and country Planning Department hinted that:

> *"This perennial flooding that occurs in this city, we are partly blamed by segments of the public. The reason is that sometimes we see our roads flooding making human and vehicular movement difficult so we see it as our duty to give the right guide to all stakeholders because the cost to the nation affects all of us"*

As can be deduced, developing a sense of collective ownership for the maintenance of our roads is an effective measure to fostering responsibility among the stakeholders. This ultimately will help to improve road maintenance in the metropolis.

4.1.4 Identifying what specific roles each stakeholder plays

Undoubtedly each of the stakeholders has particular roles it plays when it comes urban road maintenance. In this regard it is germane to systematically assess what role a stakeholder plays given that road maintenance encompasses many aspects. On the question of how they identify what roles a stakeholder is to do, respondents gave mixed responses. Some expressed that they were dissatisfied with how they are sometimes they are relegated to the background. Even though they appreciate that some consultations happen they felt that as key stakeholders their roles have been limited by only been information recipients. An official from the PDS remarked that:

> *"I don't think our roles as stakeholders is well-defined. At best what I can say is that we act based on what we are told to do by the urban roads. You will be just be told relocate this pole because the urban roads says so and we obey"*

Probing to find out what other stakeholders are made to also bring in some technical views on the road maintenance decisions, officials at the urban roads and Accra Metropolitan Assembly expressed that key stakeholders also make inputs regarding how their (other stakeholders) activities impact on road maintenance. They for instance cited that they have been many times when institutions like the GWC, PDS and telecos would consult them whenever they want to undertake any activity that impacts on the roads. These stakeholders give their ideas about what they think are appropriate ways to go about it. After careful analysis, the Department of Urban Roads together with the assembly will then implement what bests guarantees the safety of the roads and their users.

It can be deduced that notwithstanding the fact that identification of stakeholder roles occurs, there is need to go beyond that by highlighting the importance of each stakeholders to create a

sense of interdependence so that all stakeholders would feel properly placed and given the needed recognition.

4.2.0 Constraints the key institutions face in urban road maintenance

There are a myriad of challenges the key institutions involved in road maintenance face. Notable among them are inadequate financing, inadequate logistics, dumping of refuse on the roads, creation of illegal speed rumps by the public, political interference and delays in removal of accident vehicles on the road among others.

4.2.1 Inadequate financing

Roads are built for an expected life span but deteriorate over time. It is therefore important that financial arrangements are made to take mitigate or address the deterioration that occurs in the course of time. From the interviews with major stakeholders, the study found that one constraints to successful road maintenance in the Metropolis and the country in general is about inadequate financing geared towards maintenance. Generally, funding for road maintenance comes from the central government to the Department of Urban Roads for purposes of road maintenance. Oftentimes there are backlogs of maintenance in the metropolis due to funding challenges. Commenting on this issue, a senior official at the Department of Urban Roads hinted that:

> *"Although there are some maintenance works we need to undertake but we have suspended them not because we are not ready to do them but the funds are not just there. There are people (contractors) who have worked since 2016 and they have not been paid so it's quite difficult"*

Furthermore, it was discovered that funding challenges were also occasioned by the urban sprawl in the metropolis. This means that the available funds have to be spread thinly to reach

all areas within the metropolis. Explaining how this phenomenon affects road maintenance, an engineer at the Accra Metropolitan Assembly noted that:

> *"We have expanded far beyond the resources available to us. Three or four years there was a paper on maintenance backlog and it was over 12 billion Ghana cedis. Now the network of Accra has expanded so rapidly and keeps expanding annually. The money from the road fund can only fund about 60% of the maintenance work and this is because of the expansion".*

The above excerpts lends credence to findings to by Boamah, (2010) that insufficient provision of fund for the purpose of road maintenance in the urban areas constitute one of the key constraints to maintaining good roads in the urban areas.

4.2.2 Insufficient logistics

The place of logistics in the helping institutions to be effective in delivering their mandate cannot be overemphasized. Logistics in the forms of vehicles, fuel and other machinery aid the agency charged with responsibility for maintaining the road to discharge its functions in the best of ways. Interviews with the key institution involved in road maintenance in the metropolis revealed that logistics to enable it function well are inadequate. Officials at the Department of Urban Roads explained that due to the logistical constraints there are occasions that the department tend to rely on contractors to carry them in their vehicles to go round for inspection. This the study found very intriguing given that the likelihood of letting a contractor get away with a shoddy work done could not be ruled out. This is because if they (contractors) find that the department lacks certain logistics and that it sometimes has to rely on them to be able to function well, the contractors could potentially leverage on their logistical support so that certain malpractices are overlooked.

4.2.3 Dumping of refuse, sand and chippings

This constraint arises primarily from the public more than from institutional level. This is not to discount the fact that the role of some institutions in contributing to this challenge is not acknowledged. From the interviews conducted, it was observed that one area of concern to the Department of Urban Roads in relation to how the roads can be maintained in good condition to prevent deterioration is frequent dumping of refuse, sand and chippings by the public. Apart from the direct dumping of refuse on the roads, another activity which has not received considerable attention in relation to damaging the roads is dumping, solid waste and other materials into storm drains and gutters. Explaining the effect of this practice, a senior engineer at the Town and Country Planning Department had this to say:

> *"Dumping refuse in drains, look we don't design drainage to take refuse or garbage. We design them strictly for water so if you keep dumping these solid materials it creates flooding which flow unto the roads and as this continues, over time the roads become deteriorated"*

Probing to find out how this can be dealt with, officials at the Department of Urban Roads contended that there are bye-laws governing acts like improper dumping of waste and it is expected that Accra Metropolitan Assembly will enforce these bye-laws.

Officials at the Accra Metropolitan Assembly agreed that the bye-laws indeed exist but enforcement has been the challenge due to the inadequate personnel.

The submissions of the Accra Metropolitan Assembly that enforcement of the bye-laws is lacking due to lack of adequate personnel is untenable. The expectation is that deterrence is one measure that could be used to mitigate the occurrence of this practice. It seems plausible to argue that, if steps are taken to punish some wrong doers it will deter other potential law-breakers from doing same.

4.2.4 Political interference

The study found that although the Department of Urban Roads has its well-designed strategy to tackle road maintenance in the metropolis, it is sometimes political pressures to channel its attention to certain suburbs or communities. This comes in the form of political elites influencing the process. Consequently, the programme of work of the department is distracted. Explaining his view on the issue of political interference, an engineer at the Department of Urban Roads intimated that:

> *"You know how things in Ghana work sometimes. The department may have its programme but it is the cast in stone that things will be followed as planned. These politicians have their ways so if you are there and the government wants certain roads upgraded or some potholes filled because there is some pressure from the people, you cannot tell the government that no. you have to find a way to do. This means sacrificing a certain plan since it wasn't captured in your earlier arrangement"*

The implication is that state bureaucratic capacity is greatly undermined. Institutions of state are supposed to be insulated from the controls and politicians to achieve political ends. This is embedded in the idea that institutions are to be managed and their activities guided by technocratic inputs. The study observed that due to political interference in the performance of its functions some roads that have been earmarked for maintenance because their location required urgent attention based on expert analysis by the department were left undone. This has impacted negatively on economic activities in some of the areas.

4.2.5 Building of illegal/unauthorized speed rumps

To a very large extent the public plays important roles in helping to safeguard the roads from disrepair. In that, their activities can impact either positively or negatively on the roads. It was noted from the study that most of the speed rumps on the roads particularly those in the

communities were not sanctioned by the Department of Urban Roads. These were done by the communities themselves when they believe that the building of such speed rumps are necessary. Asking to find out why communities will feel emboldened to undertake such exercises without authorization from the appropriate agency, officials at the Department of Urban Roads explained that the communities embark on those activities at the blind side of the agency so they are unable to detect them early. Probing to know what sanctions are done to the people when the department notices such illegal activities, the officials conceded that at best they destroy such illegal speed rumps. They added that because it is usually the whole community it is difficult to punish the entire community. For instance, an official at the Department of Urban Roads expressed that:

> *"It is quite hard to find a particular individual and say you are going to arrest him for mounting a speed rump. You find that it is the whole community's activity so you become powerless because you cannot arrest everybody".*

It appears that a lot more need to be done if this constraint is to be addressed. To lament about the whole community's involvement in the illegality is not enough. Perhaps what can be done is to identify some individuals in the community and assign them the responsibility of reporting to the Department of Urban Roads whenever they see that illegal speed rumps are being built. Early intervention will help to minimize the practice. Again, tasking community leaders with that responsibility may also help in preventing this activity from continuing since they know that they would be held liable for such activities they would ensure the roads are not put in a state of disrepair by the communities.

4.2.6 Washing of vehicles on the road pavements

The relevance of maintaining a proper pavements can be realized when their intended purposes are understood. The most important functions of pavements are to provide space for vehicles leaving the travelled surface of the roadway to facilitate running off of surface water from the pavements to the nearby drainage ditches and to support the edge of pavement or road surface. However, this has not been much understood especially by drivers. The study realized that one major cause of road deterioration is the practice where some drivers wash their vehicles on the pavements and in some cases on the roads. Officials at the Urban Roads Department explained that, the pavements and roads are of different forms such as bituminous concrete, bituminous seal etc. and the persistent washing of vehicles on the roads and pavements quicken the process of deterioration.

4.3.0 Critical success factors that enhance effective urban road maintenance

The main objective of maintenance concerns preservation of the assets and not upgrading. Maintenance is an activity that ought to be done regularly. It is noteworthy that there are various strategies that are used to achieve effective maintenance regime. The found that there were a number of strategic approaches used with respect road maintenance in the metropolis.

4.3.1 Regular inspection

It is noteworthy that early detection of a problem helps to put in place measures to address it so that its level of destruction can be attenuated. From the interviews, the study noted that one strategic measure that is used towards maintenance is regular inspection. Respondents explained that inspection is carried out on regular basis. This comes in the form of engineers

going to the field by driving around the Metropolis to examine the state of the roads, by this strategy roads that are in bad shape and require urgent attention are noted and arrangements are consequently made to fix them.

Curious to know why despite the regular inspection and checks, the state of roads in the metropolis are generally in bad state, an engineer at the Department of Urban Roads enumerated that:

> *"We undertake the inspection alright but the main challenge is that even if you do the inspection and there is not money available, the inspection will amount to nothing because the problem will still be there"*

Even though the study observed that inspection may actually lead to early detection and identification of the problem, it is important to state that delays and unavailability of funds to address the problems further aggravates the problem. Notably, maintenance works postponed or delayed have led to high deterioration of the roads thereby increasing the cost. This means that early detection and quick maintenance intervention will save the country a lot of avoidable cost

4.3.2 Outsourcing of maintenance on long contract basis

In view of the fact that maintenance drives are very central to prolonging the life span of roads, the ministry of Roads and Highways as the main government body in charge of policy directives has introduced a component of maintenance as part of the contractual obligations for

the road sector. Even though this is new and on pilot basis, its ability to contribute significantly to giving long life to the roads is widely recognized. Respondents from the Ministry of Roads and Highways remarked that contracts are now awarded on long term basis. This they explained that hitherto contracts were given for the patching or fixing of roads from one point to the other. In the words of one official at the Ministry of Roads and Highways:

> *"This new approach, the way we award a contract is such that we put all together and give to a contractor. It makes no sense for a contractor to move equipment to patch just a few potholes. So instead of waiting to give contracts as and when potholes develop, we give the person say three years for a particular road and so all maintenance works relating to that road within the period of the three years the contractor ensures that maintenance works are done"*

Explaining why this new approach, a senior officer at the Ministry of Roads and Highways intimated that this strategy helps the contractors to pre-finance the maintenance since funds may not immediately be available. Therefore instead of allowing the road to deteriorate further due to lack or unavailability of funds, the contractors who are in a position to pre-finance the work curb this problem.

Clearly this new strategy is a noble one as it engenders the drive towards establishing high maintenance standards within the road sector. Not only does it bring immediate response to the tackling deterioration caused by lack of early response, it also serves as another avenue for exploring the idea of Public-Private Partnership (PPP) which continues to receive significant mention in modern development approaches.

4.3.3 Increased engagement with the Assemblies

In order to achieve efficiency and effectiveness in management of road maintenance a multi stake holder engagement has been identified as key strategic approach (Zietlow and Bull, 1999). The study found that the Department of Urban Roads utilizes the structures within the Accra Metropolitan Assemblies to reach out to the public in creating the awareness towards road maintenance and also for reporting same when the roads begin to show signs of deterioration. Commenting on this strategy, the Accra Metropolitan Urban Roads engineer submitted that:

> *"We rely on the assembly members as representatives of the people to receive complaints about the roads. For example, when the rains set in we have flooding and our roads are not spared so we try to find out from the assembly members if any road in their area has been affected. Sometimes because we have that collaboration with them they also call to alert us about damages caused to the roads if there are any"*

Pointing out similar view, an assembly member at the Accra Metropolitan Assembly also commented that:

"Every now and then we do inspection of the roads to see if there are things like potholes, encroachment etc. If we find any we quickly inform the Urban Roads for actions to be taken"

Probing to find out why despite their collaboration with the Department of Urban Roads and their closeness to the communities there are illegal speed rumps, encroachment of the roads and potholes scattered in the communities, he explained that the role of the assembly members to inform the appropriate agencies for actions to be taken. In particular, he mentioned that:

> *"If we inform or lodge complaints and the agency doesn't take action especially in respect of encroachment and mounting of illegal speed rumps, we cannot push again.*

Sometimes if you push too much you know our people the name calling will start and can bring you all sorts of problems"

From the above, it can be seen that engagement with the assemblies takes place. But it is equally important to note that there is the need for more direct engagement with the public through sensitization drives in order for the public to embrace the idea of road maintenance as a collective responsibility.

4.3.4 Prioritization

The study found that prioritization is one critical element that is used to effectively manage road maintenance in the Metropolis and the country in general. Due to the fact that the Metropolis covers many areas with litany of road maintenance needs, the Department of Urban Roads uses prioritization to identify which suburb or area it should give priority to. Commenting on this, an official at the Department of Urban Roads noted that:

"In selecting roads for maintenance work, we break it down because we don't have money. The strategy is that take care of the major roads first in the face of the financial difficulties. For example, the Tetteh Quarshie road serves a lot of people and purposes so it would be considered for maintenance over other roads such as roads in Madina".

This approach is seen as appropriate given that the criteria that is used in selecting certain roads as priority is technically sound and helps in protecting and rehabilitation of the road infrastructure.

4.3.5 General maintenance

Although the availability and adequacy of funds to undertake maintenance activities on all the roads in the Metropolis at a time is an uphill task and almost impossible to do. This notwithstanding the study found that the Department of Urban Roads occasionally embarks on general maintenance drives. According officials from the Department of Urban Roads, there

are times the levels of deterioration on the roads in the Metropolis is so widespread such that using the prioritization logic may not be the best way to achieve. In such circumstances, the available funds are spread to cover almost all the roads in the Metropolis. Whilst conceding that this practice means that the resources are thinly spread, the researcher probed to find out if quality will not be compromised, a senior engineer at the department said that:

> *"With the general maintenance approach, it is occasional so it is not something that we do everything. So the fear of spreading the funds in a thin approach is not a problem because it is only short term"*

From the accounts of the respondents and observation by the study, general maintenance is necessary pathway to mitigating against further deterioration and it is a short term measure which happens occasionally.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents a summary of the research findings relative to objectives of the study and key issues that emerged. Conclusions and appropriate recommendations were given based on empirical findings to improve road maintenance particularly in the urban areas.

Summary of findings

Urban road maintenance has attracted significant buy-in locally and globally as significant to the growth and development of urban settings. Its impact in saving costs from the standpoint of governments and the public are well-known and documented in literature. In recognition of the importance of good roads to development of the country, Ghana has a road fund which serves as the main source of financial support. Indeed, maintenance is not only about prolonging the life span of the roads but also about reducing vehicle operating costs, preventing accidents caused by poor state of the roads among others The foregoing reflects the motive of road maintenance given its emphasis on ensuring that the roads are always in good and safe condition for use by the public. The study therefore sought to examine the extent of collaboration among key institutions involved in urban road maintenance in the Accra metropolis, their constraints regarding road maintenance and some of the critical success factors to enhance effective urban road maintenance in the Accra Metropolis.

5.1.1 Collaboration among key institutions

The study established that there is collaboration among key stakeholders involved in urban road maintenance. Some of the notable institutions or stakeholders were the Department of Urban Roads, Town and Country Department, Ministry of Roads and Highways, GWS, PDS, the telecos. It further noted that these key institutions are categorized into two namely: those

who are directly in charge of the maintaining the urban roads and those whose activities impact indirectly in achieving good urban road maintenance drives

5.1.2 Consensus building among the key stakeholders

It was discovered that consensus building is usually undertaken among the key institutions regarding road maintenance. This is achieved through dialogues most of the times. The exception was that the consensus to some institutions like the telecos does not offer adequate participatory spaces as such they see themselves as more of passive recipients of other institutions' directives than all-inclusive process. This notwithstanding consensus building was found to be promoted and there is also the need to increase the level of engagement and broader consultation.

5.1.3 Strategies for collaboration

As the main agency in charge of urban roads, the Department of Urban Roads offers technical support to some of the stakeholders like the Metropolitan Assembly. Furthermore, it serves as the agency through which the Ministry of Roads and Highways allocates funds for the development and maintenance of the roads in the country.

5.1.4 Building sense of ownership among stakeholder

Analysis from the study findings showed that all the stakeholders are expected to play their functions well relative to the maintenance of roads in the Metropolis. It came to light that care for the roads is seen as a collective responsibility and to achieve this, every stakeholder discharged its functions in a manner that indicated ownership of the asset. This strategy was utilized so that all stakeholders would feel a sense of ownership and relevance within the context of maintenance of the roads in the metropolis. This is manifested in the way the Accra Metropolitan Assembly provides the necessary support to the Department Urban Roads and actually show enormous interest in helping to maintain the roads.

5.1.5 Identifying and assigning each stakeholder specific roles

From the observations of the study, specific roles or activities were assigned to each stakeholder as far as road maintenance drives were concerned. This helped to ease the tasks for each of the stakeholders. It however came to fore that some stakeholders felt their roles were not properly recognized and thus the need to have further engagement with all stakeholders to redefine the roles and do a lot more engagement with all stakeholders.

5.2. Constraints to effective urban road maintenance

A number of constraints were identified by the study which impact negatively on the activities of particularly the Department of Urban Roads to effectively carry out maintenance works.

5.2.1 Inadequate funding

The study observed that funding was the most important element that drives road maintenance. However, funding for roads was woefully insufficient to meet maintenance demands in the Metropolis. Funding for roads comes from the central government to the Department of Urban Roads in order to undertake maintenance and other road related activities. It was noted that although maintenance needs of the Metropolis is huge, funding hardly exceeded 60% and it also erratic.

5.2.2 Logistical challenges

Insufficient logistics was also another constraint achieving effective maintenance of the roads. Officials at the Department of Urban Roads lacked the requisite logistics to carry out their functions in the best possible ways. There were occasions they had to rely on contractors for fuel during inspection of road projects and this the study found could potentially breed corruption.

5.2.3 Dumping of refuse, sand and chippings on the roads

Evidence from the study indicated that activities such as dumping of refuse, sand and chippings created great deal of challenge to maintaining the roads to be in good condition. This constraint arises primarily from the public more than from institutional level. Another activity which has

not received considerable attention in relation to damaging the roads is dumping, solid waste and other materials into storm drains and gutters.

5.2.4 Political interference

Political pressures were also brought to bear on the activities of the Department of Urban Roads also impedes maintenance. This came in the form of political elites influencing the road maintenance planning process. Notably, this affected the plans and strategies of the Department of Urban Roads. Funds earmarked for particular roads are diverted and used for other roads due to some political influences and weakened independence and impartiality of technocrats of the department.

5.2.5 Building of illegal and unauthorized speed rumps

It was noted from the study that most of the speed rumps on the roads particularly those in the communities were not sanctioned by the Department of Urban Roads. These were done by the communities themselves when they believe that the building of such speed rumps are necessary. Whilst this is illegal, sanctions were not exacted on culprits. The communal nature of these activities also made identifying culprits all the more difficult.

5.2.6 Washing of vehicles on road pavements

Pavements are to provide space for vehicles leaving the travelled surface of the roadway to facilitate running off of surface water from the pavements to the nearby drainage ditches and to support the edge of pavement or road surface. However, this has not been much understood especially by drivers. The study realized that one major cause of road deterioration is the practice where some drivers wash their vehicles on the pavements and in some cases on the roads.

5.2.7 Critical success factors and strategies for effective road maintenance

There are various strategies that are used to achieve effective maintenance regime. The found that there were a number of strategic approaches used with respect road maintenance in the metropolis.

5.2.8 Regular Inspection

Early detection of roads in disrepair helped to put in place measures to address it so that its level of destruction can be attenuated. It was noted that one strategic measure that is used towards maintenance is regular inspection. This came in the form of engineers going to the field by driving around the Metropolis to examine the state of the roads. This strategy aided in identifying roads that were in bad shape and required urgent attention to fix them.

5.2.9 Outsourcing of maintenance on long term basis

The Ministry of Roads and Highways as the main government body in charge of policy directives has introduced a component of maintenance as part of the contractual obligations for the road sector. This is new and on pilot basis but its ability to contribute significantly to giving long life to the roads was widely recognized. Instead of allowing the road to deteriorate further due to lack or unavailability of funds, the contractors who are in a position to pre-finance the work curb this problem. This has created an avenue for exploring the idea of Public-Private Partnership (PPP) into the road sector.

5.2.10 Increased engagement with the Assembly

The Department of Urban Roads utilizes the structures within the Accra Metropolitan Assemblies to reach out to the public in creating the awareness towards road maintenance and also for reporting same when the roads begin to show signs of deterioration. This strategy was done using the Assembly Members to reach out to the communities and working closely with them to report any road damage within the communities to the appropriate agency.

5.3.1 Prioritization

The Metropolis covers many areas with litany of road maintenance needs, the Department of Urban Roads uses prioritization to identify which suburb or area it should give priority based on the urgency of the needs.

5.3.2 General maintenance

In times where the levels of deterioration on the roads in the Metropolis were so widespread general maintenance is used to fix the roads. In such circumstances, the available funds are spread to cover almost all the roads in the Metropolis. This was found to be a rare occurrence.

5.4 Conclusion

Through an analysis of findings, the study has established the importance of collaboration in urban road maintenance and the mechanisms that can be used to achieve it. It has argued that there are some unintended outcomes that undermine efforts to promote collaboration which might not have been envisaged. The study also noted that there is limited involvement of some stakeholders and thus the need to do more for better synergies and consensus among the stakeholders in the management of the urban roads in the Metropolis. Moreover, funding for the purposes of undertaking maintenance activities were found to be woefully inadequate which rarely reaches 60% of maintenance needs. The public remains a key partner in driving efforts towards road maintenance. The activities of the public have wide implications on the roads. Lack of sanctions for offenders partly explains the persistence of unlawful activities on the roads such as dumping of refuse, sand and chippings. The findings further point to the fact that there are some critical success factors that can be leveraged on to ensure effective urban road maintenance. Increased engagement with the assembly, prioritization, and regular inspection to detect early deterioration and general maintenance are some of the key factors that can be used to enhance road maintenance.

5.5 Recommendations

In view of the empirical findings of the study, the following recommendations are made as contributions for improving urban road maintenance in the Metropolis.

- There is need to equip and provide sufficient funding to the Department of Urban Roads to enable it to respond to the growing demand of road maintenance in the Metropolis
- Political interferences in the works of the Department of Urban Roads must be curbed so that the department is able to follow and implement its plans and programmes accordingly.
- Owing to the overarching finding of insufficient funds for all road maintenance activities, there should be vigorous research to identify durable but cheap materials for construction and maintenance purposes.
- To dispel notions of playing peripheral roles in the maintenance of the roads, the process of arriving at particular decisions should be broad-based and more involving of all stakeholders and their roles duly recognized. There must be efforts to ensure that all stakeholders are given concrete reasons for the selection of certain approaches over others.
- Sensitization drives are also important to make the communities understand that they are strategic stakeholders in the management of the roads and it impact on their lives in many ways. Therefore having the roads in good condition must be a collective responsibility.
- Finally, offenders must be severely sanctioned to serve as deterrent to potential culprits. This can be achieved when effective monitoring systems are put in place particularly at the community levels to identify and apprehend culprits or offenders.

REFERENCES

Abane, M.A. (1993). Tackling Traffic Congestion in Accra, Ghana: A Road User's Perspective. In *Journal of Advanced Transportation,* Volume 27, pp. 193-206

Addo, .T. (2002) Provision of Urban Transport Services in Accra. SSATP Annual Conference and Stakeholders' Meeting

Affum, J.K., & Taylor, M.A.P. (1999). Integration of Geographic Information Systems and Models for Transport Planning and Analysis. In Meersman, H., Van Der Voorde, E.,

Cervero, R. (2013). Linking urban transport and land use in developing countries. *Journal of Transport and Land Use*, *6*(1), 7-24.

Dimitriou, H.T., (1991) (Ed.) Transport Planning for Third World Cities. Routelege, Chapman and Hall, Inc.

Daganzo, C.F., & Cassidy, M.J.,(2008). Effects of High Occupancy Vehicle Lanes on Freeway Congestion. In *Transportation Research Part B: Methodological*, Volume 42, Issue 10.

Dargay, J., Gately, D., & Sommer, M. (2007).Vehicle Ownership and Income Growth, Worldwide: 1960-2030. In *Energy Journal*, Volume 28, No. 4

Derekenaris, G., Garofalakis, J., Makris, C., Prentzas, J., Sioutas, S., & Tsakalidis, A. (2001). Integrating GIS, GPS and GSM Technologies for the effective Management of Ambulances. Elsevier Science Ltd.

Del Casino, V. (2006). Theory in Warf, B. (Ed.) *Encyclopaedia of Human Geography*. SAGE Publications, Inc.

Dissanayake, D., & Morikawa, T. (2008). Impact Assessment of Satellite Centre-Based Telecommuting on Travel and Air Quality in Developing Countries by exploring the link between Travel Behaviour and Urban Form. In *Transportation Research Part A:Policy and Practice.*Volume 42, Issue 6, pp. 883-894

Dimitriou, H.T., (1991) (Ed.) Transport Planning for Third World Cities. Routelege,Chapman and Hall, Inc.,

Dowling, R. (2000). Power, Subjectivity and Ethics in Qualitative Research.In Hay, I. (Ed.), *Qualitative Research Methods in Human Geography.* Oxford:Oxford University Press, pp. 23-36.

Gatrell, J. (2006) Time Geography. In Warf, B. (Ed.) *Encyclopaedia of Human Geography*. SAGE Publications, Inc.

Ghana Statistical Service (2002). Population and Housing Census: Special Report of Urban

Localities. GSS, Accra.

Ghana Statistical Service (2002). Population and Housing Census: Special Report of Urban Localities. GSS, Accra.

Gibbs, W.W. (1997) Transportation's perennial problems. In *Scientific American,* Volume 277 pp. 54–57.

Goodwin, K. J. (2010). Reconstructing automobility: the making and breaking of modern transportation. *Global Environmental Politics*, *10*(4), 60-78.

Guohua, Z., Ming, LI., & Jingxia W. (2007) Journal of Transportation Systems Engineering & Information Technology Volume 7, Issue 5, October 2007

Gwilliam, K., Foster, V., Archondo-Callao, R., Briceño-Garmendia, C., Nogales, A., & Sethi, K. (2008). The burden of maintenance: roads in sub-Saharan Africa. *Background paper*, *14*.

Hammond, D. (2002). Exploring the Genealogy of Systems Thinking. A Research Paper in *Systems Research and Behavioral Science*, Volume.19, pp. 429-439.

Hammond, D. (2005). Philosophical and Ethical Foundations of Systems Thinking. In triple C, 3(2): ISSN 1726-670X. http://tripleC.uti.at.

Hesse, L. A ., (2008). Specific Recommendations for Accra The Urban Transport Project Ghana Institution of Engineers (GhIE). Mini-Conference on Traffic Congestion in Major Cities in Ghana. 21st February 2008 at The Engineer's Centre, Accra

Intikhb Q.A., Huapu Lu., & Shi Ye (2008). Urban Transportation and Equity: A Case Study aof Beijing and Karachi. In *Transportation Research Part A: Policy and Practice*, Volume. 42, Issue 1.

Institute for Transportation and Development Policy (ITDP), (2003). Bus Rapid Transit spreads to Africa and Asia. Sustainable Transport Fall 2003: pp 4-11.Jean-Paul R.,

Claude, C., & and Brian, S. (2006). The Geography of Transport Systems London: Routledge

Kwablah, A. (2008). 'Infrastructure and Road Use'. Ghana Institution of Engineers (GhIE).Mini-Conference on Traffic Congestion in Major Cities in Ghana. 21st February 2008at The Engineer's Centre, Accra

Palma A. D., & Lindsey, R., (2002). Transportation: Supply and Congestion International Encyclopedia of the Social & Behavioral Sciences, pp.15882-15888. Elsevier Ltd

Walsh, M. (1990) Global Trends in Motor Vehicle use and Emissions. In Annual Review of

Energy, Volume 15, pp. 217-243

Prud'homme, R. (1997) On Transport-related Externalities. In *Jornadas de Finanzas Publicas*, Volume 30, pp. 139–156.

Paniati, J. (2004). Operational Solutions to Traffic Congestion**.** U.S Department of Transportation. Federal Highway Administration.

Schrank D, & Lomax T. (1999) The 1999 Annual Mobility Report Information For Urban America, Texas Transportation Institute, Texas A&M University System, College Station, TX.

Schaefer, F.K. (1953). Exceptionalism in Geography: A Methodological Examination. In Annals of the Association of American Geographers, Volume 43. In Johnston, R.J., Gregory, D., Pratt, G. & Watts, M. (Eds.). (2000). *The Dictionary of Human Geography* (4th ed.), Blackwell.

Taylor, P.J. (2003) Time: From Hegemonic Change to Everyday Life. In Holloway, S. L., Rice, S.P., and Valentine, G. (eds.) *Key Concepts in Geography.* SAGE Publications.

Stock R.F. (2004) Africa South of the Sahara: A Geographical Interpretation 2nd Edition. Guilford Press

Stones, R. (2005). Structuration Theory. Palgrave Macmillan.

Sohail, M., Maunder, D.A.C. & Miles, D.W.J. (2004). Managing Public Transport in Developing Countries: Stakeholder Perspectives in Dar es Salaam and Faisalabad. In *International Journal of Transport Management*, Volume 2, Issues 3-4, pp. 149-160

Strahler, A. H., & Strahler, A (2003). Physical Geography: Science and Systems of the Human Environment**.** 2nd Edition John Wiley and Sons, New York.

Tackie, F. (2008). 'The Traffic-Land Use Interdependency'. Ghana Institution of Engineers (GhIE). Mini-Conference on Traffic Congestion in Major Cities in Ghana. 21st February 2008 at The Engineer's Centre, Accra

Taylor, P.J. (2003) Time: From Hegemonic Change to Everyday Life. In Holloway, S. L., Rice, S.P., and Valentine, G. (eds.) *Key Concepts in Geography.* SAGE Publications.

Texas Transportation Institute (2004) 'Urban traffic congestion costs the USA $63 billion per annum' http://www.citymayors.com/transport/congestion_usa.html

The Ghana Urban Transport Project (2008). 'Brochure for Public Forum'. Ministry of Transportation.

Thill, J.C. (2000). Geographic Information Systems for Transportation in Perspective. In *Transport Research Part C,* Vol. 8. Elsevier Science Ltd

Wu, Y.-H. and Miller, H. J. (2002), Computational Tools for Measuring Space-timeAccessibility within Transportation Networks with Dynamic Flow. In *Journal ofTransportation and Statistics*, Volume 4 Issues 2&3, pp.1-14.

Yu, H. & Shaw, S-L. (2007). Revisiting Hägerstrand's time-geographic framework for individual activities in the age of instant access. In Miller, H.J (ed) *Societies andCities in the Age of Instant Access, The GeoJournal Library*, Volume 88, Springer