THE UNIVERSITY OF ZAMBIA IN COLLABORATION WITH ZIMBABWE OPEN UNIVERSITY (UNZA-ZOU)

INSTITUTE OF DISTANCE EDUCATION

MASTERS IN BUSINESS ADMINISTRATION

AN ASSESSMENT OF THE FACTORS AFFECTING THE SELECTION OF TOWNSHIP ROADS THAT REQUIRE REHABILITATION AND UPGRADE IN SELECTED DISTRICTS OF THE COPPERBELT PROVINCE OF ZAMBIA

BY

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DECLARATION

I declare that this thesis submitted herein is an original work I have personally undertaken under supervision, and that it has not been submitted before for any Master's degree program examination in any other university, and that all sources I have used and quoted have been indicated and acknowledged by complete references.

KASONGO MIKE MAPULANGA DATE: ……

I declare that I have supervised the above student in undertaking the study reported herein and confirm that he has my permission to submit it for assessment.

DR TAMBULUKANI GEOFFREY DATE…….

CERTIFIED BY

Name (Head of Department) ……. Date……

DEDICATION

I dedicate this work to the Almighty Jehovah God for giving me the opportunity to study at the University of Zambia in collaboration with Zimbabwe Open University (UNZA-ZOU) in a Post Graduate Programme, for good health, for all the blessings and for the strength to face the challenges that came my way as this could not be possible without Jehovah's protection and guidance.

ABSTRACT

In Zambia, local authorities together with other agencies such as Road Development Agency (RDA) had been given a mandate to ensure proper rehabilitation and upgrade of roads in all Provinces of Zambia. This function was granted taking into account the fact that transportation industry, like many other infrastructure-intensive economic activities, is a significant component of the economy's impact on development and population welfare. In this regard, the aim of this study was to assess the factors affecting the selection of township roads in selected districts of the Copperbelt Province of Zambia. The study used a mixed method research design which included the combination of both quantitative and qualitative research methods. In this study, the target population comprised of RDA employees, consultants within Copperbelt province, and employees at Ndola City Council, Kitwe City Council, and Luanshya Municipal Council. Stratified random sampling was employed to select study participants from engineering department in the three council, while purposive sampling was used to select respondents from a group of consultants and employees from RDA. On the other hand, the study used survey questionnaire to collect quantitative data while in-depth interview was utilised to collect qualitative data. Moreover, quantitative data was analysed using SPSS while qualitative data was analysed using thematic analysis. The findings revealed that political interference, positional influence, and roads leading to social amenities all affected the selection of township roads for rehabilitation and upgrade. In contrast, the study also found that present condition of the road, social and economic benefits influenced the number of kilometres allocated to the selected roads. Further, the study revealed that councils used physical verification and consultant engagement to monitor implementation and completion of allocated kilometres of roads required for rehabilitation and upgrade. In view of these findings, the study recommended the use of Geography Information System (GIS) framework in the selection and allocation of kilometres to the township roads to ensure coordination and reduction in physical verification or monitoring.

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ACRONYMS

AHP: Analytic Hierarchy Process

AI: Artificial Intelligence

ANP: Analytic Network Process

BV: Best Value

CDF: Constituency Development Fund

CO: Carbon Monoxide

UNZA-ZOU: University of Zambia in Collaboration with Zimbabwe Open University

RDA: Road Development Agency

IDE: Institute of Distance Education

DMU: Decision Making Unit

FANP: Fuzzy Analytical Network Process

GIS: Geographical Information System

HDM: Hybrid Dynamic Models

IRI: International Roughness Index

LCCA: Life Cycle Cost Analysis

MCA: Multi-Criteria Analysis

NTFM: Network Level Flow Model

PMS: Pavement Management System

PPP: Public-Private Partnership

SPSS: Statistical Package for Social Sciences

TDRC: Tropical Disease Research Centre

ZIPAR: Zambia Institute of Policy Analysis and Research

ZOGP: Zero-One Goal Programming

CHAPTER ONE: INTRODUCTION

1.0 OVERVIEW

This chapter presents the background of the study, the problem statement, main objective, the specific objectives, research questions and the significance of the research study.

1.1 BACKGROUND

Like many other economic activities that are intensive in infrastructure, the transport sector is one of the important components of the economy's impact on development and the welfare of the population (Rodrigue et al., 2011). This is because, when transport infrastructure is efficient, it provides various economic and social opportunities and benefits that result in positive multiplier effect such as better accessibility to markets, employment, education, health and additional investments (Oosterhaven and Knaap, 2017).

Roads are perceived as a means of socio-economic development because they act as a link between regions, places, people and other economic activities. The expansion and improvement of any given road network would contribute to increases in accessibility and mobility, while reducing the distance to destinations, travel costs and travel time. The road infrastructure is considered to be a key prerequisite of social and economic development of any country. This is particularly true in Zambia where the road transport is the most widely used mode of transport. Since the importance of the road network transcends district boundaries, the rehabilitation and upgrade of the road network is vital as it increases economic performance of a particular district and country at large.

According to Dercon et al (2008), roads facilitate the access to new technologies as well as the marketing of surplus produce that contribute to increases in agricultural productivity. In the case of the agriculture sector, better roads can significantly reduce the cost of inputs such as fertilizers, seeds, and extension services. Roads also known to increase the scope of profitable trade, which in turn encourages on-farm investments to raising agricultural production (Binswanger et al., 1993). This in turn raises rural incomes, lowers food prices and hence raises disposable income in urban areas, thereby reducing spatial inequality in food prices, and also reducing the dependence on food imports.

According to the ministerial statement presented by former Member of Parliament Honourable Yamfwa Mukanga in 2014, the Government of the Republic of Zambia under the Patriotic Front Party allocated a total of K4.94 billion to the Road Sector in the Road Sector Budget which comprises of local and external sources toward the construction of major

projects and programmes being implemented which included the Link Zambia 8000, Pave Zambia 2000, L400 and the C400 project among others. Among the roads constructed were the Township or Feeder roads. The Government of the Republic of Zambia has the responsibility to fund for rehabilitation of the selected roads and its primary objective is to create connectivity, accessibility, lowering transport costs, reduction in transit times and poverty reduction through job and wealth creation for the majority of Zambians. Employment creation is of critical importance in a situation where people have lost almost everything but their ability is to work. Apart from generating income locally and providing work skills to the Zambians that are employed on such projects the Government's overall aim is to restore the local road network to facilitate sustainable socioeconomic recovery in the affected areas. When the Government of Zambia funds the selected Township Roads it builds the capacity of the local construction industry through training, on-the-job and in a more formal setting, of small-scale contractors and technical guidance during implementation of physical works on construction sites.

The Road Development Agency (RDA), which is a government department, have the responsibility to monitor and manage Highway Roads whilst the responsibility of District Councils is to monitor and manage the construction of public township roads in Zambia and to regulate maximum weights permissible for transport on township roads. The government release this money by directing it towards the Constituency Development Funds (CDF) which are funds monitored by the Local Authorities (District Councils). The district councils have the major responsibility of selecting township roads that need to be upgraded or be rehabilitated to bituminous standard.

As a result of the funding provided, it has clearly been observed that most of the townships in Zambia have greatly benefited from this route taken by the Government to take development to most parts of the country whereas some are not benefiting. However, it is important that the appropriate method is used in the selection of township roads that need to be rehabilitated and upgraded so as to distribute the benefits evenly within the district. Therefore the factors affecting Councils in selecting Township Roads that require rehabilitation and upgrade have not been assessed for appropriateness hence the study.

1.2 STATEMENT OF THE PROBLEM

It is a common trend of the Government of the Republic of Zambia to allocate a certain amount of money towards the construction of township or feeder roads in Zambia. It is

clearly observed that most of the townships in Zambia have greatly benefited from this route taken by the Government to take development to most parts of the country. The government releases this money by directing it towards the Local Authorities (District Councils) who then have the responsibility to select a few township roads that need to be upgraded or rehabilitated to bituminous standard.

This is also the case with Ndola City Council, Luanshya Municipal Council and Kitwe City Council where these councils receive funds from government for road rehabilitation. However, residents of the various compounds of these districts still complain that their roads are not in good condition despite the councils actively rehabilitating roads. Thus, it is important to understand the assessment criteria that are followed by Councils in this case Ndola City Council, Luanshya Municipal Council and Kitwe City council when selecting and allocating kilometers to Township Roads that require maintenance or rehabilitation.

1.3 MAIN OBJECTIVE

The aim of this study was to assess the factors affecting the selection of Township Roads that require rehabilitation and upgrade by Ndola City Council, Luanshya Municipal Council and Kitwe City Council.

1.3.1 Specific objectives

- Assess the factors affecting Ndola City Council, Luanshya Municipal Council and Kitwe City Council in selecting roads that require rehabilitation and upgrade.
- Establish the factors affecting Ndola City Council, Luanshya Municipal Council and Kitwe City Council in allocating the number of Kilometres to the selected township roads that require maintenance or rehabilitation.
- Determine the method used by Ndola City Council, Luanshya Municipal Council and Kitwe City Council to ensure that the number of Kilometres allocated to each road for rehabilitation and upgrade is worked on.

1.4 RESEARCH QUESTIONS

- What factors do Ndola City Council, Luanshya Municipal Council and Kitwe City Council consider when selecting Township Roads that require rehabilitation and upgrade?

- What factors do Ndola City Council, Luanshya Municipal Council and Kitwe City Council consider when allocating the number of kilometres to the selected roads that require rehabilitation and upgrade?
- How do Ndola City Council, Luanshya Municipal Council and Kitwe City Council ensure that the total number of kilometres allocated to each road for rehabilitation is achieved or worked on the ground?

1.5 SIGNIFICANCE OF THE STUDY

This study may be of great significance to the Republic of Zambia as it will provide a recommendation for an easy monitoring tool to guide with the progress in local community development by many governmental bodies.

Roads play a vital role in the development of towns and cities and therefore particular interests have to be paid on the factors considered when selecting roads to be worked on under the rehabilitation projects. When factors affecting the three councils in selecting township roads that require rehabilitation and upgrade are identified, it will result in a lot of benefits. And among institutions and groups of people that may benefit include the Government, District Councils, Engineering Consultants, and the Zambian people.

The Government may benefit from an appropriate selection strategy in that it will do away with wastage of time and resources required for high government officials to meet Road Development Agency (RDA), Contractors and Local Authorities to discuss the selection of roads that require rehabilitation and upgrade.

An appropriate selection strategy will enable District Councils who have the responsibility of selecting Township Roads that require maintenance spend less time in the selection process as this process if not planned well may turn out to be a debatable subject matter difficult to implement. It will also reduce on time required to evaluate the number of kilometers to allocate to each road. It will also answer questions to the general public that arise as a result of some roads selected and the number of kilometers allocated to each road. Apart from District Councils, Engineering Consultancy Firms that are appointed to supervise such projects will find it easy to answer questions to both the general public and also from High Government Officials that visit such construction sites in order to appreciate the progress of those projects.

The general public such as ordinary road users, farmers, Small and Medium Business Enterprises among others may benefit in that if there is an appropriate selection strategy in place for instance a strategy that is promoting a coordinated system will enable say farmers have a range of routes to pick from when taking their agricultural goods to Market Places within the shortest possible time.

1.6 LIMITATIONS OF THE STUDY

While the findings uncovered in this study were valuable, limitations could not be over looked. One limitation of the study was that some respondents the researcher was expecting to collect information from could not fill in the survey questionnaires but kept on promising the researcher that they were going to work on them. Another limitation was that from the onset of the research in methodology where the study mentioned uncovering the information through in-depth interviews, this was only conducted successfully on one respondent and this was caused by the Corona Virus pandemic (COVID 19) as it was a time of the year when the Virus was at its peak hence made it difficult for respondents to spare time for a meeting with the researcher. Also, the time the study was being conducted had negative effect on the research and this was worrying to the researcher whenever he could meet respondents as it was not advisable and was discouraged by health experts around that period to meet a lot of different people because of the corona virus pandemic. The challenges cited above created a limitation of limited size of the sample which came from only three districts of one province making it difficult to generalize the findings to the whole country.

1.7 CHAPTER SUMMARY

The study's background, statement of the problem, research aims, research questions, significance, and limitations were all addressed in this chapter. Most importantly, this chapter has placed the research in perspective and set a strong precedent for the subsequent chapters. The next chapter, chapter two, contains a thorough overview of the literature.

CHAPTER TWO: LITERATURE REVIEW

2.0 OVERVIEW

Development needs the help of practitioners, policymakers, and scholars to identify the ideas and areas that should be pursued and to seek the approaches that are likely to yield the highest returns. This chapter reviews related literature on factors affecting the selection of township roads that require rehabilitation and upgrade. It is important to note that the review is from global, regional, and local perspectives. Research is one of the avenues of open dialogue that allows people to test each other's premises and assumptions about development and challenges past practices that can hope to shape the intellectual foundations for effective development.

2.1 REHABILITATION, FUNDING AND MONITORING APPROACHES FOR ROAD CONSTRUCTION

Road construction often results in the drastic of the surrounding landscape. In order to define what these alterations will be and how to best plan re-vegetation, you need to be able to interpret road construction plans and terminology. This will enable one to be able to define the current site conditions and to visualize the future condition of the site following road construction. In this section, various approaches related to road construction are discussed.

2.1.1 Rehabilitation Approaches

The findings of most economic studies indicate that the road maintenance and construction projects have so far been successful in contributing to an improvement of the livelihood conditions of the targeted population. The investments made in the improvement of road access have not only created substantial short-term employment opportunities but have also boosted local economic development through an increased access to social and economic facilities and services and hence the creation of long-term developmental programmes as spin-off employment opportunities (Rooij, 2010).

The requirements for road maintenance differ from country to country and from place to place. Decisions are needed on the level and form of maintenance activity. While for paved and unpaved trunk roads maintenance and its effectiveness may be oriented to the road pavement, for rural roads greater attention is required to off-carriageway works mostly related to the drainage system, halting damage to the road components outside the road surface. In addition, emergency maintenance may be required in response to damage from natural events, especially for bridges, river crossings, and other key road components in

vulnerable or remote areas, where failure would sever transport services altogether for a time. As a result of inadequate maintenance, in most countries there is a large backlog of maintenance works still to be implemented (Asian Development Bank, 2013).

2.1.2 Funding Approaches

Governments today have acknowledged the need for a reform of funding and management of roads but action has been slow. This behavior partly reflects that the community has not been sufficiently engaged in the discussion or in decision-making on road services more broadly. For example, throughout the past decade, the funding dilemma has presented an opportunity to more fundamentally improve road service provision so that it is more responsive to motorists' actual preferences, efficiency use of road networks, and there is greater assurance of value for money on spending on this infrastructure.

In developed countries like Australia for example, arrangements for road reform were canvassed in the Commission's Public Infrastructure of 2014 inquiry (Australian Government, 2014). The inquiry recommended implementing road funds as the basis of reform efforts to move toward broader road user charging. This review specifies steps that can be taken to improve road planning and investment decisions, and elaborates on key policy considerations in pursuing more fundamental reform (Australian Government, 2017).

The republic of Zambia has also followed the same recommendation which has now seen an improved funding for the road projects and hence an improvement in the quality of roads constructed and number of roads improved (ZIPAR, 2014; Ministry of Transport and Communication, 2002).

2.1.3 Monitoring Approaches

Most countries today have had a challenge of monitoring the road projects. Zambia is however, not an exemption on that list. A study in Uganda once revealed that the staff designated to monitor contractors lack adequate supervisory skills (Byaruhanga and Basheka, 2017). It is noted that sometimes work is poorly supervised and this follows the fact that the general public has several times complained about the poor state of newly constructed roads because some roads get in a bad state a few months after construction.

2.2 EMPIRICAL REVIEW

This section reviews various empirical studies on factors affecting the selection of township roads for rehabilitation. In particular, the section shows some of the strategies used in the

selection of these roads. Thus, the review shows studies that applied the Analytic Hierarchy Process (AHP) and the Analytic Network Process (ANP) to pavement maintenance and rehabilitation projects worldwide. It also shows studies that identified major factors that influence selection of roads and rehabilitation such as political, social, environmental, and economic.

Zhang and Ahson (2004) applied an AHP-based method to prioritize relevant data for the management of the pavement at the Texas Department of Transportation. After examining the importance of data and the frequency of usage, it was shown that the most significant data were related to identifying the specific location of pavement sections in the field, followed by data related to pavement performance and traffic and safety. Data on temperature, policy issues, and existing climatic conditions were prioritized as low. Despite its relevance, the study by Zhang and Ahson (2004) did not address the methods used to ensure that the allocated kilometers for roads are worked on.

Lebo (2005) described different techniques available for rural transport infrastructure. One of them is called multi-criteria analysis (MCA). This analysis is done using criteria such as traffic level, proximity to health and educational facilities; and agricultural assets. These criteria are weighted relative to their perceived importance. Each road section is then allocated the number of points according to the criteria used. The points are then added up or converted to an index using a pre-defined formula. The result of this process leads to a score and subsequent ranking of the investment options. The entire process is based on the information collected in the area. Although Lebo (2005) indicate the steps used to identify and allocate the number of kilometers to selected roads, the researcher did not address the methods used to monitor the allocated number of kilometers.

Smith and Tighe (2005) applied the AHP as a tool for infrastructure management and nine criteria were adopted: ride quality, surface distress, structural adequacy, surface friction, and surface drainage, the level of noise, user delay, life cycle cost-effectiveness, and environmental impact. However, the study did not address the factors affecting councils in selecting roads that require rehabilitation and upgrade.

Maurer et al (2007) investigated the alternative Strategies for Rehabilitation of Low-Volume Roads in Nevada. The rehabilitation strategies investigated included full-depth reclamation with lime, cement, asphalts, and foamed asphalt. Various cold-mix, cold-in-place recycling with millings and different rejuvenating agents, and surface treatment test sections were

constructed. The results suggested that Nevada Department of Transportation could use alternative rehabilitation strategies in place of its conventional method of 2-in. plant-mix bituminous surface overlay and chip seal to rejuvenate its low-volume roadway network. In essence, the study by Maurer et al (2007) helps us to understand that cost saving is very cardinal in road rehabilitation. Most importantly, this study presents some of the rehabilitation strategies that can be used to ensure that road rehabilitation projects could be a success. Despite its relevance, the study did not unravel the major factors that influence the selection of roads to be rehabilitated or maintained.

Wey and Wu (2007) presented a combined goal programming approach using zero–one goal programming (ZOGP) and ANP for transportation infrastructure project selection; they illustrated this model with an example from Taichung city, Taiwan designed to enhance the transportation infrastructure facilities in the city. The main criteria were land use, planning and design, infrastructure definition, management and maintenance, travel demand, financial analysis and proposals, and promotion and the problem was evaluated by 10 transport experts. Nonetheless, the study did not look at the factors affecting the selection of roads that require rehabilitation and also did not look at the methods used to monitor the selected roads.

Tuzkaya and Önüt (2008) presented a fuzzy-ANP (FANP) model for the transportation mode selection between Turkey and Germany comprising eight criteria: product characteristics, flexibility, reliability, speed, traceability, costs, safety problems, and risks. Under each cluster, 32 sub criteria were included and rail, road, sea, and air were considered as the main modes of freight transportation. Although various factors for selecting roads for rehabilitation were identified, the study did not look at the methods used to monitor the allocated number of kilometers.

Wu and Flintsch (2008) introduced a model that supported decision-making for the optimal selection of pavement management and rehabilitation projects accommodating to the three proven operational research techniques of k-means clustering, AHP, and integer linear programming. A decision tree was developed including both quantitative and qualitative factors such as distress index, roughness index, roadway class, traffic volume, user satisfaction, and business/recreational importance to local communities. The AHP analysis involved three main criteria: maintenance and rehabilitation costs/benefits, network and local importance (including traffic and accessibility), and overall condition (including pavement quality index according to ride, surface distress, and structural adequacy). Despite its

relevance, the study by Wu and Flintsch did not focus on factors affecting the kilometers for selected roads that require rehabilitation.

Chu and Chen (2012) proposed a threshold-based maintenance optimization model under budget constraints using hybrid dynamic models (HDM). Pavement conditions were categorized into two types: functional conditions and structural conditions. Each condition was represented by international roughness index (IRI) thresholds and pavement age thresholds. The IRI threshold was applied for overlay and fog sealing, and the pavement age threshold for initiating reconstruction. Mathematical relationships were developed using threshold variables and user response to maintenance decisions was evaluated as a lower-level problem with traffic flow and travel time considerations. As additional parameters, maintenance cost, accumulated traffic loadings, and traffic demand for peak hours (traffic volume and capacity) were adopted for the study. Despite its relevance, this study did not focus on methods used to monitor selected kilometers for township

Chidolue, Nwajuaku and Okonkwo (2013) carried out a study on rehabilitation of Onitsha - Enugu dual carriageway in Anambra state, Nigeria. Ideally, the main purpose of the study was to unravel the lessons learned and factors that affected the success of the project. Among many, one of the major factors identified include political interference. It was revealed that most projects have political linkages. They are usually attracted by political heavy weights whose constituencies interface the project areas. The interference of political juggernauts cannot be wished away. The financing of the projects is usually influenced by the political class. Their influence which could be positive or negative should be understood. The ability to appreciate that what is professionally right might not be politically expedient makes for smooth running of the project. Nevertheless, the study did not talk about the monitoring approaches used for to ensure that the allocated number of kilometres are worked on.

Ivanović et al (2013) assessed a one approach for road transport project selection in a city in the south-eastern Balkans. An ANP model was developed that included all influencing criteria, namely exterior projects, traffic, environmental facts, costs, and benefits. Each criterion comprised two sub-criteria: for example, vehicle kilometres travelled and travel time for the traffic criterion; carbon monoxide (CO) emission and noise level for the environmental criterion; opportunity and infrastructure costs for the cost criterion; revenue and social benefits for the benefits criterion; and two ongoing projects for the exterior projects criterion. Considering small investment opportunities in transport infrastructure development within ten years of time period, Ivanović et al. (2013) defined three alternatives.

The opinions of stakeholders, traffic experts, local government, and the local population were obtained to evaluate these alternatives considering the importance of the criteria. In essence, this study provided an insight on some of the major factors that influence the selection of roads. However, nothing was done on methods used to ensure that the allocated number of kilometers of roads were worked on.

Bagloee and Asadi (2015) carried out a study on the prioritization of road network expansion projects. The researchers used dynamic project prioritization concepts, algorithms, and numerical evaluations. The dynamic variation of travel demand during the project construction stages were considered, and to deal with the complexities of projects with a vast number of influencing factors, a heuristic methodology was developed. Mathematical functions were formulated to obtain a benefit curve that represented the benefits of projects with respect to travel time or amount of saved user costs. The interdependency of projects was evaluated by formulating a neural network and traffic assignments were conducted for project benefit evaluation. However, the study did not address the factor affecting the allocation of the number of kilometers to the selected roads.

Lee and Madanat (2015) presented a mathematical formulation and a solution to optimize rehabilitation and reconstruction policies for large-scale pavement systems that minimize the life cycle costs of systems with limited budget allocations and user costs. For pavement reconstruction, a number of decision variables were included, such as budget constraints, budget expenditure period, pavement life cycle length, traffic volume and loads, and the characteristics of the roadway segment including structural design. For pavement rehabilitation activities, subsurface structural damage was considered including cumulative traffic loadings that are proportionate to the age of the structure.

To analyse the structural damage in underneath layers, an augmented condition state was defined that comprised age, number of years from the most recent construction/reconstruction activity, and pavement roughness. In addition to reconstruction and rehabilitation, corrective and preventive maintenance activities were considered. Cost and performance models, a roughness model, and a deterioration model were developed as functions of traffic loading and structural number. The vehicle operating cost per unit time was formulated as a function of pavement roughness, and travel delay user cost due to reconstruction was represented as a function of traffic volume. Thereafter, cost effective models for rehabilitation works were then formulated using factors such as overlay thickness, number of lanes, pavement roughness level, and intensity of resurfacing.

Furthermore, the study defined the reconstruction cost per unit length in terms of structural number and number of lanes, while the pavement design was not considered as a decision variable. In addition, the solution approach was determined through single-segment and system-level optimization and discussed under two budget constraints. This framework was applied for a case study consisting of 311 pavement segments in Caltrans District four of California's State Highway system to obtain segment- and system-level results. Despite its relevance, the study did not look at the factors affecting the selection of roads that require rehabilitation.

Novak et al (2015) evaluated the outcomes associated with an innovative change in a state level transportation project prioritization process in the United States by developing and implementing a novel multi-criteria analysis tool. Several project classes were considered for the prioritization, such as roadway, paving, bridges, bikes/pedestrians, traffic operations, and park and ride. Those project classes were scored by a pool of stakeholders from different responsible transportation agencies based on evaluation criteria. A metropolitan planning organization introduced evaluation criteria such as economic vitality, safety and security, mobility and connectivity, environment, energy and quality of life, preservation of existing system, efficient system management, and prior listening in transportation improvement planning, while the Vermont Agency of Transportation introduced evaluation criteria for each project class separately. Nevertheless, the study did not look at the methods used to monitor the allocated number of kilometers to selected roads that require rehabilitation and upgrade.

Rezvani et al (2015) identified the processes of identifying, prioritizing, and selecting safety projects at highway-rail at-grade crossings by calculating all costs and benefits associated with safety projects. The flow of their framework can be expressed as measuring crash costs (primary and secondary effect costs), cost-based screening (expected crash costs), CBA (cost–benefit ratio), project prioritization, and funding. Although CBA is an important component in evaluation, it is per se insufficient to ensure economic and social development (Talvitie, 2000). Despite its relevance, the study did not address methods used by councils to monitor the allocated number of kilometers to selected roads.

Shi et al (2015) carried out a study on simulation and analysis of road construction traffic flow in urban road networks. In this study, a new cellular automaton model was proposed to simulate road construction traffic flow in urban two-way-six-lane network systems with roundabout intersections. In the proposed model, a three-lane traffic rule was adopted to represent vehicle movements on road sections, turning lane changing and overtaking lane

changing were allowed, and vehicle movements in intersection areas were determined by priority which relies on vehicle position. Simulation results show that increasing the closed lane number may lead to decline of the network speed. In addition, the study found that there is a relatively fixed influence range of road construction in different cases, and a proper proportion of vehicle bypass can improve the operation efficiency of road network when semi-closed construction. In essence, the study by Shi et al (2015) show the importance of taking into account the traffic flow when selecting roads for rehabilitation. This is similar to the current study which considers traffic flow as one of the major strategies used to select roads for rehabilitation.

Yang et al (2015) conducted a study on application of network traffic flow model to road maintenance. The study shows how the evolution of two-way traffic flows on a local highway network can be predicted over time using a network-level traffic flow model (NTFM) to model both urban and motorway road networks. After a brief review of the main principles of the NTFM and its associated sub-models, the paper describes how a maintenance worksite can be modelled using a roadwork-node sub-model and a network solution routine in the NTFM. In order to model the two-way traffic flow in the road network, an iterative simulation method was used to generate the evolution of dependent traffic flows and queues. The NTFM was applied to model the traffic characteristics and the effects of maintenance activities on the local Loughborough–Nottingham highway network. Ultimately, the study demonstrated that the methodology was useful in selecting various worksite arrangements in order to reduce the effects of maintenance on road users. Concisely, this study showed the importance of selecting roads based on traffic flow. Despite its contribution, the study did not focus on other factors that influence the selection of roads for rehabilitation especially in local authorities.

Sadeghi and Moghaddam (2016) proposed a multidimensional approach for prioritizing road safety projects where uncertainties are taken into account in benefit estimations of projects in relation to the reduction of accidents and costs. The method helped decision-makers to select the most cost-effective project using DEA with an uncertainty assessment. However, this study did not focus on factors affecting the selection of roads that require rehabilitation.

Ahmed et al (2017) demonstrated the accuracy of project evaluation assisted by the objective-based AHP approach by considering 28 road sections in Mumbai city. The decision framework was developed using influencing factors such as pavement inventory data (road name, functional class, surface type, carriageway width, length, and number of lanes) and

pavement condition data (alligator cracking, patching, rutting, potholes, and raveling). The judgmental values were assigned based on extracted data rather than relying on expert opinion. Nonetheless, the study did not look at the factors affecting the allocation of the number of kilometers to the selected roads.

Nallathiga (2017) investigated the factors affecting the success and failure of road infrastructure projects under Public-Private Partnership (PPP) in India. Notably, a questionnaire survey was conducted among a sample of the stakeholders of road infrastructure projects to identify the critical success and failure factors during all four major project stages using different approaches. Initially, the critical factors were identified through ranking based on the average score. On the other hand, critical success and failure factors were also identified based on the stakeholder-wise ranking of the factors and their convergence. In terms of success factors, the study revealed traffic assessment, bid criteria, infusion of capital into project, and availability of contractor's resources. However, in terms of success factors, the study revealed public protest and opposition, influence of higher authorities and political parties among others.

Despite bringing out some of the major factors such as political interference, the study did not address the factors considered when selecting roads for rehabilitation and upgrade. Such factors are cardinal to assist in the selection of roads that will provide higher economic benefits.

Hasnain, Thaheem, and Ullah (2018) focused on best value contractor selection in road construction projects that is, ANP-based decision support system. Based on the limitations of traditional procurement, the study uses analytical network process (ANP) for contractor selection. On the other hand, using extensive literature review, best value (BV) contributing factors were identified. Notably, experts were involved to get their feedback for shortlisting the identified factors. An ANP-based decision support system was developed using data collected through a detailed questionnaire survey in the local construction industry for evaluating the selection process. Further, five case studies of completed road construction projects were used to validate the decision support system.

The findings indicate that in almost all the cases, the traditional procurement system, owing to its stringent prequalification measures, subliminally took into consideration the overall value proposition, and only one case study showed anomalies for which detailed reasoning is deliberated. This highlights the tendency of practitioners to overweigh the cost-based criteria,

despite an established significance of other factors, treating the intangible value factors of quality, health and safety, environmental impact, etc. as less important. It reflects that the local construction industry attaches marginal value to qualitative factors. Finally, the study suggested that the construction industry would benefit from implementation of BV procurement system and a prolonged exposure may help improve its value system to realize the contribution of non-cost-based factors. Although this study contributed to the body of knowledge, it did not focus on strategies used to select the kilometers for roads to rehabilitate.

Li et al (2018) derived the highway network maintenance priority, considering five factors related to decision-making: pavement performance, pavement structural strength, traffic loads, pavement age, and road grade. They also suggested including pavement structure type, climatic conditions, and details of the surface materials, in addition to pavement structural, functional and conditional factors. However, this study did not address the methods used to monitor road rehabilitation and upgrade.

Mashwama et al (2018) investigated the challenges faced by stakeholders in the road construction projects in the Gauteng province of South Africa. The study adopted a quantitative approach and a well-structured questionnaire was distributed to different construction companies in Gauteng Province, which were registered with various approved councils construction professionals and contractors such as civil engineers, project managers, directors, quantity surveyors, construction managers and resident engineers. The questionnaires were sent via e-mails, some were delivered to the known construction companies by the researcher and some were distributed during site clarification meetings of contractors and consultant's bidders on Gauteng Department Roads and Transport tenders. 75 Questionnaires were distributed and 50 came completed and eligible to use. Random sampling method was used to select the respondents in various organizations.

The findings revealed that community unrest and land proclamation were the highest ranked factors that pose a major challenge in the road construction. Furthermore, time, financial constraints, cash flow, lack of proper planning, resources, delivery of material, plant and equipment, shortage of skilled labourers, lack of equipment, lack of materials, performance guarantees, project duration/period, and cost overruns were the major challenges facing the stakeholders in roads construction projects in South Africa.

The study concluded that proper planning and communication is vital to overcome the challenges and government on the other hand needs to partner with private companies in terms of transferring skills and upgrading the upcoming contractors by emerging them with sustainable, independent contractors. Therefore, any challenges found in roads construction might be eliminated in the future projects by lesson learned, by planning for the upcoming project properly, and also by identifying possibility risks at the early stage of the project. Despite its importance, this study did not critically address the factors affecting local authorities in choosing roads that require rehabilitation and upgrade.

Li et al (2018) derived the highway network maintenance priority, considering five factors related to decision making: pavement performance, pavement structural strength, traffic loads, pavement age, and road grade. They also suggested including pavement structure type, climatic conditions, and details of the surface material, in addition to pavement structural, functional and conditional factors. However, this study did not look at factors affecting the allocating of kilometers to selected roads.

Dadashi and Mirbaha (2019) presented a ranking approach based on integration of data envelopment analysis (DEA) and Monte Carlo simulation to prioritize road safety improvement projects, minimizing the uncertainties in average crash frequency and project costs. Mathematical relationships were formulated considering each safety retrofit project as a decision-making unit (DMU) and inputs and outputs were costs and benefits of countermeasures. A range of efficiency scores for each DMU was obtained from the developed model and the effect of uncertainty on the relative efficiency was evaluated using a coefficient of variation as an indicator for the variation. However, the study did not look at the factors affecting the allocation of kilometers of selected roads.

Alimohammadi (2020) presented a framework for evaluation of existing pavement conditions and selection of feasible maintenance/rehabilitation alternatives in some routes of Livingston Parish in the state of Louisiana. In this study, the researcher identified six steps, which were followed in project evaluation and selection of feasible maintenance/rehabilitation alternatives. The first step is collection of historical data from Pavement Management System (PMS). The second step involve pavement distress and drainage surveys. However, the third step involved pavement evaluation based on trigger values. The fourth step involved analysing data and determining feasible alternatives.

Furthermore, the fifth step involves Life Cycle Cost Analysis (LCCA) and ranking of feasible alternative. The final stage involved selection of feasible alternative. In this study, data was collected by embarking on an initial site visit and researcher conducted a primary field survey to identify distresses and come up with candidate treatments. The collected data was analysed by the usage of a weighting and scoring matrix. The matrix ranked feasible treatment options by designating a score based on the expected life of the treatment option, pavement structure, existing conditions, initial cost, LCCA, traffic and ease of construction, and so on. In the end, the pavement treatment with the highest score based on the weighting and score matrix was the recommended treatment for that control section. Although the study for Alimohammadi (2020) factors affecting allocation of kilometers to selected roads was left out.

Gunathilaka and Amarasingha (2020) conducted a study to investigate the use of social and economic factors for ranking pavement maintenance and rehabilitation projects in Sri Lanka. The study was undertaken taking into account that pavement maintenance and rehabilitation project prioritization in Sri Lanka used to only consider the economic factors while neglecting social, political, and environmental factors. In this study, the Analytic Network Process (ANP) was utilized for the evaluation of three different pavement maintenance and rehabilitation projects in Sri Lanka. Social and economic factors that affected the three projects were considered and the inner and outer dependencies among them were evaluated and weighted. Pairwise comparisons were conducted, complemented by interviews of transportation experts from the Road Development Authority (RDA) of Sri Lanka.

The findings showed that selecting roads for rehabilitation based on economic factors was different from selecting roads for rehabilitation using social factors. In this regard, the study recommended using ANP for prioritizing pavement maintenance and rehabilitation projects in Sri Lanka. From Gunathilaka and Amarasingha' study, the lesson learned is that selection of roads for rehabilitation should take into account social, economic, political, and environmental factors. Nonetheless, the study did not look at the methods used to monitor the selected kilometers of roads for rehabilitation.

2.3 CHAPTER SUMMARY

In terms of road construction projects, the literature review revealed that a variety of elements and tactics are employed. To be more specific, studies have revealed that political, social, economic, and environmental issues all play a role in determining which roads are chosen for restoration and upkeep. Many studies have applied the Analytic Hierarchy Process (AHP)

and the Analytic Network Process (ANP) to pavement maintenance and rehabilitation projects around the world, according to a literature review. However, it's worth noting that the majority of studies on the variables and strategies for selecting roads for rehabilitation were conducted in other cities. In other words, in the Zambian scenario, there is a dearth of studies on the criteria and strategies used in selecting roads for rehabilitation. As a result, a study of the factors influencing the selection of township roads for rehabilitation and upgrading in the three districts of Zambia's Copperbelt Province was necessary. There is also a literature gap because no study or article has been undertaken or written on the factors influencing the selection of township roads that require renovation and maintenance by district councils in Zambia. The methodology utilized to address the study's research objectives is discussed in the next chapter.

CHAPTER THREE: METHODOLOGY

3.0 OVERVIEW

In chapter three of the research the researcher looked at the research design matrix which was a tool to ponder on that was established to provide answers to research questions. The chapter also looked at the target population and the sample of the population. It then introduced the sampling procedures, data collection methods, data collection instruments, data analysis and later addressed the need to consider ethics in research.

3.1 RESEARCH DESIGN

The study employed a mixed method research design. This design involves the combination of both qualitative and quantitative research. In order to reveal the methods or techniques that were used in the data collection and analysis in this study and put together the methodology, the researcher outlined the overall frame which was depicted below as a research design matrix (Harding, 1987). This design matrix was a tool to ponder on and it was arranged in rolls and columns informed by the philosophical research assumptions based on the type of reality sought, intertwined with the philosophical considerations of ontology, and epistemology (Guba and Lincoln, 1994; Greene, 2006; Lincoln and Guba, 2011). In terms of mirroring the research questions and objectives, the matrix did not conform to this rule of thumb as it was not philosophical. This was because research methodology was a philosophical stance linked to the nature of being or reality that underlies and informs the style of research (Sapsford and Jupp, 2006). Several authors had argued that because philosophy and methodology are intertwined, it was not possible to explicate methodology without philosophical clarity (Collis and Hussey, 2003; Creswell, 2003; Alise and Teddlie, 2010; Hesse-Biber, 2010). Table 1 shows the research design matrix.

Table 1: Research Design Matrix

Research question	**Ontologically linked objectives**	**Population and sampling**	**Technique for data collection**	**Techniques for data analysis**
What selection criteria does Ndola City Council use in the selection	Assess the selection strategies used by Ndola City Council in	NCC, LMC, and KCC Employees under Engineering Dept. including	Survey Questionnaires and In-depth Interview	Qualitative Content Analysis

of Township Roads to be rehabilitated	selecting roads that require maintenance or rehabilitation.	Top Management Engineers, Engineers from Rankin Engineering Firm and also Engineers from RDA (Purposive Sampling)		
What strategies does Ndola City Council use in allocating the number of kilometers to the selected roads that require rehabilitation	Establish the strategies used by Ndola City Council in allocating the number of kilometers to the selected township roads that require maintenance or rehabilitation.	NCC, LMC, and KCC Employees under Engineering Dept. including Top Management Engineers, Engineers from Rankin Engineering Firm and also Engineers from RDA (Purposive Sampling)	Survey Questionnaire and In-depth Interview	Qualitative Content Analysis
How does Ndola City Council ensure that the total number of kilometers allocated to the selected township roads have been worked on?	Determine the strategy used by Ndola City Council to ensure that the number of kilometers allocated to each road for rehabilitation is worked on.	NCC, LMC, and KCC Employees under Engineering Dept. including Top Management Engineers, Engineers from Rankin Engineering Firm and also Engineers from RDA (Purposive Sampling).	Survey Questionnaire and In-depth Interview	Qualitative Content Analysis

From the above research design matrix it was deduced that the study was an interactive research that required participation from the respondents indirectly through survey questionnaires when sampling employees in Councils and directly through in-depth interviews when considering top management engineers.

3.2 POPULATION

In this study the population comprised of people who were employees from some selected councils of the Copperbelt Province namely Ndola City Council, Luanshya Municipal Council and Kitwe City Council under the Engineering Department and other council employees involved in the selection process. The population also included Engineers from the Consultancy Firms and Road Development Agency (RDA).

3.3 SAMPLE

This study targeted respondents from the Engineering Departments that had served in Councils for not less than two (2) years and particularly Civil Engineers, Surveyors and Architects. The study also targeted top management engineers from Councils and the Consultancy Firms like Directors and Resident Engineers as these people are always part of the selection team. It also included Engineers from Road Development Agency (RDA) in that most of their engineers have attended several meetings on the selection of roads and therefore are well versed on how roads are selected for rehabilitation and upgrade. From the respondents sampled five (5) were Architects, one (4) Quantity Surveyor, eight (15) Civil Engineers and six (6) Directors of Engineering all of them from the Councils, two (2) Resident Engineers from Consultancy Firms and one (1) Engineer from RDA. Ultimately, the total sample size for the study was thirty-three (33) participants. However, only seventeen out of thirty-three participants participated in the study.

The breakdown of the participants with regards to type of employer, position in the organization, and number of years served with the organization are highlighted and briefly explained in sections **3.3.1**, **3.3.2**, and **3.3.3** respectively.

3.3.1 Distribution of Participants by Type of Employer

The distribution of participants with respective to type of employer was depicted in Table 2.

Table 2: Distribution of Respondents by Type of Employer

Name of Employer	Frequency	Percent (%)
Ndola City Council	10	58.8
Kitwe City Counci	3	17.6
Luanshya Municipal Council	1	5.9
Road Development Agency	1	5.9
Engineering Consultants	2	11.8
Total	**17**	**100**

Table 2 shows that fifty-eight point eight percent (58.8%) of participants were from Ndola City while 17.6 percent came from Kitwe City council. On the other hand, those who were drawn from Luanshya Municipal Council and Road Development Agency accounted for 5.9 percent each. Furthermore, engineering consultants accounted for 11.8 percent. Overall, the majority of the participants were Ndola City Council employees.

3.3.2 Position of Respondents at the Organization

The distribution of participants by types of positions held at their various organization was shown in Table 3.

Table 3: Current Position at the Organisation

Position	Frequency	Percent (%)
Architects	2	11.8
Quantity Surveyor	1	5.9
Director Of Engineering	6	35.3
Assistant Civil Engineer	5	29.4
Resident Engineers	2	11.8
Engineer	1	5.9
Total	**17**	**100**

Table 3 shows the classification of professionals in categories of field of study which enabled the researcher to carry out a stratified random sampling in that information about roads that can come from a professional say, Architect is different from the information that can come

from a Civil Engineer because a Civil Engineer by nature of their study will have rich information about roads than an Architect. From the findings, majority (35.3%) that participated in the study were directors of engineering. This was followed by assistant civil engineers who accounted for 20. 4 percent. The least participants were quantity surveyors (5.9%) and engineers (5.9%).

3.3.3 Number of Years Served at the Organization

The distribution of respondents with respect to the number of years they worked for their organizations was depicted in Table 4. This information helped the researcher to have information from different respondents with different years of experience as respondent's hard varsity number of years of experience which made them to have enough information on the identification and selection of township roads by councils than respondents with lower years of experience.

Respondents from Councils were sampled on the condition that one has been in Councils for at least 2 years because this was during the time the Government of the Republic of Zambia commenced the rehabilitation and upgrade of Township Road Projects Phase 1 in some few selected Townships of Copperbelt Province, Zambia under the C400. There were four categories of responses from which the participants were asked to pick up.

Table 4: Number of Years Served with the organisation

Years of Experience	Frequency	Percent
1 year to 3 years	3	17.6
4 years to 6 years	3	17.6
7 years to 9 years	9	52.9
10 years and above	2	11.8
Total	**17**	**100**

As can be seen in Table 4, most respondents had served their organizations for seven to 9 years. However, it was important to note that all respondents had more than three years of work experience which was good for the study.

3.4 SAMPLING PROCEDURES

The study had two phases, the first phase had Council officers under the Engineering Department who had served in Councils for not less than 2 years in these three selected Councils and these were sampled using random sampling in which case they were first sampled using stratified random sampling where officers were put in stratums or classes like engineers, architects and surveyors and later simple random sampling was deployed by way of using a survey questionnaire. In the second phase, top management engineers from Councils and the Consultancy firm that were supervising township roads in these 3 selected districts were sampled using purposive sampling method. And in the third phase, engineers from the Road Development Agency (RDA) at the Ndola Office were sampled randomly in that almost everyone in this Agency could have the experience on the selection criteria followed by councils when selecting township roads that required rehabilitation and upgrade.

3.5 DATA COLLECTION METHODS

Data Collection in this study required the use of survey questionnaires and in-depth Interviews only. The survey questionnaire had various segments relating to the selection of roads such as traffic condition, benefits, residential class, connectivity, road condition, state of the current road among others. This instrument was administered to employees at Ndola City Council, Kitwe City Council, and Luanshya Municipal Council.

On the other hand, in-depth interviews were used to bring out or explore information that could not come out on the questionnaire. In-depth interviews were one of the most efficient methods of collecting primary data and it was conducted with an intention of uncovering in-depth details of the interviewee's experience and perspective on a subject. In-depth interviews were used to explore concepts for further investigation and descriptive analysis. The interviewer needed to develop a comfortable environment with the respondent in order to achieve a complete understanding of his/her perspective. Requiring interest in and respect for people as individuals.

Thompson (2000) stated that in-depth interviews were not for the people who could not stop talking about themselves. Despite appearing realistic, a good in-depth interview bears similarity to everyday conversation. Furthermore, an in-depth interview is often considered as a form of conversation and as one of the most significant forms of data collection. And not more than 20 people and not less than 10 people are needed to be interviewed individually in a study using an in-depth interview method of data collection (Burges, 1984; Lofland and

Lofland, 1995). In this study, the Director of Engineering at one of the three selected local authorities was engaged for an in-depth interview.

3.6 DATA COLLECTION INSTRUMENTS

In this study, the two major instruments that were used to collect data include interview guide and self-administered questionnaire. The interview guide was used to collect qualitative data from one of the Directors of Engineering at one of the three local authorities included in the study. On the other hand, the questionnaire was used to gather data from employees at Ndola City Council, Kitwe City Council, Luanshya Municipal Council, Consultants, and RDA employees.

3.7 DATA ANALYSIS

The study analyzed two types of data that is, qualitative and quantitative. While qualitative data is data collected from respondents opinions using an interview guide, quantitative data was gathered using a survey questionnaire. In this regard, qualitative data was analyzed using thematic analysis while quantitative data was analyzed using SPSS.

3.8 ETHICAL CONSIDERATIONS

During the study the researcher took into account ethics to consider when gathering data such as privacy, confidentiality, research integrity and quality, ownership of data, use and misuse of results among others. With privacy the researcher looked at keeping the privacy of the respondents in order to make them respected and comfortable. The researcher also treated the information which was obtained from respondents and assured the respondents that the information that was gathered from them was confidential and only be used in this research. When looking at research integrity, the researcher ensured that the research was conducted according to the set standards.

3.9 CHAPTER SUMMARY

The approach used to investigate the factors influencing the selection of township roads in the three local authorities was addressed in this chapter. The study used a mixed method research strategy, which assessed both qualitative and quantitative data. Similarly, a total of 17 subjects were chosen for the study using both probability and non-probability selection. The study's findings are presented in the next chapter.

CHAPTER FOUR: PRESENTATION OF FINDINGS

4.0 OVERVIEW

The findings of a study aimed at determining the factors influencing the selection of township roads in need of rehabilitation and upgrade in selected local authorities in Zambia's Copperbelt province are presented in this chapter. In this regard, the presentation of findings was in line with the research objectives of the study.

4.1 FACTORS AFFECTING THE SELECTION OF ROADS THAT REQUIRE REHABILITATION AND UPGRADE

The first objective of the study sought to determine the factors affecting the selection of township roads that require rehabilitation. The findings were presented under different subheadings.

4.1.1 Factors Considered by Councils for Road Rehabilitation and Upgrade

The researcher was interested to hear views from respondents on major factors that councils considered when selecting township roads for rehabilitation and upgrade. The results were presented in Table 5.

Table 5: Factors Considered By Councils for Road Rehabilitation and Upgrade

Factors	Frequency	Percent
Roads leading to social amenities	17	31.5
Traffic flow of the road	13	24.1
Positional interference	1	1.9
Population density	6	11.1
Budget and economic benefits of the roads	7	13.0
The purpose it serves	5	9.3
Road condition	5	9.3
Total	**54**	**100**

The findings as shown in Table 5 revealed that there were a number of items that councils considered of which seventeen (17) respondents mentioned roads leading to social amenities, thirteen (13) respondents mentioned of the traffic flow of the roads, one (1) talked about positional interference, six (6) mentioned population density, seven (7) mentioned the budget and economic benefits of the roads, five (5) the purpose roads serves and five (5) also talked

about the current road condition (level of dilapidation). And from this presentation on both the figure 5 and Bar Chart 1 below it was deduced that councils considered roads leading to social amenities in the selection process of township roads that require rehabilitation.

4.1.2 Political Interference

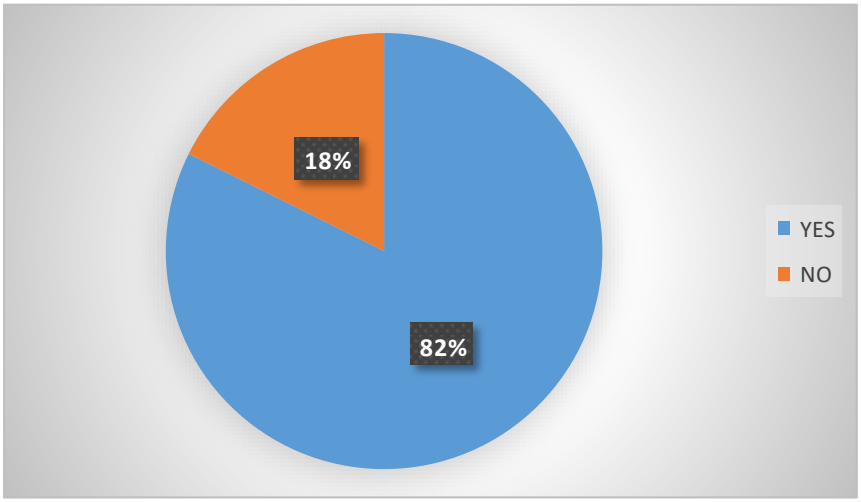

Figure 1: Respondents Responses on Political Interference

Respondents were requested to give their opinion on whether political interference had an influence in the selection of township roads that required rehabilitation and upgrade. There were two responses from which the participants could choose: *Yes* or *No*. From the findings, majority of the respondents (82%) answered in affirmative while a few (18%) answered negatively. Overall, the findings imply that political interference mainly influence the selection of township roads that require rehabilitation. Figure 1 shows the responses.

In order to gain a deeper insight on the impact of political interference on the selection of township roads that required rehabilitation and upgrade, one of the respondents at Ndola City was engaged in an in-depth interview. When asked to state some of the factors that affected the selection of roads and allocation of the number of kilometers for road rehabilitation and upgrade, the respondent revealed roads leading to social amenities, traffic flow of the road, positional interference, political interference, road condition and the purpose that the road served. To reemphasize his point on political interference, the respondent gave an example of one former Minister in the Patriotic Front Government who added a road that was not on the

selected list of township roads in Ndola district because he wanted the house for his mother to have an upgraded tarred road passing outside the yard.

4.1.3 Positional Influence

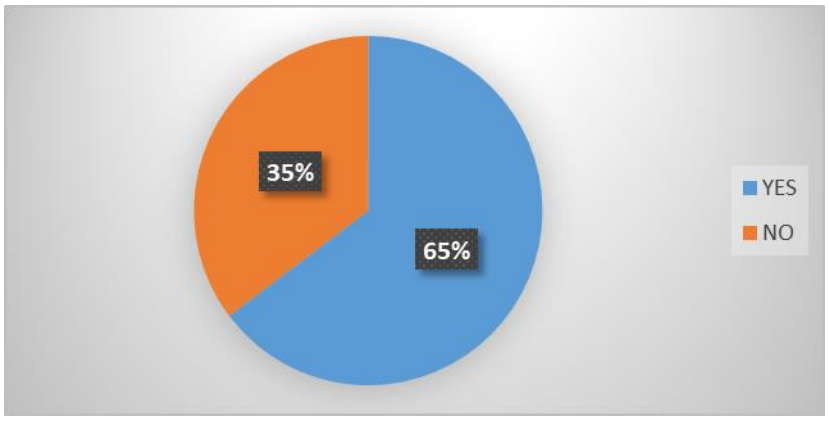

Figure 2: Responses on Positional Influence

In the selection of township roads for rehabilitation and maintenance, there is usually position influence. In this regard, some positions have so much power in the entire selection process. For this reason, there is a bias in terms of selecting roads which needs to be worked on. When asked to indicate whether positional interference influenced selection of roads that required rehabilitation, 65 percent of respondents answered in affirmative while 35 percent answered negatively. The results imply that majority of the respondents felt that positional influence mainly affected the selection of township roads that required rehabilitation and upgrade. The findings were presented in Figure 2.

4.1.4 Residential Class

Participants were asked to rate their level of agreement on whether councils regarded residential classes such as low cost, medium cost, and high cost when deciding which roads needed to be rehabilitated and upgraded in the survey. Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree were the five options given to the respondents to pick from.

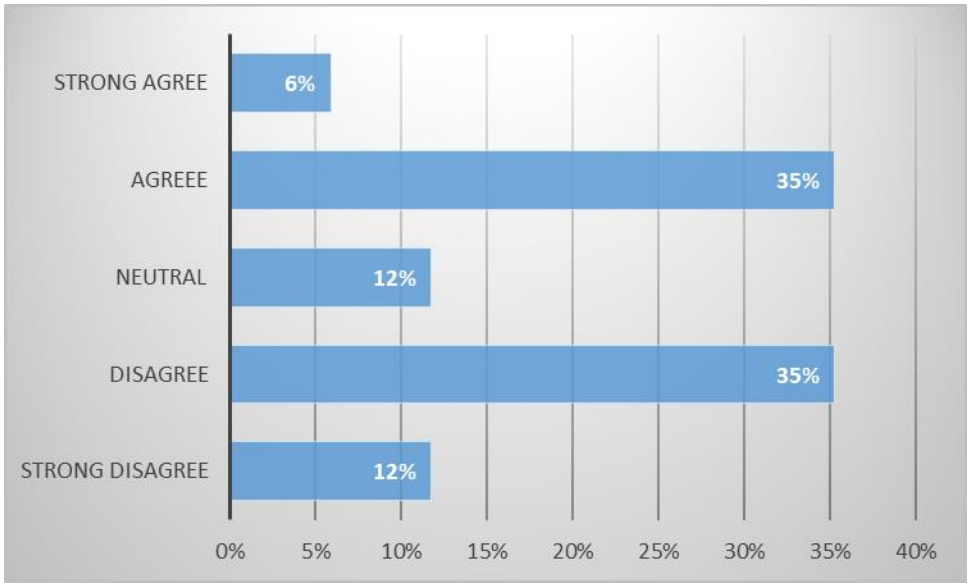

Figure 3: Extent of Residential Class Consideration

The study results, as depicted in Figure 3 revealed that majority of the respondents did not agree that councils did consider residential class when choosing which roads needed to be rehabilitated and upgraded. This implies that the local authorities surveyed in the study did not consider the residential class as the major determinant of selecting roads that needed to be upgraded and rehabilitated.

4.2 FACTORS AFFECTING COUNCILS IN ALLOCATING THE NUMBER OF KILOMETERS TO SELECTED TOWNSHIP ROADS THAT REQUIRE REHABILITATION

There are a lot of criteria that influence councils when selecting how many kilometers to devote to selected township roads that need to be rehabilitated and upgraded. The second research goal in this area was to discover the elements that influence councils when allocating the number of kilometers to selected township roads in need of rehabilitation and upgrade.

According to the survey results, political interference, the current condition of the road, and the importance of the road to the community, budget, economic, social, and environmental benefits, location, traffic flow, and positional influence were the major factors influencing the allocation of kilometers to the selected township roads. Social, economic, and environmental benefits, on the other hand, received the most votes (24.1 percent). In contrast, location of the road received the fewest votes (3.4 percent). Table 6 summarizes the findings.

Table 6: Factors Affecting the Allocation of Kilometres to Selected Roads

Factors	Frequency	Percent (%)
Political interference affect the allocation of kilometers	4	13.8
The impact the road has to the community	6	20.7
Budget at hand	3	10.3
Economic, social and environmental benefits	7	24.1
Location	1	3.4
Current road condition	4	13.8
Traffic flow	2	6.9
Positional influence	2	6.9
Total	**29**	**100**

4.3 METHODS USED BY COUNCILS TO ENSURE THAT THE NUMBER OF KILOMETERS ALLOCATED TO EACH ROAD FOR REHABILITATION AND UPGRADE ARE WORKED ON

Table 7: Methods of Monitoring Used by Councils to ensure that the Allocated Kilometres of Roads for Rehabilitation and Upgrade are Worked On

Methods	Frequency	Percent (%)
Physical Verification	11	47.8
Through Consultations With Consultants	5	21.7
Comparing what has been done on site with the contract document	4	17.4
Procurement of works by RDA, councils only receive and monitor	3	13.0
Total	**23**	**100**

The third research goal was to find out what elements Ndola City, Kitwe City Council, and Luanshya Municipal employed to ensure that the assigned number of kilometres of roads that needed to be rehabilitated and upgraded were completed. The results, as shown in Table 7, suggest that the majority of respondents (47.8%) indicated physical verification. 21.7 percent, on the other hand, stated it was done with the help of specialists. In contrast, 17.4 percent said they compared what was done on the job site to the contract documents. Only a small percentage (13%) said they employed the RDA's procurement approach. Overall, the findings show that physical verification is the most common approach used by councils to monitor and ensure that the assigned number of kilometers to be rehabilitated and upgraded is completed.

4.4 CHAPTER SUMMARY

This chapter presented the results on the factors influencing the selection of township roads for rehabilitation and upgrade in the three local authorities. It is apparent that respondents provided the researcher with a wealth of useful information that aided in the development of appropriate findings. This chapter's findings were discussed in light of the study's objectives. However, the findings reported in the current chapter are discussed in the next chapter.

CHAPTER FIVE: DISCUSSION OF FINDINGS

5.0 OVERVIEW

The results were presented in the previous chapter. This chapter, on the other hand, discusses the findings reported in the preceding chapter in light of the research questions derived from the research objectives.

5.1 WHAT FACTORS AFFECT COUNCILS IN SELECTING ROADS THAT REQUIRE REHABILITATION AND UPGRADE?

The primary goal of road maintenance is encapsulated in the word itself. It is done to ensure that the road that has been built or renovated is kept as close to its original condition as possible. Because they are vulnerable to traffic and the elements, all roadways require maintenance. Even with the finest possible construction quality, maintenance is required to ensure that the road structure provides the best possible service over its lifetime. The deterioration of the road and all of its components can be slowed with preventative maintenance, delaying the need for costly repair investments.

External elements such as traffic, terrain, soil types, and climate influence maintenance requirements. The original technical concepts used during the road's construction, as well as the quality of the work done during the construction, have a big role in the requirement for maintenance. It is possible to design maintenance solutions and management systems that optimize maintenance costs and efforts based on these characteristics.

On factors affecting the selection of township roads, the study found that roads leading to social amenities, road traffic flow, fiscal and economic benefits, political intervention, positional influence, and road conditions are all important considerations in determining which roads need to be rehabilitated and upgraded. When picking township roads that require renovation and upkeep by the three selected councils, it was crucial to notice that roads going to social facilities such as public areas like Markets, Hospitals, and Police Stations were prioritized. These findings are reinforced by Lebo's 2005 Multi-Criteria Analysis (MCA), which evaluated criteria such as traffic volume, proximity to health and educational institutions, and weighted these elements according to their relevance.

Many respondents, on the other hand, believed that political and positional involvement from senior government officials and top management personnel in government departments had a greater impact on the selection of township roads in the three councils. This is due to the fact that politicians and senior authorities have greater authority than qualified professionals in

determining which township roads need to be rehabilitated and upgraded. The findings were also published by Nallathiga (2017), who looked into the elements that influence the success or failure of public-private partnership (PPP) road infrastructure projects in India. Specifically, the study found that several factors influenced the selection of roads for rehabilitation, including traffic assessment, bid criteria, capital infusion into the project, availability of contractor's resources, public protest and opposition, influence of higher authorities, and political parties, among others.

According to the findings of this study, traffic flow and connection also had an impact on the selection of township roads in the three councils. The findings are similar to Wu and Flintsch (2008) who used the Arithmetic Hierarchy Process (AHP) and presented a decision tree with both quantitative and qualitative elements such as roughness index, roadway class, traffic volume, and so on. Maintenance and rehabilitation costs/benefits network (including traffic and accessibility) and local importance and overall condition were the three key criteria used in the AHP analysis (including pavement quality index according to ride, surface distress and structural adequacy).

In addition to what has already been mentioned, the outcomes of this study revealed that the amount of money available for the project and the present state of the roads influenced the selection of township roads that needed restoration and maintenance. The Republic of Zambia has also implemented the same proposal, resulting in increased funding for road projects and, as a result, an improvement in the quality and number of roads built (ZIPAR, 2014; Ministry of Transport and Communication, 2002).

5.2 WHAT FACTORS AFFECT COUNCILS IN ALLOCATING THE NUMBER OF KILOMETRES TO THE SELECTED TOWNSHIP ROADS THAT REQUIRE MAINTENANCE OR REHABILITATION?

Allocating the amount of kilometers to the selected routes, like selecting roads that require rehabilitation and upgrade, is mostly influenced by political involvement. When discussing roads with significant political sway, it is important to remember that these are roads that are frequently discussed by the majority of the community's population during media programs, and that when these roads are completed, they will have won the hearts of the community's residents, resulting in people having faith in the government of the day. This is because senior government officials are only concerned in the numbers in whatever development schemes the government is promoting to its citizens.

Chidolue et al. (2013) came to similar conclusions in their study on the reconstruction of the Onitsha-Enugu dual carriageway road in Anambra State, Nigeria. Political intervention, according to the authors, was one of the key elements influencing the selection and distribution of kilometers to highways, with political heavyweights whose constituencies intersected with the project areas compromising the selection process. As a result, it is true that the allocation of kilometers to township roads is influenced by political considerations.

Apart from governmental intervention, the influence of roads on the community is the second aspect to consider. This refers to the benefits or importance of roads to the community, which includes social, economic, and environmental benefits. This is how councils choose the number of kilometers to be rehabilitated by determining the positive benefits of one road over another, and so roads with more benefits are prioritized over roads with lesser benefits.

The third factor is the present total road condition, which determines how many kilometers will be assigned to each selected road during the restoration project. The fourth factor is the project's available contract sum, which determines the number of kilometers to be allocated to each selected road. The government and community do not want all of the contract sum to be channeled into the rehabilitation of a long stretch of township road of greater importance while leaving other township roads of lesser importance in a dilapidated state.

Economic, social, and environmental benefits, in addition to the previously mentioned criteria, influenced the amount of kilometers allocated. Roads with economic and social benefits are ideal since they help to stimulate economic activity. These roads, in most cases, lead to market centers and serve as key thoroughfares to other central business districts. The findings of Gunathilaka and Amarasingha (2020), who looked at the use of social and economic elements in prioritizing pavement maintenance and rehabilitation projects in Sri Lanka, are similar to the present study. Overall, the research suggested that social, economic, political, and environmental concerns be considered when rehabilitating roads (Gunathilaka and Amarasingha, 2020). According to the study, the Analytic Network Process (ANP) was recommended in the allocation of kilometers to the selected highways.

5.3 WHAT METHODS DO COUNCILS USE TO ENSURE THAT THE NUMBER OF KILOMETRES ALLOCATED TO EACH ROAD FOR REHABILITATION AND UPGRADE ARE WORKED ON?

Monitoring is critical in all road construction projects. This is because monitoring allows for the identification of issues that require care, resulting in better development and the delivery

of roads that are of tremendous value to many stakeholders. Five techniques were found in this study to ensure that the allotted kilometers for each road in need of restoration and upgrade were completed. Physical verification by workers from the three local governments, consultations with consultants, comparing what was done on site with what was written in the contract document, and procurement of works by the Road Development Agency are all examples of these techniques (RDA).

However, the majority of participants (about 48%) believed that physical verification was the best way for monitoring road building projects. This finding concur with a study by Nisar (2015) who noted that physical verification provides an on-the-spot assessment of project performance during its implementation phase. In general, only site visits or physical verification can accurately assess the overall physical development of any project. Physical verification has the advantage of allowing one to check if the work is being done according to the approved plan document and if there are any deviations from the approved plan (Nisar, 2015).

Physical verification also aids in determining the rate of progress of work in relation to the consumption of money in order to determine whether time and cost overruns are possible. Physical verifications allow for a forewarning of potential difficulties or hazards during the implementation phase, as well as the suggestion of remedial or corrective procedures. Ultimately, Physical verification, which serves as a means of quality assurance for road project completion, is the ultimate duty of Ndola City Council, Kitwe City Council, and Luanshya Muncipal Council, according to the study's conclusions.

The findings also revealed that around 22% of participants felt that consulting with independent consultants is the best way to monitor road development projects. This finding is consistent with that of Dadzie (2012), who stated that construction project consultants have the ability to help clients solve problems and improve project performance through monitoring; they are passionate about the wisdom and expertise they bring to the project; and they can galvanize clients into action.

In general, consultants ensure that the road construction project is finished to the highest quality, in accordance with technical requirements and design standards, on schedule and on budget, offering the employer a good return on investment (Dadzie, 2012). They also review and update design details, as well as review and update the contractor's program, conduct quality control tests, review and certify for payment the contractor's monthly invoices,

evaluate all claims for additional payment and time extensions, and prepare monthly, quarterly, and annual progress reports (Dadzie, 2012). In other words, having an unbiased independent consultant to assess the success of road construction projects is crucial.

5.4 CHAPTER SUMMARY

This chapter discussed the findings of the study aimed as assessing the factors affecting the selection of township roads for rehabilitation and upgrade at Ndola City Council, Kitwe City Council, and Luanshya Municipal Council in line with the research objectives. In this respect, findings of the present study and other studies in the literature were compared and contrasted. In the next chapter, conclusions relating to the three objectives of the study are given.

CHAPTER SIX: CONCLUSIONS

6.0 OVERVIEW

The discussion of findings was presented in chapter five. In this chapter however, conclusions are given in line with research objectives as outlined in chapter one.

6.1 CONCLUSION

The purpose of this study was to determine the characteristics that influenced the selection of township roads in Copperbelt Province, Zambia, that needed to be rehabilitated and upgraded. The study was led by three distinct aims in order to accomplish this. The initial goal in this regard was to identify the elements that influence the choosing of township roads. The second goal was to evaluate the factors that influenced the distribution of kilometers to chosen roads that needed to be rehabilitated. The third goal, on the other hand, was to reveal the councils' monitoring strategies for ensuring that the townships' assigned kilometers of road were being worked on. In view of these objectives, the study made the following conclusions.

6.1.1 Factors Affecting the Selection of Township Roads for Rehabilitation and Upgrade

To begin, the study argued that political intervention, positional interference, roads connecting to social amenities, road traffic flow, fiscal, and economic benefits of the roads are all key elements influencing the selection of roads that require restoration and upgrade in the three councils.

6.1.2 Factors Affecting the Allocation of Kilometers to Selected Roads That Needed Rehabilitation and Upgrade

Second, the research concluded that the distribution of kilometers to the selected roads for rehabilitation and improvement was mostly influenced by social, economic, environmental, present road condition, and political interference.

6.1.3 Methods Used To Ensure That the Allocated Kilometers to Township Roads Are Completed

Finally, the study concluded that the main methods used by Ndola City Council, Kitwe City Council, and Luanshya Municipal Council to monitor and ensure that the allocated number of kilometers to roads that required maintenance were completed, was physical verification by the three local authorities, engaging consultants, and comparing what was done on site with

the contract document. In essence, the comparison was mainly done by the local authorities, that is, Ndola City Council, Kitwe City Council, and Luanshya Municipal Council.

6.2 CHAPTER SUMMARY

In accordance with the research objectives, this chapter gave conclusions on factors that influenced the selection of township roads in the three local authorities. In terms of the first goal, political intervention was identified as one of the most important variables influencing the selection of township roads for rehabilitation and upgrade. However, when it came to allocating kilometers to specific roads, social and economic benefits emerged as the most important considerations that influenced the decision. Finally, physical verification by personnel from the three local authorities and the engagement of independent experts were employed to monitor and ensure that assigned kilometers for the selected roads were worked. Chapter seven contains recommendations based on the study's findings.

CHAPTER SEVEN: RECOMMENDATIONS

7.0 OVERVIEW

Conclusions were made in the preceding chapter regarding the factors influencing the selection of township roads in selected local authorities in Zambia's Copperbelt province. This chapter, on the other hand, is devoted to making recommendations based on the study's findings.

7.1 RECOMMENDATIONS

In light of the findings and conclusions reached, the following recommendations were made in order to improve road rehabilitation and upgrade in Zambia's Copperbelt Province.

- During both selection and allocation of kilometers to selected township roads, the Geography Information System (GIS) framework should be utilized. The justification for using GIS is that it helps in picking proper coordinates for roads that form a coordinated network of all new roads, as well as automatically dictating the number of kilometers to be allotted to each route. Since it specifies a start and ending place, having a coordinated network of selected townships would reduce the time required to check whether or not the assigned number of kilometers to the designated roadways had been met.
- To maintain independence and openness, independent experts should always be used when selecting and allocating kilometers to roads that require rehabilitation and upgrade.
- The Republic of Zambia's government should implement procedures to prevent political and positional intervention in the selection and allocation of kilometers to roads in need of rehabilitation and upgrade.

7.2 CHAPTER SUMMARY

The purpose of this chapter was to offer recommendations on the aspects that influenced the selection of township roads that needed to be rehabilitated in the three local authorities. In this regard, it was suggested that the three local authorities employ the Geographic Information System (GIS) in both selecting and assigning the number of kilometers to the selected roadways.

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APPENDIX I: SAMPLE QUESTIONNAIRE QUESTIONS

Below, you will find a series of statements about what respondents think, feel or do in their practice. Keep in mind that there are no good, bad, or correct or incorrect answers, we are only interested in your honest opinion. Try to respond by indicating whether or not you agree to the statements using the following scale:

1= strongly disagree; **2** = disagree; **3** = indifferent; **4** = agree; **5** = strongly agree

QUESTIONS		**1**	**2**	**3**	**4**	**5**
1	The engineering departments in Councils are involved in the selection of township roads rehabilitation and upgrade					
2	Apart from the departments which employees by title, the Planning departments are as well are involved in the selection of township roads required for rehabilitation					
3	The Councils consider Social Amenities such as hospitals, markets, schools and police stations when selecting roads that require rehabilitation					
4	Economic and Environmental benefits are considered when selecting roads that require rehabilitation					
5	Traffic flow is considered when selecting township roads that require rehabilitation and upgrade					
6	There are forms of Political and Positional interference selecting township roads for rehabilitation and upgrade					
7	Residential class varying from high cost, medium to low cost considered when selecting roads that require rehabilitation and upgrade					
8	Councils consider the road networks (connectivity) when selecting roads that require rehabilitation and upgrade					
9	To monitor the allocated number of kilometers for each selected road, the Council do physical verification by measuring and					

	consulting the contractors or contract documents					
10	Budget constraints and equipment availability play a role in roads selection for rehabilitation and upgrade					
11						

APPENDIX II: SURVEY QUESTIONNAIRES

The University Of Zambia

School Of Engineering

Department of Civil and Environmental Engineering

Dear Respondent,

RE: AN ASSESSMENT OF THE SELECTION CRITERIA USED BY SOME SELECTED COUNCILS IN IDENTIFYING ROADS THAT REQUIRE REHABILITATION AND UPGRADE FOR APPROPRIATENESS.

I am a Master of Engineering in Business Administration student at the University of Zambia conducting a research under the above title. The main aim of this research is to assess the factors affecting the selection of township roads that require rehabilitation and upgrade in some selected councils of the Copperbelt Province, Zambia.

You have been identified as a potential respondent as a key stakeholder in public works road construction, I therefore write to request your voluntary participation in this study by responding to the questionnaire. Please find attached to this letter a questionnaire, based on your professional experience and understanding. Please be assured that the information

provided in this study will be highly confidential and will be used for academic purposes only.

I greatly appreciate your contribution towards this research.

Thank you in anticipation.

Cell:

Email:

SURVEY QUESTIONNAIRE

NOTE:

The information you are providing is highly confidential and will only be used for academic purposes. On the essay type of questions try by all means to be brief when answering, I would like to thank you in advance for sparing time off your busy schedules to fill in the questionnaire.

SECTION A: GENERAL INFORMATION

Q1. What is the name of your current employer?

……...

Q2. What is your current position at the Company?

……

Q3. How long have you served in the Local Government?

……

Q4. Which departments in Councils are involved in the selection of township roads rehabilitation and upgrade?

…….

Q5. Part from departments which employees by title are involved in the selection of township roads required for rehabilitation?

……
…

SECTION B: ASSESSMENT OF SELECTION STRATEGIES

(Please write and tick where appropriate)

Q6. What do Councils consider when selecting township roads that require rehabilitation and upgrade?

a)..... d)……

b)…….. e)……

c)……..

Q7. Is there any form of political interference when selecting township roads that require rehabilitation and upgrade? **Yes or No**

Q8. Is there any form of positional interference at work when selecting township roads that require rehabilitation and upgrade? **Yes or No**

Q9. Is the residential class say high cost, medium cost and low cost considered when selecting roads that require rehabilitation and upgrade? **Yes or No**

Q10. If yes how do the councils use that information?

……
……
…..

Q11. To what extent do you agree that Councils consider the residential class e. g Low Cost, Medium Cost and High Cost when selecting roads for rehabilitation and upgrade?

0%		25%		50%		75%		100%	

Q12. Is traffic flow of the road considered when selecting roads that require rehabilitation and upgrade? **Yes or No**

Q13. If yes how do councils use the traffic flow in the selection of township roads for rehabilitation and upgrade?

……
……
….

Q14. To what extent do you agree that Councils consider traffic flow of the roads when selecting roads for rehabilitation and upgrade?

0%		25%		50%		75%		100%	

Q15. Is the network of the roads (connectivity) considered when selecting roads that require rehabilitation and upgrade? **Yes or No**

Q16. If yes how do councils use the network of the roads in the selection of township roads for rehabilitation and upgrade?

……
……
…

Q17. To what extent do you agree that Councils consider the network of the roads when selecting roads for rehabilitation and upgrade?

0%		25%		50%		75%		100%	

Q18. Are social benefits of the roads such as easy access to market places, hospitals, police stations considered when selecting roads that require rehabilitation and upgrade? **Yes or No**

Q19. If yes how do councils use the social benefits in the selection of township roads for rehabilitation and upgrade?

……
……
…

Q20. To what extent do you agree that Councils consider social benefits of the roads when selecting roads for rehabilitation and upgrade?

0%		25%		50%		75%		100%	

Q21. Are Economic Benefits of roads considered such as reducing travel costs considered when selecting roads that require rehabilitation and upgrade? **Yes or No**

Q22. If yes how do councils use economic benefits of the roads in the selection of township roads for rehabilitation and upgrade?

……

……..

Q23. To what extent do you agree that Councils consider economic benefits of the roads when selecting roads for rehabilitation and upgrade?

0%		25%		50%		75%		100%	

Q24. Are Environmental benefits of the roads considered such as tourism sites when selecting roads that require rehabilitation and upgrade? **Yes or No**

Q25. If yes how do councils use the environmental benefits of the roads in the selection of township roads for rehabilitation and upgrade?

……

…….

Q26. To what extent do you agree that Councils consider environmental benefits of the roads when selecting roads for rehabilitation and upgrade?

0%		25%		50%		75%		100%	

SECTION C: TO ESTABLISH AND DETERMINE THE STRATEGIES USED TO ALLOCATE AND MEASURE THE NUMBER OF KILOMETRES PER ROAD

Q27. What do councils consider when allocating the number of kilometers to every selected road for rehabilitation and upgrade?

……

……..

Q28. How do Councils monitor whether or not the allocated number of kilometer for each selected road for rehabilitation has been achieved?

.....

.....

.....

Q29. What challenges does Councils face when selecting township roads that require rehabilitation and upgrade?

……

…

Q30. What challenges do councils face in allocating the number of kilometers to every selected township road that require rehabilitation and upgrade?

……

END OF QUESTIONNAIRE

THANK YOU FOR YOUR PARTICIPATION

APPENDIX III: RESEARCH BUDGET

S/N	DESCRIPTION	QUANTITY	UNIT PRICE	TOTAL AMOUNT
1	Ream of paper	1	K150	K150
2	Printing and photocopying	40 questionnaire by 3 pages (120 pages)	K2	K240
3	Transport to and from research sites	2 trips	K300	K600
4	Pens and other accessories for data collection	1 Box	K150	K150
5	Miscellaneous Expenses	1	K6000	K6000
TOTAL				K7,140