FACTORS INFLUENCING MAINTENANCE OF BITUMEN ROADS. A CASE OF KENYA NATIONAL HIGHWAY AUTHORITY ROADS IN KISUMU COUNTY, KENYA

SIMON GATERU WAMBUGU

A Research Project Report Submitted in Partial Fulfilment of the Requirements for the Award of the Degree of Master of Arts in Project Planning and Management of the University of Nairobi

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DECLARATION

This research project report is my original work and has not been presented for study in any other university.

Signature………………………………………… Date……………………

Simon Gateru Wambugu

L50/83644/2015

This research project report has been submitted for the award of the degree with my approval as University supervisor.

Signature ……………………… Date……………………

Dr Stephen Wanyonyi Luketero

Senior Lecturer

School Of Mathematics

University Of Nairobi
DEDICATION
I dedicate this project to my family and friends who have stood as my pillar throughout the project.
ACKNOWLEDGEMENT
First and fore most I would like to thank Almighty Father for care, protection and provision throughout my studies. I am greatly indebted to my Supervisor Dr. Stephen Luketero for his guidance, encouragement and concern for me. I acknowledge the support offered by my group members and fellow classmates towards the completion of this project.

Special thanks go to the Meru extra mural center staff for availing all materials at their disposal in support of the project, and for their guidance and encouragement.

To all of you I say may God Bless you abundantly.
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ABBREVIATIONS AND ACRONYMS

AERC: African Economic Research Consortium
AFCAP: African Community Access Programme
AFDB: African Development Bank
DFID: Department for International Development
IEA: Institute of Economic Affairs
ILO: International Labour Organization
KeERRA: Kenya Rural roads Authority
KeNHA: Kenya National Roads Authority
KIPPRA: Kenya Institute for Public Policy Research and Analysis
KURA: Kenya Urban Roads Authority
MDGs: Millennium Development Goals
MTRD: Material Testing and Research Department
NCST: National
PIARC: Permanent International Association of Road Congress
RICS: Roads Inventory and Conditions
RoK: Republic of Kenya
RMI: Road Maintenance Initiative
SACTRA: Standing Advisory Committee on Trunk Road Appraisal
SIDA: Swedish International Development Cooperation Agency
SPSS: Statistical package for social sciences
UNECA: United Nations Economic Commission for Africa
WTO: World Trade Organization
ABSTRACT

Construction and maintenance of infrastructure are critical in promoting economic growth and poverty eradication. Cost of production, creation of employment, market accessibility and investment depend on the quality of infrastructure, especially transport. Road networks form important link between production points and markets. The purpose of the study was to examine the influence of social economic factors on maintenance of bitumen roads in Kisumu County. The following specific objectives guided the study: To determine the influence of availability of funding, political leadership, availability of construction material and staff management competence on maintenance of bitumen roads in Kisumu county. The information gathered in this study was aimed at assisting the Kenya national highway authority Board of Directors and Management to closely monitor the changes of the bitumen road network. Descriptive research design is employed in this study. A target population of 54 respondents from Kenya highway roads authority and other stakeholders was used. The study used a census approach and all members of the target population included in the sample of study. Questionnaires were used in data collection. Raw data was first cleaned for errors, coded, analysed and categorized as per the research questions in order to simplify it for presentation. On ethics, initial approval was secured from the University of Nairobi. A research permit was sought from the NCST. The respondents were also assured that the information given was for research purposes only and was treated with utmost confidentiality.

From the findings the study concluded that availability of funds, political leadership, availability of construction material and staff management competence positively and significantly influences maintenance of Bitumen roads in Kisumu County. The study recommends that: The road funding for the agency should be increased so that more bitumen roads to be routinely maintained to put in a good condition to speed up development. There is need to set up a special unit within the Road Agency that would manage and address all issues related to political interference so that public will get services without any discrimination. Being alive to the fact that the road authorities in Kenya were formed seven years ago through Act of Parliament, its successful existence cannot be fully concluded. There is need for further research on strategy implementation in the authority.
CHAPTER ONE
INTRODUCTION

1.1 Background of the Study
All over the world the dominant mode of transport is road transport. It is estimated that more than 75 per cent of freight traffic and over 80 per cent of passengers are carried by roads. Roads are, in this way, basic for financial improvement and neediness diminishment on the planet (Abedi, 2007). Road decay because of absence of upkeep has turned into a developing issue in various creating nations (Kocher, 2012). The essential protest of road support is understood in the word itself. It is done to guarantee that the road built or enhanced, is kept up in its unique condition. It is acknowledged that over the life of the road it will fall apart because of the variables with which upkeep exercises can't bargain. By and by, support is expected to moderate this weakening and should start when the road change is finished (ILO, 2011).

Notwithstanding the significance of roads in the locale, roads are ineffectively overseen and insufficient subsidizing is accommodated upkeep. Expansive segments of the systems in Sub-Saharan Africa are, subsequently, in poor condition. Financial development is, in this way, smothered because of high transport costs which are because of high vehicle working expenses. Bitumen roads in most Asian countries such as Mongolia, Indonesia, Philippines, Cambodia, Bangladeshi and Vietnam: represent between 30% and 40% of the total network. In most of these countries, road maintenance is conspicuously absent. Inadequate assets are allotted and even where the assets are accessible, they are for the most part not used inside the arranged support structure. Or maybe, the assets are utilized to revise significant deformities which have been caused by the nonattendance of preventive upkeep. The ramifications of absence of this support are extreme.

The Sub-Saharan Countries also face the same problem and even much worse. South Africa has 746,978 Km of Road Network with only 20.6% paved (Mamabolo, 2013). This is most replicated in most other countries of the Continent (Asif, 2012). As indicated by Ahmad (2016), support is dependably an unquestionable requirement for any structure with a specific end goal to keep up its serviceability and to forestall crumbling that may abbreviate the administration life. In all actuality, support works are not given the consideration it ought to have a financial plan allotted for upkeep work in which from time to time turn into an earlier thought. Notwithstanding, upkeep is the most
essential action to be completed to drag out or possibly keep up serviceability of structure until the finish of its administration life.

Africa has poorly maintained bitumen roads compared to developed nations (Mamabolo, 2013). The huge contrast is somewhat because of assorted levels of advancement as a rule, however it likewise mirrors the essential geographic actuality that Africa is a huge mainland, frequently with immense separations between the principle population and generation focuses. The vast size of the landmass and the far reaching of population just raises the importance of transport in all advancement choices. This absence of sufficient transportation impacts the level of business action by bringing down profitability and restricting the section of new undertakings. Organizations in Africa either supply to divided provincial markets, or confine themselves to showcase openings with benefits sufficiently substantial to take care of the high transport costs (Ramachandran, 2012).

The generally scanty road does not infer an absence of significance of road transport. Or maybe, road transport is the most imperative mode. Many years of under-capitalization, poor administration and general disregard of the railroads have moved road transport to the most vital methods for transport in Africa. Road transport represents more than 80% of all cargo and traveler developments in Africa and there are no signs that this position will be debilitated amid the not so distant (AfDB, 2013). The current road in sub-Saharan African nations were initially settled to benefit the particular needs and premiums of the provincial forces who used Africa as an import and fare market to fuel local monetary development. Thusly, in the wake of having accomplished freedom, African countries acquired a transportation framework that was outward looking instead of equipped towards enhanced exchange and transport with neighboring African nations (AfDB, 2013).

In 1998, the vehicle part in Kenya involved a road connect with 150,000 km of roads and 350,000 vehicles, a solitary track railroad running from Mombasa to Uganda, a noteworthy seaport at Mombasa, little ports at Lamu and Malindi, a ship administration to Uganda, an oil pipeline from Mombasa to Kisumu by means of Nairobi and Eldoret, four worldwide and numerous little airplane terminals, and three inland holder stops (Detges, 2016). With a 34% offer in the aggregate transport division in 1998, road transport has the most astounding commitment to national yield among the vehicle frameworks. It is followed by air transport, with 25%, and water transport, with 16% (Ikiara, 2000). Considering that this level of execution was accomplished over a time of lacking
road support, clearly the subsector and by suggestion the road framework approach holds the potential for quick monetary development and destitution decrease through its effect on generation costs, business creation, access to business sectors, and venture (RoK, 2000).

Because of the falling apart state of the road organize and the high related monetary expenses being experienced, African nations under the aegis of the United Nations Economic Commission for Africa (UNECA) counseled with the World Bank, the giver group and different partners offering ascend to the making of a Road Maintenance Initiative (RMI) in 1988 where the RMI set out the expansive blueprint of another approach structure for the road area went for practical administration and financing of open road benefits in Africa. Experience increased under the RMI, proposes that the key idea required to defeat the above issues is commercialization: bring roads into the commercial center, put them on a charge for-benefit premise, and oversee them like some other business endeavor. Be that as it may, since roads are an open imposing business model, and responsibility for roads will stay in government hands for quite a while to come, commercialization requires integral changes in four other critical zones. (Detges, 2016).

In conclusion, the maintained exchange with Development Partners, governments in Sub-Saharan Africa hence left on changes in the road Sub-Sector in the mid-1990s. The changes go for giving the road client incentive to cash through better administration, and by bringing roads into the commercial center. The changes are to guarantee expanded and unsurprising road upkeep subsidizing through proper cost recuperation strategies.

1.2 Statement of the Problem

Improvement and support of physical framework are critical to fast financial development and destitution lessening. Generation costs, work creation, access to business sectors, and speculation rely upon the nature of framework, particularly transport. Road systems shape essential connections between generation focuses and advertises. Moreover its numerous capacity of giving access to business, social, wellbeing and instruction administrations influences road to arrange essential in battling against neediness by opening up more territories and fortifying monetary and social improvement. There is an issue, be that as it may, which is regular all through the world, the disregard of looking after roads. Building new roads cost cash, however without keeping up the roads legitimately, they fall apart rapidly. In the case of nothing is done, roads with a plan life of decades can require supplanting or significant repair work after only a couple of years.
Different studies demonstrated this was owing to deficient arrangements for the financing and the administration of roads. The Kenyan government has been worried over the divided idea of the institutional structure for the vehicle part. As to road, it is viewed as that the foundation of the Kenya Roads Board in 2000 and the authorization of the Kenya Roads Act in 2007 which built up the KeNHA, KURA and KeERRA were to go far in enhancing the lawful and institutional structure for road advancement and support (Ministry of Transport, May, 2009). This study tries to build up the impact of social monetary factors on upkeep of bitumen roads in Kisumu area.

1.3 Purpose of the Study
The purpose of the study is to examine the influence of social economic factors on maintenance of bitumen roads in Kenya with a special focus of KeNHA roads in Kisumu County.

1.4 Objectives of the Study
The study is guided by the following specific objectives

   i. To determine how availability of funds influence on maintenance of bitumen roads in Kisumu county
   ii. To evaluate the influence of political leadership on the maintenance of bitumen roads in Kisumu county
   iii. To assess the influence of availability of construction material on maintenance of bitumen roads in Kisumu county
   iv. To find out the influence of staff management competence on maintenance of bitumen roads in Kisumu county

1.5 Research questions
i. To what extent does availability of funds influence maintenance of bitumen roads in Kisumu County?
ii. To what extent does political leadership influence maintenance of bitumen roads in Kisumu County?
iii. How does availability of construction material influence maintenance of bitumen roads in Kisumu County?
iv. To what extent does staff management competence influence maintenance of bitumen roads in Kisumu County?
1.6 Significance of the Study
The information gathered in this study will be aimed at assisting the Kenya national highway authority Board of Directors and the Management to closely monitor the changes of the bitumen road network. Also, to come up with the appropriate measures to counter the challenges currently being experienced on maintenance of bitumen roads in relation to the area under study.

For academicians and researchers, they would do an in-depth investigation on the effectiveness of managing bitumen roads maintenance by Kenya national highway authority. Through studying the degree or the quantitative measurements of their challenges, the study will enable them to carry out further studies as they progress in advancing their knowledge.

The findings of the study may help to show a solid understanding of the regulatory framework and the recommendations on the appropriate regulations that will be necessary for maintenance of bitumen roads. The outcome of this process will inform the specific measures that either will be developed or may address the specific challenges that influence either the increase or decline of the effectiveness of managing bitumen roads maintenance by Kenya national highway authority.

1.7 Scope of the Study
This study will be restricted to the sampled respondents involved in roads within Kisumu County and solicit information deemed to be representative of the situation in the County. The research will be limited to the social cultural factors that influence maintenance of bitumen roads in Kisumu County with a view to identifying options to guide policy and programs in enhancing the activity. The research was carried out during the month of June and September 2017 and was restricted to the area demarcated as Kisumu County. It was also assumed that the sampled respondents were knowledgeable and could provide current and relevant data as per the objectives of the study.

1.8.1 Limitations of the Study
The study used descriptive survey design which tends to be unpopular for studies that are too detailed to be fully explained by description. The researcher had a clear perception of what the study intends to cover, failure to which the results may had led to inappropriate data collection. The respondents in descriptive survey design tend not to be truthful and give inappropriate answers and the assumption was that the respondents are knowledgeable and can give answers that answer the research questions. There are other intervening variables like environmental factors and
moderating variables like government policy that affect the relationship between the factors influencing maintenance of bitumen roads thus limiting the study.

1.8.2 De-Limitation of the study
This study focused on stakeholders in the road sector within the boundaries of Kisumu County. The study concentrated on few independent variables like level of funding, political leadership, availability of construction materials, contractor competence and staff management. This means that there are other variables that are influential to maintenance of bitumen roads. During the administration of the questionnaire the sampled respondents were informed by the researcher that the information given would only be used for research purposes and would be treated with uttermost confidentiality. This created trust between the researcher and the sampled respondents

1.9 Basic Assumptions of the Study
The study assumed that there were no serious changes in the composition of the target population that would affect the effectiveness of the study sample. This study also assumed that the respondents will be honest, cooperative and objective in the response to the research instruments.

1.10 Definition of Key Significant Terms
**Asphalt** – A mixture of bitumen with crushed stones, aggregates, sand or fill materials used for road paving and roofing.

**Bitumen** – A dark thick blend of hydrocarbons got normally or as a buildup from refining.

**Gravel** – The natural material used for road construction, sometimes referred to as murram.

**Maintenance** – Exercises required or embraced to preserve as about, and to the extent that this would be possible the first state of an advantage or asset while making up for typical wear and tear.

**Pavement or road surface** – This is a solid surface material laid on a region planned to maintain vehicular or pedestrian activity.

**Rehabilitation** – Restoring the road to previous condition, by strengthening or replenishing the existing vulnerable formation which suffer damage.

**Road maintenance** – Reasonable customary and intermittent exercises to keep asphalt shoulders inclines, surface, seepage offices and every single other structure properties edges as close as conceivable to their built or reestablished conditions.

**Road networks** - A persistent portion of a road straight or bended with a consistent number of paths all through its entire length.
Shoulder – Paved or unpaved part of the roadway next to the outer edge of the pavement. The shoulder provides the side support for the pavement and allows vehicle to slip or pass in an emergency case.

Unpaved or unsealed road – A road with seal or gravel surface.

1.11 Organization of the Study
This study was organized into five chapters. Chapter one contains the introduction to the study. It presents background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the Study, delimitations of the study, limitations of the Study and the definition of significant terms. On the other hand, chapter two reviews the literature based on the objectives of the study. It further looked at the conceptual framework and finally the summary. Chapter three covers the research methodology of the study, it describes the research design, target population, sampling procedure, tools and techniques of data collection, pre-testing, data analysis, ethical considerations and finally the operational definition of variables. Chapter four presents analysis and findings of the study as set out in the research methodology. The study closes with chapter five which presents the discussion, conclusion, and recommendations for action and further research.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction
This section consists of the theoretical framework for the study, review of the literature on variables, the conceptual framework, and empirical review, critique of the existing section provides the theories that support the variables under investigation.
2.2 Availability of funding and bitumen road maintenance
A study by the World Bank (2010), taking a gander at framework in Sub-Saharan Africa provides reason to feel ambiguous about the reasonability of prohibition through toll financing, notwithstanding for real trunk roads. It takes note of that toll roads right now make up just 0.1% of the districts formal road arrange, and that these are discovered altogether in South Africa. Going further, it gauges that a base movement volume of 15,000 vehicles daily is important for toll concessions to be monetarily reasonable, and that these conditions exist on under 10% of the current Sub-Saharan road organize, with these zones amassed in South Africa and a few territories of Nigeria. These gauges exhibit the troubles of suitable prohibition in the roads part, yet in addition outline that there is unexploited potential for doing as such, at any rate inside South Africa and Nigeria, and this may turn out to be more reasonable later on, if and when activity volumes increment.

While the cost of road support is little with respect to the benefit esteem, it is pivotal that upkeep is done on a convenient and customary premise. Therefore it is a repetitive action and should be financed in that capacity. The assets assigned to it should identify with an upkeep arrange for which characterizes those roads in a viable condition and characterizes a repetitive cost for the system. Assets apportioned to road support are diverted to interurban roads dismissing rustic roads. Lamentably, road upkeep is regularly seen as an arrangement of tasks to be done on roads which, as a result of absence of support, have crumbled to a state where they require re-development. (ILO, 2012).

Upkeep subsidizing is a noteworthy issue in the road division. The outcome is that real parts of the nations’ road systems get practically zero support starting with one year then onto the next. The further down the system one goes, the lower the measure of assets that are accessible (ILO, 2007). One IPFRI examine by Fan and Chan-Kang (2004), finds that low standard roads have advantage/taken a toll proportions for national GDP in China that are around four times bigger than the advantage/cost proportions for high standard roads. Mobilizing the resources necessary to finance road maintenance is of paramount interest in most developing countries. In Bangladesh, donors’ role in infrastructure maintenance financing is not substantial as it has been visualized by the donors that after the completion of project, maintenance are government’s responsibility.
Donors’ role is limited to the maintenance of project feeder roads within the project period (Ahmed, 1997).

In India, Aggarwal and Singh (2010) remarks that there is a ceaseless decrease in the asset arrangements for support of bitumen roads in India. Adequate assets are not accessible for general support of roads. Henceforth, convenient support isn't being done. Nonappearance of opportune upkeep brings about serious harms. Rebuilding works are exceptionally costly and time escalated. An ILO (2006) examine in Madhya Pradesh additionally represented the uncertainty caused by an absence of prescience in degenerating bitumen road upkeep obligations (ILO, 2006). The investigation called attention to that the spread of duties regarding road support inside the different levels of government has prompted a circumstance where nobody organization feels in charge of maintaining the country road arrange. The investigation demonstrated that almost no road upkeep has been conceivable because of absence of assets and an absence of appropriate arrangement and institutional system. In any case, shortcomings in the execution limit combined with the absence of lucidity of the institutional duties are covered up as the accentuation has been put on the insufficiency of assets. While the requirement for satisfactory assets is obvious it is the more basic institutional issues which require consideration (ADB, 2006).

There have been considerable improvements in the financing bitumen roads maintenance in Bangladesh since early 90s. An analysis shows that current resource requirement for maintenance is closely matched with the resources available. Bangladesh in the past has not paid attention to planned road maintenance, achievements in the context of bitumen feeder road maintenance financing in recent times are laudable. More efforts is still needed to achieve sustainable solution to bitumen road maintenance, financing of present stocks and planned improved stocks of road infrastructure (Ahmed, 1997).

Roads funds have been set up in several African countries in order to ensure stable flow of fund for operation and maintenance of road infrastructure (de Richecour & Heggie, 1995). Some of them were set up also to finance transport studies, road safety programmes, road rehabilitation and new investment. The first Road Fund in Africa was set up in South Africa in 1935 and the remainder were established in the 80s and 90s (de Richecour & Heggie, 1995). Road Fund derives its revenues from road users’ charges - mainly fuel levy, bridge and ferry tools and an earmarked
portion of other taxes and charges. The Road Funds are special account held either at a Central Bank or a commercial bank.

Figures for general reserve portion and consumption on road upkeep are famously hard to obtain. Support is regularly not delegated a different thing in the financial plan or it is recorded under the capital speculation spending plan as opposed to the repetitive spending plan; spending plans for upkeep are frequently utilized for development, assets might be reserved for ventures which in reality are occasional upkeep exercises, distinctive offices are in charge of various classes of roads, frequently intermittent spending plans don't separate between road support and other intermittent exercises. Distributions, especially at the neighborhood level, are more hard to recognize (ILO, 2007).

Road support assignments, being a piece of the repetitive spending plan, are effectively appropriated for other all the more squeezing exercises. Indeed, even where there is a financial plan for road support regularly little is spent on upkeep exercises thusly. The roads are in such a parlous state, to the point that the cash is spent to keep some key connections open. Hence the spending that exists for upkeep is frequently spent on what can be portrayed as repairs, remaking and crisis support works (ILO, 2007).

2.3 Political leadership influences and bitumen road maintenance
In Vietnam the inclination for road development far beyond upkeep, and the readiness to exchange help cash for that reason, demonstrates that neighborhood government officials see road development as more politically striking and face political motivators that reward them for organizing development over support (Walle and Mu, 2007).

In setting of Peru, taking a gander at both the cutting edge time and the prompt post-Independence period, the capacity of road development to permit more noteworthy government impact in the regions and simpler preparation of the coercive power of the state implied that, even where roads were not requested, or even were opposed, they were still in the long run gave (Wilson (2004)). In the present period, there is an unmistakable arrangement between remarkable quality rising up out of this want to extend state specialist and request from individuals for availability. This guarantees road development is an exceedingly politically striking assignment and that, to a substantial degree, upkeep misses out accordingly.
Kenya gives a decent case of how political polarization can prompt political market defects that at that point give motivating forces to road development focused for support purposes. Burgess et al. (2009) noticed that Kenya has extraordinary political and provincial fracture, with five gatherings involving 70% of the population, which have a high level of geographic focus and social isolation. They contend this gives the perfect conditions to territorial partiality and support governmental issues, as assets can be focused to lawmakers’ provincial power bases effortlessly and solid characters give a typical purpose of political recognizable proof for inadequately educated voters.

For the roads division, this adds to the preoccupation of assets particularly cleared road development ventures towards regions that host offered help for decision gatherings and legislators. Burgess et al. (2009) show this by investigating an exhaustive dataset of post-Independence time data on road development designs in Kenya, the geographic appropriation of political groupings and the characters and home districts of focal government priests. They find solid proof that road upkeep in any given year is firmly identified with the home areas of the senior priests and the clergyman of open works, and to political gatherings spoke to in the Cabinet, with the second biggest gathering accepting a specific support.

This proposes lawmakers have utilized road development as a system for circulating support, either to secure their own energy bases, or to guarantee political strength. This may add to under-arrangement of roads in a few territories and a disintegration of the road organize in regions that do not have a high-positioning priest or political associations. Political market flaws can mean political pioneers abuse the status of roads as a very obvious and request great with a specific end goal to utilize them as a device for support, encouraged by abnormal amounts of awry data. Motivating forces can prompt expanded venture costs that breaking point organize development, circulation of road assets to territories that are politically critical to the detriment of others and wasteful prioritization of exceptionally unmistakable and politically remunerating development and restoration ventures when general support would deliver better road quality for far less consumption.

Decision in regards to the reason and extent of effect assessments are political and has imperative ramifications for the choice of suitable philosophies, the sorts of information and conclusions created, and development and utilization of these. It is significant in this way, that satisfactory time
is figured in for the important support of all partners in characterizing the reason and extent of effect assessments, (Patton, 2008).

The key issue is whether the inquiry being postured in the effect assessment is pertinent to these necessities. On the off chance that they are not, at that point there is a high like hood the assessment won't see generous take-up, Patton, (2008). Road stores are for all intents and purposes under the control of legislators who propose the undertakings in their voting public as well as present and vote in favor of their evaluations in Parliament. It is odd and against the rule of partition of forces for Members of Parliament to submit yearly gauges to themselves for endorsement, partake in the genuine spending and afterward question the spending themselves through Public Accounts Committee or Public Investments Committee, to the degree that individuals from Parliament have a key part in the recognizable proof and execution of the undertakings, we do expect decisions are affected by political boost, (Mwangi, 2005).

Lion's share of constituents in some chose voting demographics in Kenya took road stores for the nearby as government officials possess improvement motion reached out to the general population. With this sort of mindset, it is normal that when such finances are stolen, the neighborhood individuals may not know, and if so might be not able inquiry or may not know the channel through which to gripe (Mapesa, Kibua, 2006)

2.4 Availability of Construction Material and maintenance of Bitumen Roads
Just like the materials used for the manufacture of garments making them durable, the materials used for road constructions should also be well checked and tested for it to achieve its purpose. Material testing and research department (MTRD) is charged with the responsibility of research and testing materials for quality and standard compliance both in government and private sector construction and industry. Specifically, MTRD’s mandate is testing and research on roads and building construction materials, road pavement design and construction specifications, construction quality control and assurance and post construction evaluation of roads and other infrastructure (AFCAP, 2012). Any materials used for roads such as murram, concrete, bitumen and aggregates should be tested for recommendation by the relevant officers. Therefore where such procedure isn’t the roads maintained may have problems to the users.
Bitumen are visco-flexible materials and their conduct fluctuates from absolutely thick to versatile, contingent on the season of stacking and the temperature. Amid the blending and compaction of thick black-top blends, for instance, and for a wide range of bitumen surfacing at high administration temperatures, the properties can be considered as far as consistency at the same time, for most administration conditions, bitumen's carry on visco-flexibly and their properties can be communicated as a solidness modulus. Different tests are led on bitumen to evaluate its consistency, degree, thickness, temperature weakness, and wellbeing. Bitumen in its emulsified shape is utilized as a part of an extensive variety of uses for development, upkeep and preventive support medications.

This is characterized as the proportion of worry to coming about strain (or their separate amplitudes, if the stacking is sinusoidal) and is comparable to Youngs' Modulus of versatility for other designing materials, for example, steel and bond concrete. The incentive for a bitumen isn't, in any case, consistent however will rely on the time and temperature of loading. The solidness modulus can be measured specifically with uncommon mechanical assembly under a particular conditions or can be evaluated with adequate exactness for most purposes from the standard infiltration and softening point information. In spite of the fact that the mind boggling modulus is regularly utilized as a part of basic work, it has no functional favorable position over protection from misshapening in light of disintegration.

Broad investigations of the conditions causing the break of bitumen and black-top blends have demonstrated that this conduct is specifically identified with solidness modulus and that, in a similar manner as different materials, both bitumen and black-top blends are liable to disappointment by exhaustion. Data picked up from these investigations of mechanical properties might be utilized to get a superior knowledge into the connection between the level and sort of bitumen and its execution in application and administration out and about.

Materials are basic in the operations in each industry since inaccessibility of materials can stop creation. What's more, inaccessibility of materials when required can influence efficiency, cause postponements and conceivable suspension of exercises until the point that the required material is accessible. Inaccessibility of materials isn't the main viewpoint that can cause issues. Exorbitant amounts of materials could likewise make significant issues to directors. Capacity of materials can build the expenses of generation and the aggregate cost of any venture (Ali, Smith and Pitt, (2012).
At the point when there are restricted zones accessible for capacity, the chiefs need to discover different contrasting options to store the materials until the point that they are required. Some of these choices may require re-treatment of materials, which will expand the expenses related with them.

Arrangements ought to be grasped to deal with and store the materials satisfactorily when they are gotten. Extraordinary consideration ought to be given to the stream of materials once they are obtained from providers (Aliverdi, Naeni and Salehipour, 2013). Enshassi, Mohamed and Abushaban (2009) considering factors influencing the execution of development extends in the Gaza strip found that the most imperative variables concurred by the proprietors, specialists, and temporary workers as influencing the execution of development ventures were material costs, quality and accessibility of assets.

Gichaga (1982 ) carried out a field study to determine the various types of distress features of flexible pavements in Kenya and found them to be cracks, potholes, severe deformations, shear failure, edge failure, surface ravelling and fretting, breaking up of patched areas, poor trench reinstatement, poor verge maintenance and poor drainage maintenance. The study concluded that pavements give higher deflections with increase in repetitions of traffic loads and that they develop strength with age. Further, he observed that, Pavements made up of cement stabilized murram base showed lower elastic deflection than that made of crushed stone bases. Pavements made up of cement stabilized murram base showed less rutting than that made up of crushed stone base. Pavements made up of crushed stone base showed high rate of cracking than that made up of cement stabilized murram base (Muhammet & Braimah (2010).

Higher elastic deflections are obtained during the months of high rainfall and high air temperatures. For a pavement, approaching failure, elastic deflections tend to increase with increase in cracking. Road pavements with surface dressing as a form of surfacing have continued to perform well for periods in excess of fifteen years despite heavy traffic loading in the pavements studied (Aliverdi, Naeni & Salehipour, 2013). This emphasizes the need for materials with improved characteristics to cater for great demands that are placed on the permanent deformation resistance of asphalt mixtures.
2.6 Staff Management competence and bitumen road maintenance

Administration is a specialty of completing things through individuals, proficiently and adequately. Henry Minzberg (1973), in his book the Nature of Managerial Work (referred to in Robbins, 2003) gave ten parts of supervisors play for expanding administrative viability, which can be separated into relational parts, enlightening parts and decisional parts. Keeping in mind the end goal to assume these parts successfully, administrators require a few arrangements of abilities; Robbins (2003) likewise refered to Robert Kaltz three sorts of administrative aptitudes, which incorporates specialized abilities, human aptitudes and theoretical abilities.

Associations are stood up to by ceaseless change to their items, administrations, process, markets, rivalry and innovation. These progressions expect directors to react with better approaches for considering and carrying on. Progressively, it is perceived that the information and aptitudes of chiefs influence the upper hand of associations (Korter, 1988; Pedler, 1989). Various scientists have considered the administrative part and the aptitudes required for compelling execution (Kaltz, 1955; Mintzberg, 1975; Burgoyne and Stuart, 1976; Boyatzis, 1982).

Studies concerning viable directors and fruitful chiefs keep on equating viability with progress, which is every now and again attributed to an administrator's procedures or abilities as a pioneer, for the most part without lucid hypothesis (Calonious 1990; Lipshitz and Nevo 1992; Davidhizar and Shearer 1993; Hill 1998; Landry 1999; Miller 1999).

Run of the mill concerns have included breaking rules, learning procedure, staying away from forceful lead, passionate insight, time administration, and relevant impacts. A few investigations are more engaged upon what makes for a compelling administration vocation, and they excessively tend, making it impossible to accentuation initiative ranges of abilities. To succeed, chiefs need to form aptitudes to fit into the corporate culture (Pearse and Bear 1998), and to have a capacity to gain for a fact (Spreitzer, McCall and Mahoney 1997).

From perception, most roads don't keep going sufficiently long as intended to last. This has been ascribed to poor workmanship and absence of appropriate administration. In spite of the fact that administration and control issues are basic to powerful execution of the vehicle division in Africa, there has been little research in this field (DFID, 2012). A couple of studies give some sign of the size of the issues among transport unions that can confine the advancement of productive and
reasonable transport administrations (Benmaamar, 2012). In Zambia, of the nine road offices, one has fell and two are near falling (Malawi and Mozambique), and four are vigorously reliant on exiles (Botswana, Lesotho, Namibia, and Tanzania (World Bank, 2013).

Task administration aptitudes are a key component in a road development undertaking and ability is a basic factor impacting venture arranging, planning, and correspondence (Ika, 2009). Factors under this factor comprise of the aptitudes and qualities of undertaking administrators, their dedication, skill, experience, and specialist (Davis, 2014). A road development venture requires cooperation; accordingly, group building is essential among various gatherings. Collaboration by all gatherings to an agreement; proprietor, build, development supervisor, temporary worker, and subcontractors is a critical element for the effective fulfillment of an undertaking (Hassan, Airey, Khan and Collop, 2012). Accordingly, inspiration is essential to guarantee open to workplace inside and around venture destinations. This does not aphoristically exist without duty from the best administration of all venture parties. The duty of best administration toward the undertaking is imperative and its dedication and support is a urgent prerequisite for venture achievement (Serrador and Turner, 2014). It is noticed that best administration ought to be comprehended to mean best administration of all concerned task parties. Top administration bolster exhibits unmistakably how solid the sense of duty regarding the undertaking is. For instance, venture individuals normally don't see extend administration as a comment them yet rather something that is obligatory, filling minimal valuable need. On road development ventures, it is amazingly hard to collect sufficient and competent experts to guide activities to progress. Therefore, it isn't astonishing that these variables are seen as having high effect on venture achievement. The inclusion of many gatherings is a prevailing normal for road development ventures (Davis, 2014). On the off chance that one of the gatherings isn't fit to act inside his/her part, the venture is probably going to come up short. It is, subsequently, fundamental to guarantee that the offering procedure can help single out the correct architects, temporary workers and different gatherings to successfully change venture thoughts into reality.

Human asset limitation has been called attention to as the absolute most critical issue confronting most road offices. They experience the ill effects of an intense deficiency of actually qualified staff and still utilize very numerous incompetent laborers. An individual or firm needing development administration will utilize a procedure of choice to recognize the contracting firm with which they
need to work together. In this procedure, the client will use an arrangement of criteria to help in the recognizable proof (Fapohunda and Stephenson, 2010). These criteria could incorporate such factors as past encounters with the firm, saw capacity of the firm, cost, et cetera. At the finish of the contractual worker’s work, the client will encounter fulfillment or disappointment with the temporary worker. The fulfillment or disappointment depends on an arrangement of criteria that might be the same as or unique in relation to the criteria utilized as a part of the choice. These criteria may incorporate such factors as quality, number of cases documented, mishaps, et cetera (Luthaus, 2012). In Kenya, contractual workers (Republic of Kenya, 2012) do all road development ventures.

Chan and Kumaraswamy (2011) commented that powerful correspondence and quick data exchange amongst directors and members help to enhance the nature of the bitumen road development activities and execution. Kuprenas (2013) considered the effect of the utilization of a venture administration based hierarchical structure, venture supervisor preparing, recurrence of plan gatherings, and recurrence of configuration investigates configuration stage cost execution. The procedure of a plan group meeting recurrence and the procedure of composed announcing of configuration stage advance were observed to be measurably noteworthy in diminishing outline stage costs.

2.7 Theoretical framework
The theoretical framework for the study will be underpinned by conventional theory of Pavement Deterioration as postulated by Van Rijn (2006). Van Rijn assumes that the requirement for occasional upkeep relies upon the customary hypothesis of Pavement Deterioration, showed by weakness at the underside of the asphalt, and accept that redirection increments with time and activity as the asphalt decays from movement actuated burdens.

Ifeoma (2010) explains that no road is constructed to last forever, just like every other thing created by man. Roads get damaged with usage over time. In urban areas where majority of roads are bitumen roads, changes in weather conditions over time, floods, usage and other factors have some damaging effect on roads right from the moment they are built. However, effect of these factors to a large extent depends on the quality of the material used for building specific roads, how well they were constructed and the frequency of usage.
Earth roads for the most part get harmed quicker than their cleared or tarred partners. The sorts and stacking of vehicles that would utilize a road and the volume of activity must be put into thought while building it notwithstanding the idea of the dirt on which it is to be fabricated. Something else, the road would get harmed rapidly and neglect to give the coveted administration. Each road should be kept up keeping in mind the end goal to repair the harms jumping out at it with time and utilization.

2.8 Conceptual framework
The study can be conceptualized in a conceptual framework presented in a schematic interpretation explaining the relationship. The Figure 1 shows the relationship between the dependent and independent variables:

Figure No.1: Conceptual Framework.
Availability of Funding
Cost of funds
Source of finance
Adequacy of finances

Political Leadership
Member of Parliament
County representative
Senators
Governor

Availability Construction materials
Type of bitumen
Cost of bitumen
Application procedure

Staff Management skills
Academic qualifications
Technical expertise
Prior experience
Staff skills

Moderating variable
- Government Roads Policies
- Topography

Maintenance of bitumen roads
Useful life of the road
Customer satisfaction
CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction
This chapter identifies the research design of the study. It further highlights the target population, Sampling procedures and the methods of data collection. Also include measures undertaken to ensure the validity of data collected, and its reliability in this study. A summarized table at the end of this chapter is provided to highlight the operational variables and show how they are scaled.

3.2 Research design
An exploration configuration is the game plan of conditions for accumulation and study of information in way that expects to join importance to the study reason with economy in technique. It is the reasonable structure inside which look into is led. It stipulates the blue print for gathering, estimation and investigation of information (Kothari 2003). In this investigation distinct research configuration was utilized. The purpose behind choosing elucidating research configuration is that outline portrays the situation as it exists at introduce; for this situation the analyst has no influence over the factors. One can just report what is going on or what has happened. Likewise clear research configuration gives a chance to accumulate nitty gritty information that offer clarification to examine questions and legitimately structure the investigation into the issue of study.

3.3 Target Population
Target population is defined as all the members of a real or hypothetical set of people, events or objects to which a researcher wishes to generalize the results of the research study. The target population of the study is 54 respondents from Kenya highway roads authority, County officials and the road Contractors because there are the persons involved mostly in maintenance of classified roads which are mostly bitumen roads.
Table 3.1 Target population

<table>
<thead>
<tr>
<th>Category</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>KeNHA</td>
<td>14</td>
</tr>
<tr>
<td>County inspectorate</td>
<td>12</td>
</tr>
<tr>
<td>Contractors</td>
<td>28</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
</tr>
</tbody>
</table>

3.4 Sample Size and Sample Procedure
The study used a census approach where all the members of the target population were included into the study sample. Census approach was appropriate as the target population was small and all respondent could be easily contacted as was the case for this study.

3.5 Data Collection Methods
Data was collected by the use of questionnaires. A written questionnaire is a data collection tool in which written questions are presented that are to be answered by the respondents in written form. These written Questionnaires were administered to respondents via hand-delivery and collected later. Questionnaires, incorporating both open-ended and closed-ended questions items were used to gather the necessary data to conduct this study. According to Cooper and Emory (2008), the questionnaire is conveniently used because it is cheaper and quicker to administer, it is above researcher’s effect and variability, and is highly convenient for the respondents as they could fill them during free times or when workloads are manageable.

3.5.1 Pilot Testing of the instrument
Six questionnaires were administered in Siaya County which neighbors Kisumu County. The respondent were selected randomly, a week before the main study so as to allow the researcher enough time to make changes to the questionnaire, before the questionnaire was presented to the respondents.

The respondents were asked to respond to the questions as the researcher observed whether each question measured what it was supposed to measure, how long it took to interview one respondent, whether response choices were appropriate, whether the tool collected the information needed
among other things. Necessary adjustments were made to the tool. To facilitate this, the researcher sought permission from local leaders, for example, the chief and assistant County Commissioner.

3.5.2 Validity of the instrument
Validity is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study (Mugenda & Mugenda, 2003). To enhance validity of the questionnaires the instruments were reviewed under the supervision of the research supervisors in order to ensure they captured valid and reliable information. Questionnaires were pre-tested to ensure their validity. Also research assistants were trained on how to administer the questionnaires.

3.5.3 Reliability of the instrument
Joppe (2000) characterizes unwavering quality as the degree to which comes about are steady after some time and an exact portrayal of the aggregate population under study. On the off chance that the aftereffects of an investigation can be recreated under a comparative strategy, at that point the instrument is thought to be solid.

This study espoused the test retest reliability approach as a measure of consistency. Reliability was tested using the Cronbach’s alpha which was calculated from questionnaires from the pilot study that were conducted so as to assess the survey tool before the study; All the four variables were found to have an alpha of 0.7 and above and therefore considered acceptable, for use in data collection.

3.6 Data Collection Procedure
A full list of respondents to be interviewed was first prepared. The local administration office was informed of the research and an introductory letter was sought from them, permission was also sought from the national council of science and technology (NACOSTI) so as to make the study conformed to the set standards. The physical location of the respondents was established for ease of delivery of the questionnaire; all questionnaires were edited, verified and corrected for analysis.

3.7 Data Analysis Technique
Raw data collected from the field was cleaned for errors, coded, analyzed and categorized as per the research questions in order to simplify it for presentation. Data was analyzed and presented descriptively using statistical package for social science version 20. The researcher used regression analysis and cross tabulation to show the link and relationship that exist between the independent variables and maintenance of bitumen roads. Qualitative data was checked for completeness and
cleaned ready for data analysis. Content analysis was used in processing the data and results presented in prose form. Content analysis is summarizing qualitative data that relies on the scientific method. The study used multivariate regression model. The independent variables of this study were availability of funds, political leadership, availability of construction material and staff management competence. The multivariate regression model for this study is:

\[ Y = A + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 \]

Where \( Y \) is the dependent variable, maintenance of bitumen roads, while the independent variables \( X_1 \) availability of funds, \( X_2 \) political leadership, \( X_3 \) availability of construction material and \( X_4 \) staff management competence.

3.8 Ethical Consideration
Ethical measures are principles the researcher should bind herself to in conducting the research before data collection (Macmillan and Schumacher, 1993). Initial approval were secured from the University of Nairobi. A research permit was sought from the NACOST.

The respondents were assured that the information given was for the purpose of this research only and therefore are treated with utmost confidentiality.

3.9 Operationalization of Variables
The Operationalization of a variables means manipulating both the independent and dependent variables in such a way that they end up having a few levels thus becoming measurable.


**Operationalization of Variables.**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Variables</th>
<th>Indicators</th>
<th>Data collection method</th>
<th>Measurement Scale</th>
<th>Type of analysis/Type of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>To determine the influence of level of funding on maintenance of bitumen roads in Kisumu county</td>
<td>Independent variable</td>
<td>Cost of funds.</td>
<td>Questionnaire</td>
<td>Nominal</td>
<td>Quantitative (regression)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Source of funds.</td>
<td>Questionnaire</td>
<td>Interval</td>
<td>Quantitative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adequacy of finances</td>
<td>Questionnaire</td>
<td>Nominal</td>
<td>Quantitative</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Questionnaire</td>
<td>interval</td>
<td></td>
</tr>
<tr>
<td>To evaluate the influence of politics leadership on the maintenance of bitumen roads in Kisumu county</td>
<td>Independent variable</td>
<td>Member of parliament</td>
<td>Questionnaire</td>
<td>Nominal</td>
<td>Quantitative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>County representatives</td>
<td>Questionnaire</td>
<td>Nominal</td>
<td>Quantitative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Senators</td>
<td>Questionnaire</td>
<td>Nominal</td>
<td>Quantitative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Governors</td>
<td>Questionnaire</td>
<td>Interval</td>
<td>Quantitative Regression</td>
</tr>
<tr>
<td>To assess the influence of availability of construction material on maintenance of bitumen roads in Kisumu county</td>
<td>Independent variable</td>
<td>Type of bitumen</td>
<td>Questionnaire</td>
<td>Nominal</td>
<td>Quantitative</td>
</tr>
<tr>
<td>---</td>
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<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cost of bitumen</td>
<td>Questionnaire</td>
<td>Interval</td>
<td>Quantitative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Application procedure</td>
<td>Questionnaire</td>
<td>Interval</td>
<td>Quantitative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mix specification</td>
<td>Questionnaire</td>
<td>Interval</td>
<td>Quantitative</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To find out the influence of staff management competence on maintenance of bitumen roads in Kisumu county</th>
<th>Independent variable</th>
<th>Academic qualifications</th>
<th>Questionnaire</th>
<th>Nominal</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Technical expertise</td>
<td>Questionnaire</td>
<td>Interval</td>
<td>Quantitative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prior experience</td>
<td>Questionnaire</td>
<td>Nominal</td>
<td>Quantitative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Staff competencies</td>
<td>Questionnaire</td>
<td>Interval</td>
<td>Quantitative</td>
</tr>
</tbody>
</table>

(regression)
CHAPTER FOUR
DATA ANALYSIS, PRESENTTION AND INTERPRETATION

4.1 Introduction
The chapter is organized as follows: First it presents the response rate and the background information of the respondents. This is followed by factors influencing maintenance of bitumen roads. The chapter concludes with an analysis of the relationship between various factors influencing the maintenance of bitumen roads.

4.2 Response Rate
The response rate was 100% since all the 54 targeted respondents filled and returned the questionnaires. This response rate was within what Cooper and Schindler (2012) set as a significant response rate (above 50%) for statistical analysis.

4.3 Reliability Analysis
Reliability analysis was subsequently done using Cronbach’s Alpha which measures the internal consistency by establishing if certain items within a scale measure the same construct.

Table 4.1: Reliability Analysis

<table>
<thead>
<tr>
<th></th>
<th>Alpha Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of funds</td>
<td>.715</td>
</tr>
<tr>
<td>Political leadership</td>
<td>.819</td>
</tr>
<tr>
<td>Availability of construction material</td>
<td>.739</td>
</tr>
<tr>
<td>Staff management competence</td>
<td>.728</td>
</tr>
</tbody>
</table>

Sekaran and Bougie (2010) established the Alpha value threshold to be 0.7. This therefore illustrates that all the four scales were reliable and accepted as their reliability values exceeded the set threshold of 0.7.

4.4 Background Information
This section gives an analysis of the background information of the respondents. The aim of doing this was to enhance understanding of the background information of the respondents and their personal ability to provide relevant data sought for under this study.
4.4.1 Respondents Designation
Table 4.2 shows the respondents’ summarised responses to the question about their designation at work.

Table 4.2: Respondents Designation.

<table>
<thead>
<tr>
<th>Designation</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractors</td>
<td>28</td>
<td>51.86</td>
</tr>
<tr>
<td>County officials</td>
<td>12</td>
<td>22.22</td>
</tr>
<tr>
<td>Kenya National Highway Authorities officials</td>
<td>14</td>
<td>25.92</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Findings show that contractors were 51.86% of the respondents, county officials were 22.22% of the respondents, Kenya National Highway Authorities officials were 25.92%. This reveals that these respondents were in a position to be able to respond to the questionnaires.

4.4.2 Highest Level of Education of the Respondent
Table 4.3 illustrates the summary of the answers provided by the respondents when they were asked about their highest level of education.

Table 4.3: Highest Level of Education of the Respondent

<table>
<thead>
<tr>
<th>Highest Level of Education</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Graduate</td>
<td>3</td>
<td>4.92</td>
</tr>
<tr>
<td>Undergraduate</td>
<td>28</td>
<td>52.46</td>
</tr>
<tr>
<td>Diploma</td>
<td>16</td>
<td>29.51</td>
</tr>
<tr>
<td>Certificate</td>
<td>7</td>
<td>13.11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

The summary of the answers provided by the respondents on their highest level of education reveals that respondents with highest level of education as post graduate were 3, with highest level of education as undergraduate were 28 and with highest level of education as diploma were 16 while those with highest level of education as certificate were 7. This reveals that the respondents’ level of education was a clear indication that they could give correct information concerning the subject under study.
4.4.3 Length of Time the Working in the Institution

Table 4.4 gives a summary of the responses given by the respondents concerning their length of time in which they have been working.

<table>
<thead>
<tr>
<th>Length of Time the working in the Institution</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 5 years</td>
<td>10</td>
<td>18.85</td>
</tr>
<tr>
<td>6 to 10 years</td>
<td>21</td>
<td>39.34</td>
</tr>
<tr>
<td>11 to 15 years</td>
<td>14</td>
<td>26.23</td>
</tr>
<tr>
<td>16 to 20 years</td>
<td>6</td>
<td>10.66</td>
</tr>
<tr>
<td>21 years and above</td>
<td>3</td>
<td>4.92</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

Respondents’ summary of answers concerning their length of time in which they have been working in the institution indicates that majority of the respondents had been working in the institution for 6 to 10 years (Frequency=21, Percentage=39.34). It also indicates that other respondents had been working in the institution for 11 to 15 years (Frequency=14, Percentage=26.23), for 1 to 5 years (Frequency=10, Percentage=18.85) and for 16 to 20 years (Frequency=6, Percentage=10.66) while the rest had worked in the institution for 21 years and above (Frequency=3, Percentage=4.92). This implies as per the length of time working with the institution that they could give correct information on the subject under study.

4.5 Factors Influencing maintenance of Bitumen Roads

This contains findings for availability of funds, political leadership, availability of construction material, and staff management skills on maintenance of bitumen roads.

4.5.1 Availability of Funds

The respondents were asked to rate the statements in table 4.5 about availability of funds using a scale of 1-5 on their level of agreement. The average mean and standard deviations are shown in table 4.5.
Table 4.5: Agreement with statements on availability of funds

<table>
<thead>
<tr>
<th>Statement</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of funds influence maintenance of roads</td>
<td>54</td>
<td>2.00</td>
<td>3.00</td>
<td>2.4599</td>
<td>0.4997</td>
</tr>
<tr>
<td>Sources of finance influence maintenance of roads</td>
<td>54</td>
<td>3.00</td>
<td>5.00</td>
<td>4.016</td>
<td>0.7294</td>
</tr>
<tr>
<td>Cost of bitumen influence the maintenance of roads</td>
<td>54</td>
<td>2.00</td>
<td>5.00</td>
<td>3.8128</td>
<td>0.9403</td>
</tr>
<tr>
<td>Adequacy of finances influence maintenance of roads</td>
<td>54</td>
<td>3.00</td>
<td>5.00</td>
<td>4.2513</td>
<td>0.72285</td>
</tr>
<tr>
<td>Time of disbursement influence maintenance of roads</td>
<td>54</td>
<td>2.00</td>
<td>5.00</td>
<td>4.1925</td>
<td>0.8068</td>
</tr>
</tbody>
</table>

**Composite Mean** 3.7465

Ratings of the respondents on statements in table 4.5 show that they agreed with the statements; Adequacy of finances influence maintenance of bitumen roads as shown by mean of 4.2513, Time of disbursement influence maintenance of bitumen roads as shown by a mean of 4.1925, Sources of finance influence maintenance of bitumen roads as expressed by a mean of 4.016 and cost of bitumen influence the timely completion of the project as illustrated by a mean score of 3.8128. They also disagreed with the statement cost of funds influence maintenance of bitumen roads as represented by a mean score of 2.4599.

**4.5.2 Political leadership**

Statements on influence of political leadership shown in table 4.6 were rated by the respondents focusing on their level of agreement with each of the statement.
Table 4.6: political leadership influence

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governors influence maintenance of bitumen roads</td>
<td>54</td>
<td>2.00</td>
<td>5.00</td>
<td>4.0428</td>
<td>0.7817</td>
</tr>
<tr>
<td>Member of parliament influence maintenance of bitumen roads</td>
<td>54</td>
<td>3.00</td>
<td>5.00</td>
<td>3.9947</td>
<td>0.8829</td>
</tr>
<tr>
<td>County representatives influence maintenance of bitumen roads</td>
<td>54</td>
<td>2.00</td>
<td>4.00</td>
<td>2.4118</td>
<td>0.9927</td>
</tr>
<tr>
<td>Senators influence maintenance of bitumen roads</td>
<td>54</td>
<td>3.00</td>
<td>5.00</td>
<td>3.8342</td>
<td>0.4744</td>
</tr>
</tbody>
</table>

**Composite Mean**  
3.5709

Statements that the respondents agreed with were Governors influence maintenance of bitumen roads as illustrated by a mean of 4.0428, Member of Parliament influence maintenance of bitumen roads as expressed by a mean score of 3.9947 and Senators influence maintenance of bitumen roads as illustrated by an average of 3.8342. They however disagreed on the statement County representatives influence maintenance of bitumen roads as shown by mean of 2.4118.

4.5.3 Availability of construction material

Statements on availability of construction material shown in table 4.7 were rated by the respondents focusing on their level of agreement with each of the statement.

Table 4.7: Availability of construction material

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of bitumen influence the maintenance of bitumen roads</td>
<td>54</td>
<td>2.00</td>
<td>5.00</td>
<td>4.0428</td>
<td>0.7817</td>
</tr>
<tr>
<td>Mix specifications influence the maintenance of bitumen roads</td>
<td>54</td>
<td>3.00</td>
<td>5.00</td>
<td>3.9947</td>
<td>0.8829</td>
</tr>
<tr>
<td>Cost of bitumen influence the maintenance of bitumen roads</td>
<td>54</td>
<td>2.00</td>
<td>4.00</td>
<td>2.4118</td>
<td>0.9927</td>
</tr>
<tr>
<td>Application procedure influence the maintenance of bitumen roads</td>
<td>54</td>
<td>3.00</td>
<td>5.00</td>
<td>3.8342</td>
<td>0.4744</td>
</tr>
</tbody>
</table>

**Composite Mean**  
3.5709
Statements that the respondents agreed with were type of bitumen influence the maintenance of bitumen roads as illustrated by a mean of 4.0428, mix specifications influence the maintenance of bitumen road as expressed by a mean score of 3.9947 and application procedure influence maintenance of bitumen roads as illustrated by an average of 3.8342. They however disagreed on statement cost of bitumen influence maintenance of bitumen roads as shown by mean of 2.4118.

4.5.4 Staff Management competence
Opinions on the level of agreement with statements on staff management competence were summarized in table 4.8.

<table>
<thead>
<tr>
<th>Table 4. 8: Agreement with staff Management competence</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic qualification influence timely maintenance of bitumen roads</td>
<td>54</td>
<td>1.00</td>
<td>4.00</td>
<td>2.4599</td>
<td>0.4997</td>
</tr>
<tr>
<td>Adequate prior experience determines the quality of bitumen roads</td>
<td>54</td>
<td>3.00</td>
<td>5.00</td>
<td>4.4064</td>
<td>0.5637</td>
</tr>
<tr>
<td>Technical expertise greatly determine the life of bitumen roads</td>
<td>54</td>
<td>3.00</td>
<td>5.00</td>
<td>4.0535</td>
<td>0.5654</td>
</tr>
<tr>
<td>Staff competencies influence maintenance of bitumen roads</td>
<td>54</td>
<td>3.00</td>
<td>4.00</td>
<td>3.8342</td>
<td>0.4744</td>
</tr>
<tr>
<td><strong>Composite Mean</strong></td>
<td>3.6885</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As per the opinions, the respondents agreed that adequate prior experience determines the quality of bitumen roads (Mean=4.4064), that technical expertise greatly determine the life of bitumen roads (Mean=4.0535) and that staff competencies influence maintenance of bitumen roads (Mean=3.8342) while disagreeing on the fact that professional and academic qualification influence timely maintenance of bitumen roads (Mean=2.4599).

4.5.5 Maintenance of Bitumen Roads
Respondents attested the extent of success in the various aspects of maintenance of bitumen roads in Nyanza region. The table 4.9 shows their opinions.
Table 4.7: Maintenance of Bitumen Roads

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of the road</td>
<td>54</td>
<td>1.00</td>
<td>4.00</td>
<td>4.1872</td>
<td>0.8114</td>
</tr>
<tr>
<td>Useful life of the road</td>
<td>54</td>
<td>3.00</td>
<td>5.00</td>
<td>4.0053</td>
<td>0.7999</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>54</td>
<td>3.00</td>
<td>5.00</td>
<td>3.8663</td>
<td>1.24792</td>
</tr>
<tr>
<td>Routine Maintenance</td>
<td>54</td>
<td>3.00</td>
<td>4.00</td>
<td>3.0802</td>
<td>0.8545</td>
</tr>
<tr>
<td><strong>Composite Mean</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>3.7848</strong></td>
<td></td>
</tr>
</tbody>
</table>

In a great extent the quality of the road has been successful as shown by 4.1872, useful life of the road has been successful as shown by mean of 4.0053 and customer satisfaction has been successful as shown by a mean of 3.8663. Further routine Maintenance in a moderate extent has been successful as illustrated by a mean of 3.0802.

### 4.6 Correlation Analysis

This was used to determine the strength and the direction of the relationship between the dependent variable and the independent variable. The analysis using Pearson’s product moment correlation was based on the assumption that the data is normally distributed and also because the variables are continuous.
Table 4. 8: Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Maintenance of Bitumen roads</th>
<th>Availability of funds</th>
<th>Political leadership</th>
<th>Availability of construction material</th>
<th>Staff management competence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance of bitumen roads</td>
<td>Pearson Correlation</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of funds</td>
<td>Pearson Correlation</td>
<td>0.842</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.002</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Political leadership</td>
<td>Pearson Correlation</td>
<td>0.773</td>
<td>0.502</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.000</td>
<td>0.008</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Availability of construction material</td>
<td>Pearson Correlation</td>
<td>0.663</td>
<td>0.632</td>
<td>0.546</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.0002</td>
<td>0.010</td>
<td>0.012</td>
<td>.</td>
</tr>
<tr>
<td>Staff management competence</td>
<td>Pearson Correlation</td>
<td>0.731</td>
<td>0.572</td>
<td>0.506</td>
<td>0.304</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.010</td>
<td>0.016</td>
<td>0.018</td>
<td>0.000</td>
</tr>
</tbody>
</table>

From the table 4.10, availability of funds has a strong positive correlation with maintenance of bitumen roads which is statistically significant at the 5% significance level (r = 0.842; p = 0.002 < .05). Political leadership has a positive correlation with maintenance of bitumen roads and the relationship is statistically significant at the 5% significance level (r = 0.773; p = .000 < .05). Availability of construction material also has a positive correlation which is statistically significant at the 5% significance level (r = 0.663; p = .0002 < .05). Finally, staff management competence was found to have a positive correlation with maintenance of bitumen roads and the relationship was statistically significant (r = 0.731; p = .010 < .05).

From the findings all variables were found to have a positive and significant relationship with the maintenance of bitumen roads.
CHAPTER FIVE
SUMMARY, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction
From the study and information gathered, the discussions, conclusion and recommendations were made. The reactions depended on the destinations of the study. The researcher had intended to determine factors influencing maintenance of Bitumen roads in Kisumu County, Kenya.

5.2 Summary
5.2.1 Availability of funds
It was clear that adequacy of finances influence maintenance of bitumen roads, time of reserve dispensing impact upkeep of bitumen road, wellsprings of fund impact upkeep of bitumen roads and cost of bitumen impact the convenient finishing of the upkeep venture. They likewise couldn't help contradicting the announcement cost of assets impact upkeep of bitumen roads.

5.2.2 Political leadership
The research responses showed that majority of respondents cited that the influence of political leaders in regards to identification of bitumen roads for maintenance is very much felt while the minority of the respondents cited that there is little influence of politicians in regards to identification of roads for maintenance. Statements that the respondents agreed with were Governors influence maintenance of bitumen roads, Member of Parliament influence maintenance of bitumen roads and Senators influence maintenance of bitumen roads. They however disagreed on the statement County representatives influence maintenance of bitumen roads.

5.2.3 Availability of construction material
From the summary, Statements that the respondents agreed with were type of bitumen influence the maintenance of bitumen roads, mix specifications influence the maintenance of bitumen roads and application procedure influence maintenance of bitumen roads. They however disagreed on the statement cost of bitumen influence maintenance of bitumen roads.

5.2.4 Staff management competence
As per the opinions, the respondents agreed that adequate prior experience determines the quality of bitumen roads, that technical expertise greatly determine the life of bitumen roads and that staff competencies influence maintenance of bitumen roads while disagreeing on the fact that professional and academic qualification influence timely maintenance of bitumen roads.
5.3 Discussion

5.3.1 Availability of funds
Adequacy of finances influence maintenance of bitumen roads as shown by mean of 4.2513, time of fund disbursement influence maintenance of bitumen roads as shown by a mean of 4.1925, sources of finance influence maintenance of bitumen roads as expressed by a mean of 4.016 and cost of bitumen influence the timely completion of the maintenance works as illustrated by a mean score of 3.8128. They also disagreed with the statement cost of funds influence maintenance of bitumen roads as represented by a mean score of 2.4599.

As per (Rafiqui, 2003) the cost of support is little in respect to the benefit esteem, it is significant that upkeep is done on an auspicious and consistent premise. Therefore it is a repetitive action and should be financed in that capacity. The assets designated to it should identify with a support arrange for which characterizes those roads in a viable condition and characterizes an intermittent cost for the system.

5.3.2 Political leadership
Statements that the respondents agreed with were Governors influence maintenance of bitumen roads as illustrated by a mean of 4.0428, Member of Parliament influence maintenance of bitumen roads as expressed by a mean score of 3.9947 and Senators influence maintenance of bitumen roads as illustrated by an average of 3.8342. They however disagreed on the statement County representatives influence maintenance of bitumen roads as shown by mean of 2.4118.

Kenya provides a good example of how political polarization can lead to political market imperfections that then provide incentives for road construction targeted for patronage purposes. Burgess et al. (2009) examine this case in detail, noting that Kenya has great ethnic and regional fragmentation, with five groups comprising 70% of the population, which have a high degree of geographic concentration and social segregation. They argue that this provides the ideal conditions for political favouritism and patronage, as resources can be targeted to politician’s regional power bases with considerable ease and strong identities provide a common point of political identification for poorly informed voters.

5.3.3 Availability of construction material
Type of bitumen was found to influence the life of the road and also mix specifications influenced the quality of the roads. These were similar to Asphalt Institute and Eurobitume (2011) who claims
that the thermally-cracked residue produced by this process is vacuum-distilled and further treated to create a hard material used in blending bitumen’s.

Further the study found that application procedure influence customer satisfaction and that cost of bitumen doesn’t influence the timely completion of maintenance work. These conform to Gichaga (2012) who carried out a field study to determine the various types of distress features of flexible pavements in Kenya and found them to be cracks, potholes, severe deformations, shear failure, edge failure, surface raveling and fretting, breaking up of patched areas, poor trench reinstatement, poor verge maintenance and poor drainage maintenance.

5.3.4 Staff management competence
As per the opinions, it was revealed that adequate prior experience determines the quality of maintenance projects. This is similar to Davis (2014) who says that variables under this factor consist of the skills and characteristics of project managers, their commitment, competence, experience, and authority.

It was also found that technical expertise greatly determines life of the road maintenance and that staff competencies influence customer satisfaction. This concurs with Serrador and Turner (2014) who claims that the responsibility of top management toward the project is important and its commitment and support is a crucial requirement for project success.

Further it was clear that professional and academic qualification don’t influence timely project completion. This was similar to Chan and Kumaraswamy (2011) who remarked that effective communication and fast information transfer between managers and participants help to improve the quality of the bitumen road maintenance projects.

5.4 Conclusion
5.4.1 Availability of Funds
The study concluded that availability of funds positively and significantly influences maintenance of Bitumen roads in Kisumu County. The study deduced that adequacy of finances influence maintenance of bitumen roads, time of fund disbursement influence maintenance of bitumen road, sources of finance influence maintenance of bitumen roads and cost of bitumen influence the timely completion of the maintenance works.
5.4.2 Political Leadership
The study also concluded that political leadership influence maintenance of Bitumen roads in Kisumu County positively. Under this it was deduced that Governors influence maintenance of bitumen roads, Member of Parliament influence maintenance of bitumen roads and Senators influence maintenance of bitumen roads.

5.4.3 Availability of construction material
The study finally concluded that availability of construction material influenced maintenance of Bitumen roads in Kisumu County positively. From the findings deduced that type of bitumen influence the maintenance of bitumen roads, mix specifications influence the maintenance of bitumen roads and application procedure influence maintenance of bitumen roads. They however disagreed on the statement cost of bitumen influence maintenance of bitumen roads.

5.4.4 Staff management competence
Further it was concluded that staff management competence significantly influences maintenance of Bitumen roads in Kisumu County. The study deduced that adequate prior experience determines the quality of the maintenance works and that staff competencies influence customer satisfaction. Further it was deduced that professional and academic qualification don’t influence timely maintenance works completion.

5.5 Recommendations
The study therefore recommended the following:

The road funding for the agency should be increased so that more bitumen roads will be routinely maintained to be put in a good condition to speed up development.

There is need to set up a special unit within the Road Agency that would manage and address all issues related to political interference so that public will get services without any discrimination.

The public should be synthesized on usage of roads and their importance in economic development so that they can contribute positively towards efficient maintenance of these roads.

The study also recommends that programming routine maintenance practices which was found to influence the life time of the project. This can be done by continuous repairs of disembarked roads to increase their life of service. Again the contractors awarded with the roads contracts should have
the required expertise as well as prior experience in order to improve the quality of work done as well as the life of the road maintenance works.

The materials for road construction should be identified by the Agency Officers who are able to examine if it is good for use so that any poor quality material should be avoided.

5.6 Suggestions for Future Study
Being alive to the fact that the road authorities in Kenya were formed seven years ago through Act of Parliament, its successful existence cannot be fully concluded. There is need for further research on strategy implementation in the authority.
REFERENCES


Ahmad R., (2006), Maintenance Management and Services (Case Study: Perkeso Building’s in Peninsular Malaysia), Master, Universiti Teknologi Malaysia.


Embassy of Finland, Nairobi, (2012), „Programme for Agriculture Livelihoods for Families of Western Kenya Communities.


Kenya Rural Roads Authority (2013). „Human resource and administration”.


APPENDICES

APPENDIX I: LETTER OF TRANSMITTAL

Wambugu Simon Gateru

University of Nairobi

P O Box 21086 – 00100,

Nairobi.

Dear Respondent,

RE: REQUEST FOR RESEARCH DATA

I am a graduate student at University of Nairobi. In partial fulfillment for the award of a Master of Arts Degree in Project Planning and Management, I am carrying out a research study on social economic factors that influence maintenance of bitumen roads in Kisumu County Kenya.

You have been identified as one of the people that could be of assistance with the research and I thus request your participation in the research. Essentially, you would be required to complete a questionnaire. You will be treated anonymously and your responses will be treated with utmost confidentiality. The information you provide will be used only for academic purposes.

Yours Faithfully,

Simon Gateru

Thank you in advance.
APPENDIX II: RESEARCH QUESTIONNAIRE
Kindly answer the following questions by writing a brief answer or ticking in the boxes provided.

PART A: BACKGROUND INFORMATION
1. What is your role in road maintenance?
   - Contractors  [ ]
   - County inspectorate  [ ]
   - National government officials  [ ]
   - Construction worker  [ ]

2. Which is your highest level of education?
   - Post Graduate  [ ]
   - Undergraduate  [ ]
   - Diploma  [ ]
   - Certificate  [ ]
   - Any other (specify)…………………………………………………………………………………………

3. How long have you been in this industry?
   - 1 to 5 years  [ ]
   - 6 to 10 years  [ ]
   - 11 to 15 years  [ ]
   - 16 to 20 years  [ ]
   - 21 years and above  [ ]

PART B: Availability of Funding
To what extent does availability of funding influence maintenance of bitumen roads in Kisumu County?
   - Very great extent  [5]
   - Great extent  [4]
   - Moderate extent  [3]
   - Low extent  [2]
   - Very low extent  [1]

4. To what extent does the following influence maintenance of bitumen roads in Kisumu County?

<table>
<thead>
<tr>
<th></th>
<th>Very great extent</th>
<th>Great extent</th>
<th>Moderate extent</th>
<th>Low extent</th>
<th>Very low extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of funds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source of finance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. In your own opinion, how does availability of funding influence maintenance of bitumen roads in Kisumu County?

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

PART C: I Political Leadership

6. To what extent do you think political leadership influence maintenance of bitumen roads?
   Very great extent [5]
   Great extent [4]
   Moderate extent [3]
   Low extent [2]
   Very low extent [1]

7. To what extent do the following influence maintenance of bitumen roads?

<table>
<thead>
<tr>
<th></th>
<th>Very great extent</th>
<th>Great extent</th>
<th>Moderate extent</th>
<th>Low extent</th>
<th>Very low extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member of parliament</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>County representatives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. In your opinion, how does political interference influence maintenance of bitumen roads in Kisumu County?

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

9. What obstacles do you encounter when maintaining roads when the country is in political instability?

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
PART D: Availability Construction Materials

10. To what extent does availability of construction materials influence maintenance of bitumen roads?

<table>
<thead>
<tr>
<th>Extent</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very great</td>
<td>5</td>
</tr>
<tr>
<td>Moderate</td>
<td>3</td>
</tr>
<tr>
<td>Very low</td>
<td>1</td>
</tr>
<tr>
<td>Great</td>
<td>4</td>
</tr>
<tr>
<td>Low</td>
<td>2</td>
</tr>
</tbody>
</table>

11. To what extent do the following affect maintenance of bitumen roads?

<table>
<thead>
<tr>
<th>Factor</th>
<th>Very great extent</th>
<th>Great extent</th>
<th>Moderate extent</th>
<th>Low extent</th>
<th>Very low extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of bitumen</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Cost of bitumen</td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>Mix specifications</td>
<td></td>
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</tr>
<tr>
<td>Application procedure</td>
<td></td>
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</tr>
</tbody>
</table>

12. In your own opinion, how do the facets of construction materials above influence maintenance of bitumen roads in Kisumu County?

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PART E: Staff Management Competence

13. To what extent does staff management competence influences maintenance of bitumen roads in Kisumu County?

<table>
<thead>
<tr>
<th>Extent</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very great</td>
<td>5</td>
</tr>
<tr>
<td>Moderate</td>
<td>3</td>
</tr>
<tr>
<td>Very low</td>
<td>1</td>
</tr>
<tr>
<td>Great</td>
<td>4</td>
</tr>
<tr>
<td>Low</td>
<td>2</td>
</tr>
</tbody>
</table>

14. To what extent do the following influence maintenance of bitumen roads?

<table>
<thead>
<tr>
<th>Factor</th>
<th>Very great extent</th>
<th>Great extent</th>
<th>Moderate extent</th>
<th>Low extent</th>
<th>Very low extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic qualifications</td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>Technical expertise</td>
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<tr>
<td>Prior experience</td>
<td></td>
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<tr>
<td>Staff competencies</td>
<td></td>
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</tr>
</tbody>
</table>
15. In your own opinion, how do the facets of management skills above influence maintenance of bitumen roads?

Thank You for Your Participation