SOCIAL ECONOMIC FACTORS INFLUENCING MAINTENANCE OF BITUMEN ROADS: A CASE STUDY OF KENYA NATIONAL HIGHWAY AUTHORITY ROADS IN KISUMU COUNTY, KENYA

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ABSTRACT

The key to rapid economic growth and poverty reduction is production costs Development and maintenance of physical infrastructure is, employment creation, access to markets, and investment depend on the quality of infrastructure, especially transport. Road networks form vital links between production centres 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 study was guided by the following specific objectives: 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. In this study descriptive research design was employed. The target population of the study was 54 respondents from Kenya highway roads authority and other stakeholders. The study used a census approach where all the members of the target population were included into the study sample. Census approach is appropriate where the target population is small and all can be easily contacted as is the case for this study. Data was collected by the use of questionnaires. Raw data collected from the field was first cleaned for errors, coded, analysed and categorized as per the research questions in order to simplify it for presentation. The study established that the type of bitumen, mix specifications and the application procedure greatly influences the quality and the maintenance of the roads. It was deduced that adequate prior experience determines the quality of maintenance projects. It was clear that governors Member of Parliament and senators influence maintenance of bitumen roads in a great extent. The study concluded that availability of funds had the greatest influence on the maintenance of bitumen roads followed by political leadership then availability of construction material while staff competence had the least influence on maintenance of bitumen roads. The study recommends that there is need to have all key stakeholders look at the wider societal benefits and a balance between cost and political millage balanced, that financial resources for maintenance should be increased and disbursed on time so that more bitumen roads and that continuous repairs of disembarked roads to increase their life of service should done.

Key Words: *social economic factors, maintenance of bitumen roads, Kenya National Highway Authority Roads, Kisumu County, Kenya*

INTRODUCTION

All over the world road transport is the dominant mode of transport. Typically, over 80 per cent of passenger and more than 75 per cent of freight traffic are carried by roads. Roads are, therefore, essential for economic development and poverty reduction in the world (Abedi, 2007). Road deterioration due to lack of maintenance has become a growing issue in a number of developing countries (Kocher, 2012). The basic object of road maintenance is implicit in the word itself. It is done to ensure that the road constructed or improved, is maintained in its original condition. It is accepted that over the life of the road it will deteriorate due to the factors

with which maintenance activities can't deal. Nevertheless, maintenance is intended to slow this deterioration and should begin as soon as the road improvement is completed (ILO, 2011).

In spite of the importance of roads in the region, roads are poorly managed and inadequate funding is provided for maintenance. Large portions of the networks in Sub-Sahara Africa are, therefore, in poor condition. Socio-economic growth is, therefore, stifled due to high transport costs which are as a result of high vehicle operating costs. 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. Insufficient funds are allocated and even where the funds are available, they are generally not utilized within the planned maintenance framework. Rather, the funds are used to correct major defects which have been caused by the absence of preventive maintenance. The implications of lack of this maintenance are severe.

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). According to Ahmad (2016), maintenance is always a must for any structure in order to maintain its serviceability and to prevent deterioration that may shorten the service life. In reality, maintenance works are not given the attention it should have a budget allocated for maintenance work in which seldom become a prior consideration. However, it is a fact that maintenance is the most important activity to be carried out to prolong or at least maintain serviceability of structure until the end of its service life.

Africa has poorly maintained bitumen roads compared to developed nations (Mamabolo, 2013). The significant difference is partly due to diverse levels of development in general, but it also reflects the basic geographic fact that Africa is a very large continent, often with vast distances between the main population and production centers. The large size of the continent and the wide spread of population only raises the significance of transport in almost all development decisions. This lack of adequate transportation impacts the level of business activity by lowering productivity and limiting the entry of new enterprises. Businesses in Africa either supply to fragmented regional markets, or restrict themselves to market opportunities with profits large enough to cover the high transport costs (Ramachandran, 2012).

The relatively sparse road network does not imply a lack of importance of road transport. Rather, road transport is the most important mode. Decades of under-capitalization, poor management and general neglect of the railways have propelled road transport to the most important means of transport in Africa. Road transport accounts for over 80% of all freight and passenger movements in Africa and there are no signs that this position will be threatened during the foreseeable future (AfDB, 2013). The existing road networks in sub-Saharan African countries were originally established to service the specific needs and interests of the colonial powers who

utilized Africa as an import and export market to fuel domestic economic growth. Therefore, after having achieved independence, African nations inherited a transportation system that was outward looking rather than geared towards improved trade and transport with neighboring African countries (AfDB, 2013).

In 1998, the transport sector in Kenya comprised a road network with 150,000 km of roads and 350,000 vehicles, a single-track railway running from Mombasa to Uganda, a major seaport at Mombasa, small ports at Lamu and Malindi, a ferry service to Uganda, an oil pipeline from Mombasa to Kisumu via Nairobi and Eldoret, four international and many small airports, and three inland container depots (Detges, 2016). 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, 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).

In response to the deteriorating condition of the road network and the high associated economic costs being experienced, African countries under the aegis of the United Nations Economic Commission for Africa (UNECA) consulted with the World Bank, the donor community and other stakeholders giving rise to the creation of a Road Maintenance Initiative (RMI) in 1988 where the RMI set out the broad outline of a new policy framework for the road sector aimed at sustainable management and financing of public road services in Africa. Experience gained under the RMI, suggests that the key concept required to overcome the above problems is commercialization: bring roads into the market place, put them on a fee-for-service basis, and manage them like any other business enterprise. However, since roads are a public monopoly, and ownership of most roads will remain in government hands for some time to come, commercialization requires complementary reforms in four other important areas (Detges, 2016).

In conclusion of the sustained dialogue with Development Partners, governments in Sub-Saharan Africa therefore embarked on reforms in the road Sub-Sector in the early 1990s.The reforms aim at providing the road user value for money through better management, and by bringing roads into the market place. The reforms are to ensure increased and predictable road maintenance funding through appropriate cost recovery policies.

STATEMENT OF THE PROBLEM

The key to rapid economic growth and poverty reduction is development and maintenance of physical infrastructure. Production costs, employment creation, access to markets, and investment depend on the quality of infrastructure, especially transport. Road networks form vital links between production centers and markets. In addition its multiple function of providing access to employment, social, health and education services makes road network crucial in

fighting against poverty by opening up more areas and stimulating economic and social development. There is a problem, however, which is common throughout the world, the neglect of maintaining roads. Building new roads cost money, but without maintaining the roads properly, they deteriorate very quickly. If nothing is done, roads with a design life of decades can need replacing or major repair work after just a few years. Various studies indicated that this was attributable to inadequate provisions for the financing and the management of roads. The Kenyan government has been concerned over the fragmented nature of the institutional framework for the transport sector. With regard to road, it is considered that the establishment of the Kenya Roads Board in 2000 and the enactment of the Kenya Roads Act in 2007 which established the KeNHA, KURA and KeRRA were to go a long way in improving the legal and institutional framework for road development and maintenance (Ministry of Transport, May, 2009). This study sought to establish the influence of social economic factors on maintenance of bitumen roads in Kisumu County.

GENERAL OBJECTIVE

The purpose of the study was 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.

SPECIFIC OBJECTIVES

1. To determine the influence of availability of funds on maintenance of bitumen roads in Kisumu county
2. To evaluate the influence of political leadership on the maintenance of bitumen roads in Kisumu county
3. To assess the influence of availability of construction material on maintenance of bitumen roads in Kisumu county
4. To find out the influence of staff management competence on maintenance of bitumen roads in Kisumu county

THEORETICAL FRAMEWORK

The theoretical framework for the study was underpinned by conventional theory of Pavement Deterioration as postulated by Van Rijn (2006). Van Rijn assumes that the need for periodic maintenance depends on the conventional theory of Pavement Deterioration, manifested by fatigue at the underside of the pavement or structural deformation, and assumes that deflection increases with time and traffic as the pavement deteriorates from traffic induced stresses.

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 generally get damaged faster than their paved or tarred counterparts. The types and loading of vehicles that would use a road and the volume of traffic have to be put into consideration when constructing it in addition to the nature of the soil on which it is to be built. Otherwise, the road would get damaged quickly and fail to give the desired service. Every road needs to be maintained in order to repair the damages occurring to it with time and usage.

RESEARCH METHODOLOGY

Research Design

A research design is the arrangement of conditions for collection and analysis of data in manner that aims to combine relevance to the research purpose with economy in procedure. It is the conceptual structure within which research is conducted. It stipulates the blue print for collection, measurement and analysis of data (Kothari, 2003). In this study descriptive research design was employed. The reason for selecting descriptive research design is that design describes the state of affairs as it exists at present and the researcher has no control over the variables. One can only report what is happening or what has happened. Also descriptive research design provides an opportunity to gather detailed data that give explanation to research questions and logically structure the inquiry into the problem of study, Marsh (1982).

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 was 54 respondents from Kenya highway roads authority and other stakeholders

Sample Size Sampling Procedures

The study used a census approach where all the members of the target population were included into the study sample. Census approach was appropriate where the target population is small and all can be easily contacted as is the case for this study.

Data Collection Methods

Data was collected by the use of questionnaires and interview schedules. A written questionnaire was 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.

Pilot Testing of the Instrument

Six questionnaires were administered in Siaya County which neighbors Kisumu County. The respondents were selected randomly, at least a week before the main study. They were asked to respond to the questions as the researcher observes whether each question measures what it is supposed to measure, how long it takes to interview one respondent, whether response choices are appropriate, whether the tool collects 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.

Validity of the Instrument

Validity is the accuracy and meaningfulness of inferences, which are based on the research results; it 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 are reviewed under the supervision of the research supervisors in order to ensure they capture valid and reliable information. Also the questionnaires were pre-tested to ensure their validity. Also research assistants were trained by the researcher on how to administer the questionnaires.

Data Collection Procedure

An assistant researcher was trained in order to standardize the data collection exercise. A full list of respondents to be interviewed was first prepared. The local administration office was informed of the research and an introductory letter sought from them, permission was also sought from the national council of science and technology so as to make of the study conform 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 collected for analysis.

Data Analysis Technique

Raw data collected from the field was first be 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 are level of funding, political interference construction material and 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 was the dependent variable, maintenance of bitumen roads, while the independent variables X_1 level of funding, X_2 political interference, X_3 construction material and X_4 management competence.

RESEARCH FINDINGS

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 1: Reliability Analysis

	Alpha Value
Availability of funds	.715
Political leadership	.819
Availability of construction material	.739
Staff management competence	.728

The study results showed that political leadership was the most reliable variable as expressed by a Cronbach's Alpha of 0.819 followed by availability of construction material Cronbach's Alpha of 0.739, then staff management competence with Cronbach's Alpha of 0.728 while Availability of funds was the least reliable as shown by Cronbach's Alpha of 0.715. This therefore illustrates that all the four scales were reliable and accepted as their reliability values exceeded the set threshold of 0.7 as argued by Sekaran and Bougie (2010).

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.

From the table 2, the results reveal that availability of funds has a strong positive correlation with maintenance of bitumen roads which is statistically significant since the coefficient is 0.842 and p-value is 0.002< 0.05. The study further shows that political leadership has a positive

correlation with maintenance of bitumen roads and the relationship is statistically significant at the 5% significance level as shown by a coefficient of 0.773 and p-value of 0.000< .05.

Table 2: Correlation Matrix

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

The findings also show a positive and significant relationship between availability of construction material and of maintenance of bitumen roads as expressed by a coefficient 0.663 and p-value of 0.0002 <.05. Finally, the study shows that staff management competence and maintenance of bitumen roads are positively and significantly correlated as shown by a coefficient of 0.731 and a p-value of 0 .010 < .05.

Overall, availability of funds had the greatest influence on the maintenance of bitumen roads followed by political leadership then availability of construction material while staff competence had the least influence on maintenance of bitumen roads.

DISCUSSION

Availability of Funds

The study revealed that adequacy of finances, time of disbursement of finances and sources of finance influence maintenance of bitumen roads greatly. It was also revealed that cost of bitumen greatly influences timely completion of the maintenance works. The study also found that cost of funds moderately influence maintenance of bitumen roads. This is in line with Rafiqui (2003)

who argue that the cost of maintenance is small relative to the asset value, it is crucial that maintenance is carried out on a timely and regular basis. Consequently it is a recurrent activity and needs to be financed as such. The funds allocated to it should relate to a maintenance plan which defines those roads in a maintainable condition and defines a recurrent cost for the network.

Political Leadership

It was clear that governors Member of Parliament and senators influence maintenance of bitumen roads in a great extent. The study further revealed that County representatives lightly influence maintenance of bitumen roads. This agrees with Burgess et al. (2009) who 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.

Availability of Construction Material

The study established that the type of bitumen, mix specifications and the application procedure greatly influences the quality and the maintenance 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 showed that cost of bitumen influence the timely completion of maintenance work slightly. 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 have 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.

Staff Management Competence

It was deduced 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 staff competencies and technical expertise greatly influences the road maintenance. Further it was clear that academic qualification slightly influence maintenance of the roads. 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.

CONCLUSIONS

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 time of disbursement and sources of finance greatly influence maintenance of bitumen roads.

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 MPs and Senators influence maintenance of bitumen roads in a great extent.

Availability of Construction Material

The study further concluded that availability of construction material influenced maintenance of Bitumen roads in Kisumu County positively. This was as a result of great influence of type of bitumen, mix specifications and application procedure on maintenance of bitumen roads.

Staff Management Competence

The study finally concluded that staff management competence significantly influences maintenance of Bitumen roads in Kisumu County. This was as result of adequate prior experience, staff competencies and technical expertise great influence on maintenance of roads.

RECOMMENDATIONS

The study recommends that political leadership being a key influence, there is need to have all key stakeholders look at the wider societal benefits and a balance between cost and political millage balanced. 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 influence on rural roads development.

The study also recommends that financial resources for maintenance should be increased and disbursed on time so that more bitumen roads will be constructed and those existing can be put in a good condition to speed up development.

The study also suggest that there is need to set up a special unit within the Kenya highway roads authority that would manage and address all issues related to political interference so that public will get services within any discrimination. The public should also be sensitized 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 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 study further recommends that 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.

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