

# DETERMINANTS OF DURABILITY OF RURAL ROAD NETWORK IN UGUNJA SUB-COUNTY, SIAYA COUNTY, KENYA

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**ABSTRACT:** This study was carried out to assess the determinants of durability of road networks in the rural setting of Ugunja Sub-County in Kenya. This study was anchored by the constraint theory. The target population of the study was 120 employees of Kenya rural road authority, 180 road side residents, and chiefs in Ugunja Sub- County. A sample size of 94 respondents was studied from which comprised of 36 officials of KeRRA, 54 roadside residents and 4 chiefs. Purposive sampling was used to identify the respondents. Questionnaires and interview guides were employed for data collection. Analysis of study variables to answer the research questions were conducted using descriptive statistics of frequency tables, charts, graphs and percentages. Quantitative data was analysed using statistical packages for social sciences. The SPSS was used because it is effective. The study found out that funding, political interference, contract time and human activities greatly influence the durability of rural roads network in Ugunja. The study therefore concluded that a lot need to be done around the cited areas. The study therefore recommended that all stakeholders needs to play their roles in ensuring that the roads remain durable after construction.

**Key Words:** Durability, Road maintenance, rural roads, Human activities, Political Interference

## Introduction

Adequate rural road infrastructure is critical for rural development, and fundamentally relies on effective participation between all parties for example the government, policy makers, planners and the community. Durable roads are very important for day to day activities and as such are required in all sectors for development. The road transport network of any country plays a vital role in determining the chances for reaching a high number of Sustainable Development Goals(SDGs) for example all weather accessible roads, however, the benefits of improved access are short lived if the rural roads are not properly maintained (International Labour Organization, 2007).

Stable and long lasting roads are required globally to enable the accessibility and development of the basic necessities such as education, health, agriculture, industries among others, which are considered among the most important aspects of life (Ramachandran, 2008). Durability is one of the important aspects to be considered when designing a road construction project. The ability of the rural roads to have prolonged service life is what any developer would prefer because it will ensure that the benefits are realised. When roads are constructed to standards that are required, they will serve for long without frequent maintenances and significant deteriorations (Kocher et al., 2007). The provision of stable and long lasting road services is therefore of vital importance for accelerated development.

Generally, some of the aspects considered influencing durability rural road network worldwide include; contract time, availability of funds, political issues among others. Recognizing the important role, rural roads play in agriculture, rural industries and social development (health, education, etc.) makes rural roads of paramount importance, often taking precedence over any new investment for economic development.

Road deterioration due to lack of maintenance has become a growing concern in a number of developing countries (Kocher et al., 2007). The basic object of road maintenance is implicit in the word itself. It is done to ensure that a road that has been constructed or improved is maintained to its original condition. It is accepted that over the life of the road it will deteriorate due to the factors with which maintenance activities cannot deal with like landslides. Nevertheless, maintenance is intended to slow this deterioration and should begin as soon as the road improvement is completed (International Labour Organization, 2007).

According to Ahmad (2006), maintenance is a must for any structure in order to increase its durability and to prevent deterioration

that may shorten the service life. In reality, planning and funding for maintenances has generally been neglected or handled separately from construction that leads to cumulative effects of road deteriorations and finally wear out. However, it is a fact that maintenance is important and the activity to be carried out to prolong or at least maintain stability of roads.

Decades of under-capitalization, poor management and high cost of other means of transport like air and railways have propelled road transport to be the most important means of transport in Africa due to its affordability and accessibility. Improving the roads in Africa has experienced numerous negative factors. Most countries in Africa lack adequate funds to improve their road networks and rely on donors for funding. As these past road networks that were established by the colonial powers are observed to deteriorate at rates exceeding expectations, concern has mounted that policies be undertaken to improve longevity and stability efforts in order to sustain past and current road investments and delay replacement of this necessary infrastructure (Schroeder, 1988).

In 1998, the transport sector in Kenya comprised a road network with 150,000 km of roads and 350,000 vehicles IEA (1998). With a 34% share in the total transport sector in 1998, road transport has the highest contribution to national output among the transport systems. It is followed by air transport, with 25%, and water transport, with 16% (Ikiara et al., 2000). Considering that this level of performance was achieved over a period of deficient road maintenance, it is obvious that the subsector and by implication the road infrastructure policy holds the potential for rapid economic growth and poverty reduction through its influence on production costs, employment creation, access to markets, and investment (RoK, 2000).

Most of the rural roads in Kenya according to the Ministry of Roads (2012) still remain unfinished yet the contracts were awarded a long time ago. This in their report is as a result of awarding contracts to companies which lack the capacity to handle the jobs. Some of the companies were also reported to have done sub-standard jobs resulting into poor quality roads that are short-lived and unstable with bridges being washed away during the rainy season. Therefore this study will be carried out to assess the determinants of longevity and stability of roads in the rural setting of Ugunja Sub- County in Kenya.

Globally, rural roads connectivity is one of key components of rural development as it promotes access to economic and social services generating increased agricultural income and productive employment in various parts of the globe. The world has millions of kilometres of rural roads which have helped ease movements among local communities. However, maintaining these roads to make them stable and durable has always been a challenge.

A substantial portion of rural population in developing countries does not have motorised access to transport network, only unreliable or partial access. It is well documented that ensuring an effective Rural Transport Infrastructure (RTI) system is an essential requirement for rural development. Without reliable access to market and productive resources, economic development stagnates and poverty reduction cannot be sustained. Provision of all season basic access is therefore an essential condition not just for rural development but for development as a whole.

In Siaya County accessible roads are mainly concentrated around Siaya Township and its environs; and nothing much has been done on the rural roads. The status of the roads in Siaya County are unstable and short lived; this means that accessibility is a problem with people, goods and services taking longer time to get to their destination. Many researchers have been done in different regions of Kenya among them are the role of rural roads in poverty alleviation (Njangu, 2015), factors influencing the management of rural roads in Busia County (Esaba, 2012) but little attention have been given to the poor condition of road networks in Ugunja Sub-County. This study therefore, sought to examine the determinants of durability of rural road network in Ugunja Sub- County, Kenya.

The overall objective of this study was to examine the determinants of durability of rural road network in Ugunja Sub- County, Kenya. The specific objectives of the study were to examine the effect of funding by the government on the durability of rural road network in Ugunja Sub-County, Kenya, to determine the influence of political interference on rural road network durability in Ugunja Sub-County, Kenya, to establish the effect of construction contract time on the durability of rural road network in Ugunja Sub- County, Kenya and to determine how human activities influences the durability of rural road network in Ugunja Sub- County, Kenya.

## 1. Literature Review

### 2.1 Constraint Theory

This study was guided by the constraint theory which was developed by Goldratt in 1984. It is a management paradigm that views any manageable system as being limited in achieving more of its goals by a very small number of constraints. There is always at least one constraint, and uses a focusing process to identify the constraint and restructure the rest of the organization around it. It adopts the common idiom "a chain is no stronger than its weakest link." This means that processes, organizations, etc., are vulnerable because the weakest person or part can always damage or break them or at least adversely affect the outcome (Goldratt, 1984).

The theory is used as a methodology for identifying the most important limiting factor (i.e. constraint) that stands in the way of achieving a goal and then systematically improving that constraint until it is no longer the limiting factor. The core concept of the Theory of Constraint is that every process has a single constraint and that total process throughput can only be improved when the

constraint is improved. A very important corollary to this is that spending time optimizing non-constraints will not provide significant benefits; only improvements to the constraint will further the goal (achieving more profit), (Learn Productivity, 2013).

Theory of constraints seeks to provide precise and sustained focus on improving the current constraint until it no longer limits, at which point the focus moves to the next constraint. The underlying power of Theory of Constraint flows from its ability to generate a tremendously strong focus towards a single goal (profit) and to removing the principal impediment (the constraint) to achieving more of that goal. In fact, Goldratt considers focus to be the essence of Theory of Constraint. In project management the Theory of Constraint is based on the idea that all projects look like A-plants: all activities converge to a final deliverable. As such, to protect the project, there must be internal buffers to protect synchronization points and a final project buffer to protect the overall project. According to Khan (2010), the Theory of Constraint is an in improving common process. This is most applicable when handling large projects e.g. road projects, building projects, manufacturing etc.

This theory is applicable in this study on determinants of longevity and stability of rural road project in Ugunja Constituency in that, the goal of achieving durability of the rural roads in question cannot be possible if the constraints i.e. funding by the government, political interference, contract time and human activities are not dealt with. If the determinants above are made adequate and appropriate, then profit maximization in terms of prolong utilization of roads without additional or frequent maintenance is going to be achieved.

## **2.2 Empirical Review**

### **2.2.1 Construction Funding**

According to Yuzdespki and Merkosky (2004) the cost of maintaining rural roads tend to outweigh the cost of construction of a bitumen road. They believe that ideally rural roads carry far much weight in terms of raw materials despite the weather conditions but have always been ignored. In most countries across the globe the estimate cost of maintaining rural roads whether gravel or earth has always been a task as there is no better method of minimizing those costs.

Given the severe lack of resources at the local level, rural road development will continue to require central funding (World Bank, 1995). The financial capacity of the central government is usually limited because of other competing priority areas of development such as health, education etc. Hence, there is usually limited or no funds to carry out maintenance activities, even when this is considered appropriate. Budgetary allocations for road maintenance are usually inadequate, often times, the funds that eventually get released are small fractions of the original requirement. This limits the scope, quantity and quality of maintenance work that can be done. Generally, whenever the maintenance funds are released, they are grossly inadequate, rural roads are the first casualty for neglect. The application of labour based method in these circumstances will ensure sustainable road maintenance system, and also allow creation of strategies and institutional arrangements which will facilitate the maintenance of rural roads within such limited funds.

A report by the World Bank (2010), looking at infrastructure in Sub-Saharan Africa also casts doubt on the viability of exclusion through toll financing, even for major trunk roads. It notes that toll roads currently make up only 0.1% of the region's formal road network, and that these are found almost entirely in South Africa. Going further, it estimates that a minimum traffic volume of 15,000 vehicles a day is necessary for toll concessions to be economically viable, and that these conditions exist on less than 10% of the existing Sub-Saharan road network, with these areas concentrated in South Africa and some areas of Nigeria

Rafiqui (2003) provides a different perspective, where questions of economic viability combined with a lack of local legal ownership over community-constructed and maintained roads have been found to undermine the ability of communities to exclude and charge tolls to non-local users. The author also notes initiatives organized by the Swedish International Development Cooperation Agency (SIDA) and others that provide models for community roads and use taxation of non-community members to provide at least partial finance for them. Exclusion may therefore be possible but requires a legal framework and an acceptance that this cannot be the main source of road financing under most circumstances. Although the provision of rural road infrastructure had been devolved to the county level, the allocation of development funds is still centralized and the central government has continued to control counties through the financial purse.

A study in Uganda (Ministry of Works and Transport, 2003), into the funding needs for road networks, recommended that extra funding to be dedicated to increase the proportions of the paved roads in good or fair conditions from 74% - 89%. To achieve this, a higher priority was given to routine and periodic maintenance and rehabilitation of roads in poor conditions. The post-independence era of the late 1950 and 1960s saw a substantial expansion of national road networks. In most African countries by the end of the 1980 over 2 million kilometres of roads had been constructed with an asset value of \$150 billion. However, the expansion of the networks was not matched with commensurate funding for maintaining the infrastructure. The result was that by 2000 over 33 per cent of the asset value had been lost due to lack of routine and periodic maintenance (World Bank, 2009).

Most analysts (for example, Nalo 1993; World Bank 1995; Kimuyu & Mugerwa, 1998) agreed that the conditions of road networks in Kenya especially in the rural areas began to deteriorate extensively in the 1980s. This was partly because overall road funding fell and priority was given to development rather than the maintenance of the existing road networks. According to Kimuyu and Mugerwa (1998), the revenues available to the road sector are inadequate to maintain the road networks in their stable, long-term conditions and to undertake necessary improvements. A larger portion of funding for maintenance of these roads to increase their

durability, is concentrated at the top tier of the road networks in Kenya, thus the national highways receive the lions' share of any maintenance funding that is available with the remaining amount of funds reduced at each level up to the village roads (World Bank, 2002).

### 2.2.2 Political Interference

Issues of political salience or patronage may affect road construction, while community dynamics may shape local use and access to roads (Wales & Wild, 2012). Governments in the Sub-Saharan Africa are made of politicians. For any decision to be arrived at, politicians have to be engaged (Riverson, 1998). As it is known politicians are elected by communities so as to represent them and their needs. These politicians make the government and will tend to favour certain areas when it comes to development (Levick, 2003).

According to Van de Walle and Mu (2007), in Vietnam the preference for rural road construction over and above maintenance, and the willingness to transfer aid money for that purpose, indicates that local politicians view road construction as more politically salient and face political incentives that reward them for prioritizing construction over maintenance.

According to Wilson (2004), in the context of Peru, looking at both the modern era and the immediate post-Independence period; the ability of road construction to allow greater government influence in the provinces and easier mobilization of the coercive force of the state meant that, even where roads were not demanded, or even were resisted, they were still eventually provided. In the current era, there is a clear alignment between salience emerging from this desire to expand state authority and demand from rural people for connectivity. This ensures that road construction is highly political salient task and that, to a large extent, maintenance loses out as a result. Roads play critical roles as political capital in my study area i.e. Ugunja Sub-County. Decisions about where roads should be built, which road should be upgraded and which should be maintained are heavily influenced by prevailing political context (Hamala, 2007).

In Bangladesh according to Farhad (1997) politics plays an important role in any form of development. Road construction and any form of maintenance largely dependent on politics. According to him like any other developing country without any proper structures some areas are more developed than the rest as a result of political decisions. Rural areas whose representatives are not in government tend to be less developed as most of the government projects are deviated to other areas whose representatives are directly in power. Contractors benefit when politicians who they are connected to win offices. These politicians appear to be intervening in the allocation of contracts on behalf of members of their own networks even though they have no official role in making contracting decisions. These favoured contractors build very expensive roads without any observable differences in quality. Hence it is evident that democratically elected politicians use their powers improperly to benefit connected firms and individuals at the expense of the larger population who suffer from sub-standard or poorly built roads (Farhad, 1997).

In Malawi like other African countries, as observed by the World Bank 2009 Country Economic Memorandum (CEM, 2009) the poor state of the unpaved roads can be attributed to politics. The regime during the time of survey had its pressure on maintaining and rehabilitating some given roads due to political pressure from certain individual politicians.

Leyland (2003) noted that in East Africa countries, there are also little recognition by politicians of the importance of routine maintenances and preservation of the existing maintainable road networks as opposed to spending more money opening up or improving other roads which garner more political support.

Kenya provides a good example of how ethnic 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 ethnic favouritism and patronage politics, as resources can be targeted to politicians' ethnic power bases with considerable ease and strong identities provide a common point of political identification for poorly informed voters. For the roads sector, this contributes to the diversion of resources (chiefly paved road construction projects) towards areas that have provided support for ruling parties and politicians.

Burgess et al. (2009) demonstrate this by analysing a comprehensive dataset of post-Independence era information on road construction patterns in Kenya, the (relatively unchanged) geographic distribution of ethnic groupings and the identities and home regions of central government ministers. They find strong evidence that road expansion in any given year is closely related to the home regions of the prime minister and the minister of public works, and to ethnic groups represented in the Cabinet, with the second largest group receiving a particular boost. This suggests that politicians have used road construction as a mechanism for distributing patronage, either to secure their own power bases, or to ensure political stability. This may contribute to under-provision of roads in some areas and a deterioration of the road network in areas that lack a high-ranking minister or political connections.

### 2.2.3 Construction Contract Time

Time also is always a factor highly influenced by the general population. If the community has demanded the need for use of a road at a given time it requires that the responsible contractor to be up and finish his job in the shortest time possible. Going beyond the time limit set always triggers questions of competency.

Rural roads unlike the sophisticated urban roads have a short time season of completion. Considering the fact that it is almost impossible to do maintenance in wet weathers contractors always have limited time. Besides, these roads also consider the agricultural pattern of the area. As it is known that the rural roads are meant to assist in transportation of agricultural products maintenance should consider which time of the year trucks are not likely to use the roads. Nevertheless, country policies also dictate the time given to a contractor to complete a road. This is always as a result of government intending to ensure completion of rural roads at a particular time. The time set for constructions is mostly set based on millage and expects contractors to be done at a particular time of the year as per the distances they are covering (ADB, 2012).

According to Tighe (2000), the reason for most of the countries giving limited time for any form of road project is the belief that all contractors have the necessary technology for the job. In his article: *Why use Labour based Technology?* He argues that the labour based technology improves speed of construction. It enables easy movement of earth and gravel that reduces the time needed for construction.

### 2.2.4 Human Activities

Local institutions and communities (which include local government below state level) have usually been involved in rural road projects at planning stage and in maintenances. As far as maintenance is concerned, results have been disappointing. Activities ranging from driving along road shoulders, blocking culverts and other drainage channels would hamper the life span of roads (Kocher et al., 2007).

When road users decide to farm closer to the roads and provide water channels directly to the roads, this would bring about erosion which would deteriorate the lifespan of the road either paved or unpaved. Road maintenance should be considered unavoidable necessity of living in rural areas. People should take time to learn about roads because when they are well designed and maintained they have fewer negative impacts on the environment, are more reliable and cost less to maintain. Poorly designed, maintained and located roads have a higher risk of failing during storms than those which are properly designed and maintained.

Globally, literatures have shown much on issues surrounding managing rural roads maintenance and the obstacles faced. Studies that have been carried out in Kenya include: factors influencing maintenance of roads by Kenya Rural Roads authority (Esaba, 2014) and factors influencing maintenance of rural roads network (Njangu, 2015). However, these studies lack detailed information on effectiveness of managing rural road network durability. This work will be a modest attempt to fill this knowledge gap.

## 2. Methodology

This study was conducted using descriptive study design by employing both qualitative and quantitative approaches. This method was chosen because enabled the researcher to explore all the variables in the study in order to investigate the determinants of durability of roads in Ugunja Sub-County.

The target population of the study was 120 employees of Kenya Rural Roads Authority (KeRRA), the chiefs and sub-chiefs (4) and road side residents (180) in Ugunja Sub-County. The researcher believed that the selected key informants including the Kenya rural roads authority officials, chiefs and the road side residents possess more knowledge on the determinants of durability of rural road network in Ugunja Sub-County.

Table 3.1: Target Population

| Category           | Target Population |
|--------------------|-------------------|
| KeRRA officials    | 120               |
| Chiefs             | 6                 |
| Roadside residents | 180               |
| <b>Total</b>       | <b>306</b>        |

Sample size of Kenya Rural Road Authority officials (36) and that of the roadside residents (54) was arrived at by using the Mugenda & Mugenda (2003) criterion of 30% the target population. Because the target population of the chiefs is small (4), the researcher included all of them (chiefs and sub-chiefs) on the study as shown below;

Table 3.2: Sample Size

| Category        | Target Population | Sample Size<br>(30% Target Population) |
|-----------------|-------------------|--|
| KeRRA officials | 120               | 36                                     |
| Chiefs          | 4                 | 4                                      |



|                    |            |           |
|--------------------|------------|-----------|
| Roadside residents | 180        | 54        |
| <b>Total</b>       | <b>360</b> | <b>91</b> |

The sample size was therefore 91 respondents and purposive sampling and non-probability sampling procedure was used to select the respondents and interviewees because it specifically allowed the researcher to select a sample that was of interest to the study.

Primary data were collected using questionnaires and interview guide. The study also utilised the secondary data from journals and even the Kenya Rural Roads Authority records on durability of rural road network.

Questionnaire were the main tool used for data collection because they are more objective and gather responses in a more systematic way, while at the same time ensures confidentiality to the respondents (Kothari, 2007). It was administered to the respondents who in this case were the officials of Kenya Rural Roads Authority by the researcher with the help of research assistants.

Semi structured questionnaires with both open and closed ended questions were used. The researcher also used matrix and contingency questions within the study. (Mugenda & Mugenda, 2003) states that these are questions that are only answered if respondent gives particular response to a previous question. The questions were grouped into sections based on the objectives of the study.

Structured interview guide was used in getting information from chiefs and sub-chiefs, and the roadside residents. The interview guide had the same questions for this category of the respondents. Interview guides gives first hand, more accurate and reliable information as responses could be clarified by respondents.

These instruments were designed for the category of interviewee based on the four research objectives i.e. funding by the government, political interference, contract time and human activities. Social cues, such as voice, intonation, body language etc. of the respondents was a key influencer of using this method, other factors such as synchronous communication were also considered. According to Best and Kahn (2005) interview is superior to other instruments in that it creates rapport between the respondent and the researcher.

A letter of introduction was obtained from Catholic University of Eastern Africa .This was used to acquire permit to conduct the study. The questionnaires were given to specific respondents and collected there or later during the day and the interviews were administered and collected there and there.

After the completion of data collection, data were arranged and grouped according the four questions for the study. Analysis of study variables to answer the research questions were conducted using descriptive statistics of frequency tables, charts, graphs and percentages.

Quantitative data were analysed using Statistical Packages for Social Sciences version 20.0. The SPSS package was used because it is effective in handling large amount of data for analysis. Qualitative data were analysed through content analysis which in turn were analysed by organizing the data into themes, patterns and sub topics. Frequency tables, pie charts, percentages and graphs were used to present the results of the analysis for ease of understanding and interpretation. Phenomenological approach was used to analyse qualitative data in order to bring out the experience of the respondents meaning that the study attempts to understanding the perceptions, perspectives and understanding of a particular situation meaning.

Reliability was tested through test-retest method. This technique involved administering the questionnaires twice within a period of two weeks after which the scores in the two sets would be correlated. The researcher would use Pearson’s moment co-efficient approach to determine the co-efficient of correlation using the formula shown;

Where

$$r = \frac{N\sum xy - (\sum x) (\sum y)}{\sqrt{(\sum x^2) - (\sum x)^2 (\sum y^2 - (\sum y)^2)}}$$

- Where r = person correlation co-efficient
- X = result from the first test
- Y= results from the second test
- N = number of observations

A correlation coefficient of 0.7 to 1 is considered reliable (Mugenda & Mugenda, 2003).According to Mugenda and Mugenda (2003), a coefficient of 0.80 or more simply shows that there is high reliability of data. If the instrument will realize a Pearson product correlation coefficient (r) of 0.75 it will be deemed reliable.

Validity according to Borg and Gall (1989), is the degree to which a test measurers what it purports to measure. Wiersma (1995) adds that all assessments of validity are subjective opinions based on the judgment of the researcher. The researcher ensured validity by giving the questionnaires to professionals or experts in research for assessment as recommended by Mugenda (2003).

The questionnaires were given to two experts. The first expert was requested to assess what the questionnaire is trying to measure. The second one was asked to determine whether the set of items accurately represents the concept under study. The qualitative study instruments were tested by doing a pilot study on the same population to determine if the questions are answering what they are supposed to answer.

Department of Social Sciences and Development Studies of the Catholic University of Eastern Africa (CUEA) gave authorization for field work. For the researcher to have carried out the study, she sought permission from the National Council of Science and Technology and Innovation (NACOSTI). The researcher informed the respondents that the purpose of the study is purely academic and assure them of confidentiality and anonymity. Participants were not required to indicate their names on the questionnaire. The researcher administered the questionnaires personally and collects them at the agreed time once they are filled. Interviews were also scheduled with the interviewees to enable the researcher gather all the information needed.

### **3. Summary of Findings, Conclusions and Recommendations**

#### **4.1 Summary of Findings**

The purpose of this study was to examine the determinants of durability of rural roads networks in Ugunja Sub-County, Siaya County, Kenya. The study was guided by the following research questions: What are the effects of funding by the government on the durability of rural roads network in Ugunja Sub-County? How does political leadership influence the durability of rural roads network in Ugunja Sub-County? What are the effects of human activities on the durability of rural roads network in Ugunja Sub-County and finally what are the effects of construction contract time influence on the durability of rural roads program in Ugunja Sub-County, Kenya?

The study employed descriptive study design. KeRRA employees, chiefs and roadside residents in Ugunja Sub-County, Siaya County, Kenya were the targeted population. Purposive sampling was used to arrive at a sample 94 consisting of 36 KeRRA officials, 4 chiefs and 54 roadside residents. Data was collected using questionnaires and interview guide. Questionnaires were used to collect data from the KeRRA employees while interview guides for the chiefs and roadside residents.

Collected data was analysed with the help of Statistical Packages for Social Sciences (SPSS).Data from questionnaire was analysed quantitatively and presented in frequencies and percentages while data from interview guides was analysed qualitatively and its findings integrated within the quantitative data. From the analysis, the study came up with the following summary of findings presented below based on the research questions.

##### **4.1.1 Construction Funding**

Findings established that funding influence maintenance of rural roads to make them stable and durable to a very great extent as indicated by 57.1% of the respondents whereby the funds received for rural road construction were unreliable as indicated by 45.7% and funds allocated to KeRRA are slightly adequate as indicated by 62.9% of the respondents. This finding is in agreement with Kimuyu and Mugerwa (1998) that the revenues available to the road sector are inadequate to maintain the road networks in their stable, long-term conditions and to undertake necessary improvements.

##### **4.1.2 Political Leadership**

The findings revealed that of political interference influence durability of rural roads as indicated by 68.6% of the respondents whereby political leaders determine which rural roads are to be maintained or constructed to a very great extent as indicated by 57.1% although there is a time when the relevant bodies do not respect political decisions on which roads to maintain as indicated by 71.4% of the respondents. This concurs with Farhad (1997) that politics plays an important role in any form of development especially road construction and any form of maintenance largely dependent on politics.

##### **4.1.3 Construction Contract Time**

Findings established that construction contract time influence durability of rural roads whereby all rural projects are not carried out on time and the rush contributes to substandard roads as indicated by 62.9% at the same time, there are penalties if contractors do not complete the projects in time as indicated by 57.4% of the respondents. This is in agreement with ADB(2012) that contractors have little time for road construction in rural areas thus they should be allowed to schedule their completion time.

##### **4.1.4 Human Activities**

Findings established that human activities which included poor driving along the road, blockage of culverts and farming close to the road influence stability and durability of roads to a great extent as indicated by 42.9% of the respondents. Findings also established that KeRRA does not hold seminars or road shows to create awareness to the public on road usage and preservation as indicated by 42.9% of the respondents hence KeRRA experience problems as far as human activities from the locals are concerned occasionally as indicated by 57.1%. However, KeRRA sometimes educate the public on road issues as indicated by 28.6% although in most cases they result to doing repairs and take no action to members of the public who damage the road and the road reserves as indicated by 57.1% of the respondents. This finding is in line with (Kocher et al., 2007) that human activities ranging from driving along road shoulders, blocking culverts and other drainage channels would hamper the life span of roads.

## **4.2 Conclusions**

On the objective of funding by the government, the study concluded that the funding procedure for the construction or maintenance of rural roads move from the national government to the county government and then disbursed to relevant bodies like the Kenya Rural Roads Authority who currently from the study, receives a smaller fraction of the total fund disbursed by the national government hence inadequate to cater for proper and routine maintenance and construction of these rural road networks.

The study further concluded that Political leadership influences the durability of rural road networks. Political leaders are key players in making decisions as to which roads needs to be constructed, maintained or rehabilitated and mainly tends to concentrate or favor areas where they have strong political support. Political leadership has emerged to be a very influencing factor behind any development efforts hence needs a lot of attention when planning for such developments.

The study is also in agreement with time as a factor that influences durability of rural road network. Most road construction works takes very long time to be completed and things even grow worse when it is rainy season. This leads to a lot of cumulative deteriorations that takes very long time to be repaired hence making the areas very inaccessible. The study therefore concluded that time needs to be given consideration when allocating contracts for long lasting and standard results of road construction.

The study findings also showed that there is influence of human activities in the durability of rural road networks. These have the effect of damaging the roads hence increasing the maintenance costs and in some cases even leading to change of design from the original one.

## **4.3 Recommendations**

### **4.3.1 Policy Recommendations**

From the inadequacy of funds received by Kenya Rural Roads Authority for the construction and maintenance of rural roads networks, the study recommended that the road funding should be increased so that more rural roads can be constructed and the existing ones can be expanded, properly maintained and put in a good condition to speed up development in all sectors in rural areas. This will also increase productivity of other sectors that rely on good road networks for their effectiveness like the agricultural and industrial sectors.

The study also recommends that Political leadership involvement in matters of roads construction and maintenance should be minimized with the presence of the bodies like KeRRA who are responsible for the same. Being a key influence on most decisions pertaining to roads constructions, there is need to have all key stakeholders look at the wider societal benefits and a balance between cost and political mileage. Both the national assembly and the county assembly should clearly come up with an act and procedure on the extent of involvement of the political leaders on rural roads development.

The study further recommended that constructors should be allowed to allocate time that they feel is adequate to construct roads that are durable, stable and to the standards required because they understand their abilities. Giving those deadlines without putting quality in the forefront has resulted into very sub-standard works. Contractors should be allowed to schedule the project completion time to avoid constructing roads in a hurry which results to unstable and short-lived roads.

The general public plays very critical role in rural roads construction and even maintenance. They should be sensitized on usage of roads and their importance in economic development so that they can contribute positively towards efficient maintenance of these roads. Human activities such as farming along road reserves that leads to erosion of road shoulders could be minimized. The efforts of local communities participation needs to be integrated into the process of rehabilitation and maintenance of roads.

Incorporation of Labor Based Approach (LBA) in the maintenance of rural roads is important as it instills sense of ownership and plants a good maintenance regime and therefore recommended for the agencies involved.

### **4.3.2 Recommendations for Further Studies**

This study was carried out to assess the determinants of durability of rural roads network in Ugunja Sub-County only and did not take into consideration other Counties and therefore recommended the study to be done in other counties in Kenya for the comparison of results and also to mobilize a lasting solution to the poor conditions of rural roads.



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**REFERENCE TABLES AND CHARTS**

Table 4.1: Instrument Return Rate

| Respondents        | Sample size | No. collected | Return rate (%) |
|--------------------|-------------|---------------|-----------------|
| KeRRA staff        | 36          | 30            | 83.3            |
| Village chiefs     | 4           | 4             | 100.0           |
| Roadside residents | 54          | 45            | 83.0            |

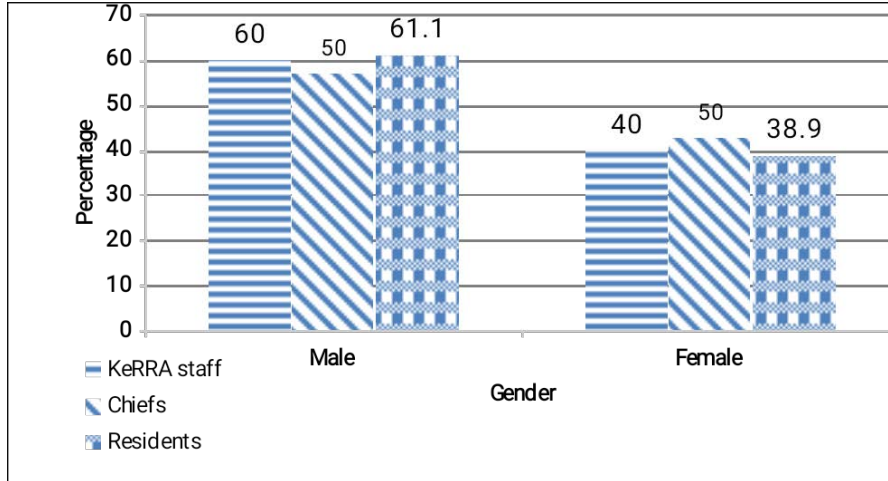


Figure 4.1: Gender of Employees, Residents and Chief

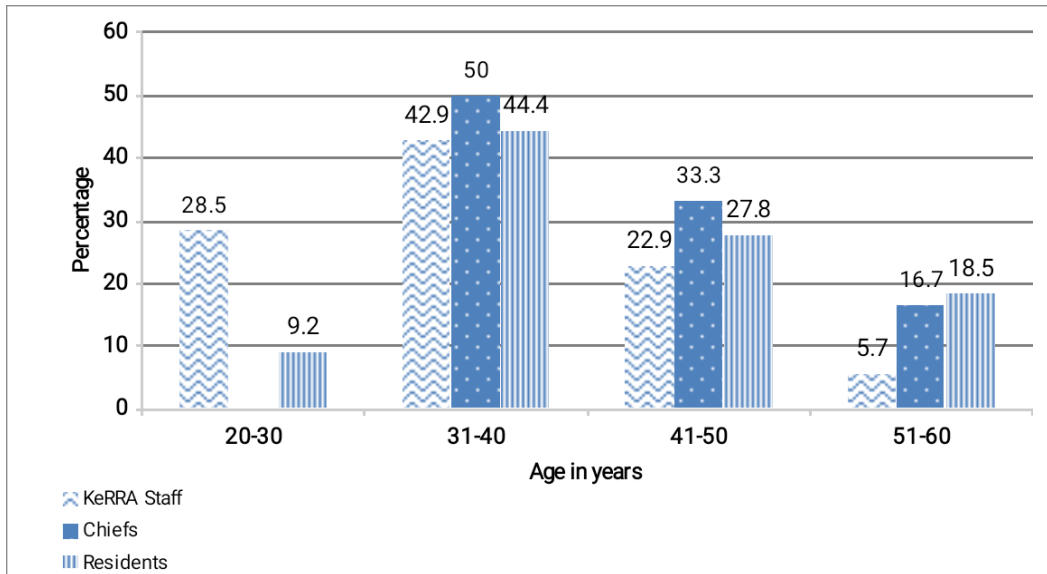


Figure 4.2 Age of KeRRA Staff, Residents and Chiefs

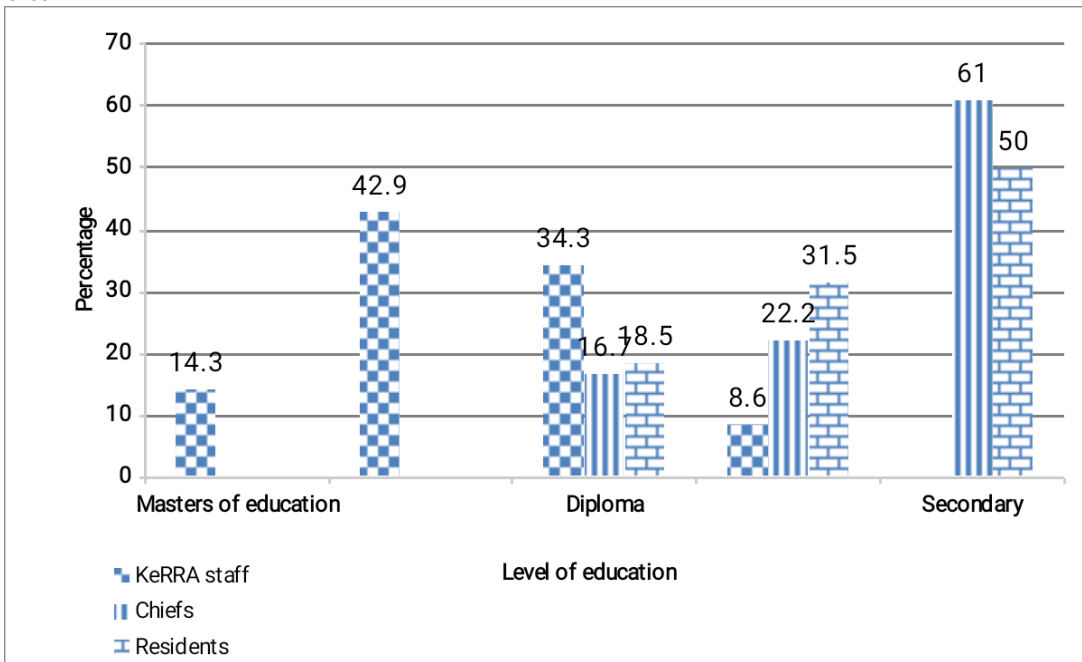


Figure 4.3: Education Level for KeRRA Staff, Residents and Chiefs

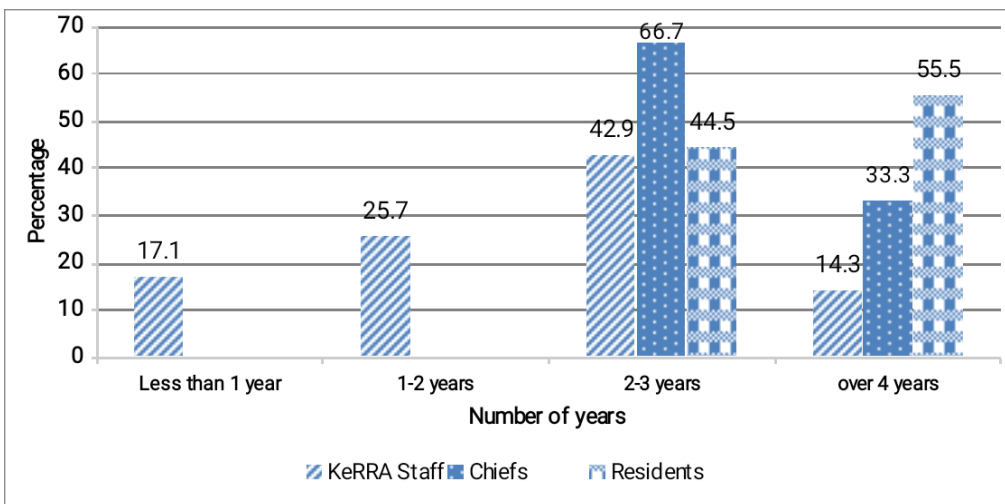


Figure 4.4: Number of Years in the Current Station

Table 4.2: Adequacy of Funds Allocated to KeRRA

| Adequacy of funds allocated to KeRRA | Frequency | Percentage |
|--------------------------------------|-----------|------------|
| Inadequate                           | 5         | 14.2       |
| Slightly adequate                    | 22        | 62.9       |
| Adequate                             | 8         | 22.9       |
| Total                                | 35        | 100        |

Table 4.3: Reliability of Funds Received for Rural Road Construction

| Reliability of funds received | Frequency | Percentage |
|-------------------------------|-----------|------------|
| Reliable                      | 4         | 11.4       |
| Unreliable                    | 16        | 45.7       |
| Sometimes reliable            | 5         | 14.3       |
| Very unreliable               | 10        | 28.6       |
| Total                         | 35        | 100        |

Table 4.4: Extent to which Funding Influence Maintenance of Rural Roads

| Extent to which funding influence maintenance of rural roads | Frequency | Percentage |
|--|-----------|------------|
| Very great Extent  | 20        | 57.1       |
| Great extent   | 10        | 28.6       |
| Moderate extent  | 5         | 14.3       |
| Total  | 35        | 100        |

Table 4.5: Sources of Finances that KeRRA Uses

| Sources of finances that KeRRA uses | Frequency | Percentage |
|-------------------------------------|-----------|------------|
| Central government                  | 15        | 42.9       |
| Local government                    | 10        | 28.6       |
| World bank                          | 10        | 28.6       |
| Total                               | 35        | 100        |

Table 4.6: Relationship between Funding and Durability of Roads

| Model   | Coefficients                |            | Standardized Coefficients | t      | Sig. |
|---|-----------------------------|------------|---------------------------|--------|------|
|   | Unstandardized Coefficients |            |                           |        |      |
|   | B                           | Std. Error |                           |        |      |
| (Constant)  | -.071                       | .162       | -.441                     | .662   | .000 |
| How reliable are the Funds for rural road construction received | .632                        | .058       | .885                      | 10.897 | .000 |

Table 4.7: Political Leadership and Rural Roads Maintenance

| Responses | Frequency | Percentage |
|-----------|-----------|------------|
| Yes       | 24        | 68.6       |
| No        | 11        | 31.4       |
| Total     | 35        | 100        |



Table 4.8: Extent to which Political Leadership Influence Maintenance of Rural Roads

| Extent to which political leadership influence maintenance of rural roads | Frequency | Percentage |
|---|-----------|------------|
| Very great Extent   | 20        | 57.1       |
| Great extent  | 10        | 28.6       |
| Moderate extent   | 5         | 14.3       |
| Total   | 35        | 100        |

Table 4.9: Respect of Political Decisions on which Roads to Maintain

| Responses | Frequency | Percentage |
|-----------|-----------|------------|
| Yes       | 25        | 71.4       |
| No        | 10        | 28.6       |
| Total     | 35        | 100        |

Table 4.10: Relationship between Political Interference and Durability of Roads

| Model  | Coefficients                |            | Standardized Coefficients | t     | Sig. |
|--|-----------------------------|------------|---------------------------|-------|------|
|  | Unstandardized Coefficients |            |                           |       |      |
|  | B                           | Std. Error |                           |       |      |
| (Constant)   | 1.045                       | .238       | .229                      | 4.402 | .000 |
| 1 Do political leadership play a role in decision making for rural roads maintenance | .705                        | .170       | .584                      | 4.135 | .000 |

Table 4.11: Opinions on Influence of Time on Road Durability in Ugunja Sub-County

| Statements  | Yes |      | No |      |
|---|-----|------|----|------|
|   | F   | %    | F  | %    |
| All rural roads projects are carried out on time                        | 15  | 42.9 | 20 | 57.1 |
| Contractors complain of shorter time limit for completion of projects   | 11  | 31.4 | 24 | 68.6 |
| If contractors do not complete the projects in time are there penalties | 22  | 62.9 | 13 | 37.8 |

Table 4.12: Whether Contractors should be allowed to Schedule their Project Completion Time

| Level of agreement | Frequency | Percentage |
|--------------------|-----------|------------|
| Strongly agree     | 3         | 8.6        |
| Agree              | 15        | 42.9       |
| Somehow agree      | 10        | 28.6       |
| Disagree           | 7         | 20.0       |
| Total              | 35        | 100        |

Table 4.13: Relationship between Time and Durability of Roads

| Coefficients |  | Unstandardized Coefficients |            | Standardized Coefficients | t     | Sig. |
|--------------|--|-----------------------------|------------|---------------------------|-------|------|
| Model        |  | B                           | Std. Error | Beta                      |       |      |
|              | (Constant)   | .182                        | .216       | .842                      | .406  | .000 |
| 1            | To what extent to you agree that contractors should be allowed to schedule their project completion time | .517                        | .109       | .940                      | 4.746 | .000 |

Table 4.14: Extent to which Human Activities Influences durability of Rural Roads

| Extent to which human activities influence its stability and durability | Frequency | Percentage (%) |
|---|-----------|----------------|
| Very great Extent   | 12        | 34.2           |
| Great extent  | 15        | 42.9           |
| Moderate extent   | 8         | 22.9           |
| Total   | 35        | 100            |

Table 4.15: Seminars or Road Shows to Create Awareness to the Public

| Responses | Frequency | Percentage (%) |
|-----------|-----------|----------------|
| Yes       | 15        | 42.9           |
| No        | 20        | 57.1           |
| Total     | 35        | 100            |

Table 4.16: Frequency of Human Activities Problems

| Frequency    | Frequency | Percentage (%) |
|--------------|-----------|----------------|
| Never        | 3         | 8.6            |
| Occasionally | 20        | 57.1           |
| Always       | 12        | 34.3           |
| Total        | 35        | 100            |

Table 4.1: How KeRRA Handle Cases of Members of the Public Damaging the Road

| Frequency                         | Frequency | Percentage (%) |
|-----------------------------------|-----------|----------------|
| Educate them on road issues       | 10        | 28.6           |
| Prosecute them to pay for damages | 5         | 14.3           |
| Do repairs and take no action     | 20        | 57.1           |
| Total                             | 35        | 100            |

Table 4.18: Relationship between Human Activities and Durability of Rural Road Network

Coefficients

| Model   | Unstandardized Coefficients |            | Standardized Coefficients | t     | Sig. |
|---|-----------------------------|------------|---------------------------|-------|------|
|   | B                           | Std. Error | Beta                      |       |      |
| (Constant)  | -.255                       | .326       | -.781                     | 4.440 | .000 |
| How often do you experience problems as far as human activities from the locals are concerned | .948                        | .139       | .764                      | 6.801 | .000 |