

# Road Assets Maintenance and Performance of Road Agencies in Kenya

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DOI: <https://doi.org/10.51244/IJRSI.2024.1108083>

Received: 07 August 2024; Accepted: 14 August 2024; Published: 14 September 2024

## ABSTRACT

According to Sustainable Development Goals (SDG) target 11.2, access to secure, affordable, accessible, and sustainable transport systems is to be provided by the year 2030. In addition, Kenya's Vision 2030 aims to improve domestic and regional trade through the construction and rehabilitation of approximately 5,500 kilometers of roads, including 3,825 kilometers of national trunk roads and 1,675 kilometers of county roads (Kenya Vision 2030). This study aimed in establishing the effect of road assets maintenance on the performance of road agencies in Kenya. The study was guided by administrative management theory and the agency theory. Positivism research philosophy and cross-sectional research design was used. The study target population comprised of the five road agencies in Kenya. The unit of observation comprised of 251 staff from the five road agencies in Kenya. The data was collected using self-administered questionnaires and used SPSS version 26 for diagnostic tests, descriptive, and regression analysis. The findings revealed that the organization rigorously tracks road defects nationwide and includes them in maintenance planning. Moreover, the organization adheres to a strict maintenance procedure that aligns with the speed at which road defects occur. The establishment of standards for road inspection planning and compliance, as well as ensuring engineering fundamentals are in line with the inspection plan, were also observed. Furthermore, the study confirmed the presence of a moderate positive and significant correlation between road asset maintenance and the performance of road agencies in Kenya. This indicates that effective road asset maintenance contributes significantly, accounting for approximately 20% of the overall performance of road agencies in the country. These results highlight the importance of prioritizing road asset maintenance as a means to enhance the performance of road agencies in Kenya.

**Keywords:** Road Asset Maintenance, Performance

## INTRODUCTION

The provision of roads, trains, airports, water systems, and electrical networks is normally undertaken by the government of a country. Public infrastructure serves as the foundation for all economic operations. Nevertheless, it is common for governments to place emphasis on the construction of new infrastructure, despite the potential consequences of neglecting maintenance, which may result in degradation, significant issues, and even catastrophic events. Numerous instances of severe catastrophes resulting from the lack of infrastructure maintenance have been documented by the media (Gibson & Rioja, 2019). The catastrophic event that occurred in 2018, namely the collapse of the Morandi bridge, resulted in the unfortunate loss of 43 lives and left around 600 individuals without a place of residence. According to a report published by La Stampa newspaper in 1967, it was said that the concrete construction of the bridge would not need any maintenance. The catastrophe is often attributed to the persistent disregard for upkeep. The bridge's final collapse may be attributed to insufficient upkeep. Infrastructure maintenance often employs traditional contracting methods, whereby the client organization establishes the requirements and chooses the contractor with the most competitive bid in terms of price via a tendering process. According to Gibson and Rioja (2019), the conventional maintenance contract compensates the contractor based on the number of repairs or replacements performed. This arrangement creates a counterproductive incentive structure, as the contractor

stands to gain from systems that are less dependable.

Over the course of the previous two decades, a notable decline in the condition of the Southern Africa Development Community (SADC) regional trunk road network has been noticed, mostly attributed to inadequate maintenance practices. The degradation of road infrastructure has resulted in the depletion of a considerable amount of the enormous expenditures made in this sector, hence exerting a detrimental effect on the economies of the area as a consequence of escalated transportation expenses. (Tee and Ekpiwhre, 2019; Jeong et al., 2021). The maintenance and upkeep of road assets hold immense importance. However, a significant proportion of road networks in many African countries are now experiencing a state of deterioration, owing to a range of contributing reasons. Based on a research undertaken by the World Bank, it was determined that a significant proportion, namely less than 50 percent, of the primary road infrastructure that is covered with pavement is in a state of optimal condition.

Kenya faces challenges with corruption and maintenance backlogs, but recent investments aim to improve its road network (Onyango et al., 2022). Within the specific geographical setting, the government of Kenya has instituted many public road agencies and devolved administrations with the primary objective of supervising and managing the country's extensive road networks. The entities responsible for the management, development, and maintenance of various road networks in Kenya include the Kenya Roads Board (KRB), which oversees the Road Maintenance Levy Fund (RMLF); the Kenya National Highways Authority (KeNHA), which is in charge of managing, developing, and maintaining National and Trunk Roads in Classes S, A, and B; the Kenya Rural Roads Authority (KeRRA), which is responsible for the management, development, and maintenance of National Trunk Roads in Class C; the Kenya Urban Roads Authority (KURA), which is tasked with the management, development, and maintenance of Urban Roads in Cities and Municipalities; the Kenya Wildlife Service (KWS), which is responsible for the management, development, and maintenance of roads in National Parks and National Game Reserves; and the 47 County Governments, which are responsible for the management, development, and maintenance of County Roads in Classes D and below (KRB, 2022).

### **Road Asset Maintenance**

The management of assets often entails the examination of a great number of factors, such as the levels of investment, the maintenance standards, and the economic relevance. When it comes to the management of infrastructure, these aspects may be evaluated using a variety of performance measures of the asset, such as the amount of time it is actually being used, its degree of safety, and its impact on the environment. The management of assets is susceptible to the influence of geographical and socio-economic elements that are present inside the firm, in addition to the established business processes (Schoenmaker & De Bruijn, 2020).

According to the study conducted by Kim et al. (2018), the primary aim of this particular methodology is to effectively and consistently oversee tangible assets and their corresponding expenses, efficacy, and potential hazards throughout their complete lifespan, ultimately working towards the strategic goals of the organization. The aforementioned notion highlights the connection between asset management and the attainment of corporate goals.

Additionally, Kamau and Human (2020) proposed a policy-level component that encompasses the development of long-lasting goals and the enhancement of transportation infrastructure. Furthermore, the research emphasized the many elements pertaining to budget management, such as the thorough examination of the budget, estimation of expenses, and implementation of monitoring and evaluation protocols. The evaluation of road asset upkeep undertaken by the Kenya Road Board involves a variety of elements. The elements included in this study are the degree of responsiveness shown towards road-related concerns, adherence to established inspection protocols, prioritization of road safety considerations, assessment of the environmental consequences associated with repair operations, and the amount of acceptance and satisfaction experienced by road users.

### **Performance**

According to Nugrahani and Jahja (2018) argue that the use of performance indicators is essential for

conducting a precise assessment of the results achieved by agencies within the domain of highways. Rafi et al. (2022) posit that the assessment of a road assets maintenance performance indicator's efficacy necessitates a comprehensive examination including many key considerations, including effectiveness, efficiency, relevance, and financial feasibility. The government of Kenya has created a significant number of public road agencies with the goals of efficiently administering the nation's road network and preserving its condition. Examples of the aforementioned government agencies are the Kenya National Highways Authority, the Kenya Wildlife Services, the Kenya County administrations, the Kenya Rural Roads Authority, and the Kenya Roads Board. Both the formulation of road-related policies and the establishment of road-related standards are the responsibilities of the Ministry of Roads and Transport. They are the ones who are responsible for carrying out this duty. The Keystone Regulatory Board (KRB) is responsible for the administration of the Road Maintenance Levy Fund (RMLF), which means that it is tasked with the responsibility of monitoring the allocation of funds for activities that are directly linked to road repair. This activity is carried out in order for the KRB to satisfy its legal requirements.

According to the First Schedule of the Kenya Roads Act (2007), the Kenya Wildlife Service (KWS) is the organization that is assigned the duty of maintaining and supervising the administration of the road infrastructure that is located within Kenya's national parks and reserves. This responsibility falls under the KWS's jurisdiction. The establishment of these organizations has, as its major emphasis, the purpose of ensuring effective management of the road network. This was the fundamental motivation for the establishment of these organizations. It is vital for organizations that use roads to have distinct legal identities and aims, as well as suitable, reliable, and consistent financial resources and a professional and practical approach to the administration of roads. This is because the challenges that were outlined above make it essential for organizations to have separate legal identities. Because the Kenya Medium-Term Plan (MTP) includes activities that are intended to extend the lifetime and resilience of roads, it is important for the relevant governmental institutions in Kenya to put the plan into action.

### **Kenya Road Agencies**

Kenya's road infrastructure development and maintenance rely on a coordinated effort by several key road agencies (Kenya Roads Board, 2013). These agencies play a crucial role in ensuring the quality, safety, and connectivity of the road network throughout the country. The main road agencies in Kenya include the Kenya National Highways Authority (KeNHA), the Kenya Urban Roads Authority (KURA), and the Kenya Rural Roads Authority (KeRRA). Established under the Kenya Roads Act, 2007 (Republic of Kenya, 2007), KeNHA is responsible for developing, managing, rehabilitating, and maintaining national highways in Kenya (Kenya National Highways Authority, n.d.). This act empowers KeNHA by outlining its responsibilities and powers in overseeing the national road network, ensuring its quality, safety, and efficiency (Republic of Kenya, 2007). KeNHA focuses on constructing and maintaining major highways that connect different regions of the country. They collaborate with various stakeholders, including the government, private contractors, and international organizations, to achieve efficient and sustainable development of national roads (Kenya National Highways Authority, n.d.).

### **Statement of the Problem**

According to Sustainable Development Goals (SDG) target 11.2, access to secure, affordable, accessible, and sustainable transport systems is to be provided by the year 2030 (UN-SDG 2030). In addition, Kenya's Vision 2030 aims to improve domestic and regional trade through the construction and rehabilitation of approximately 5,500 kilometers of roads, including 3,825 kilometers of national trunk roads and 1,675 kilometers of county roads (Kenya Vision 2030). Approximately 80% to 93% of passenger and cargo travel in Kenya is carried out by road (Greiner et al., 2021). This mode of transport accounts for more than 30% of the total output each year from 2010 to 2020. Despite its importance, roads are poorly managed and receive inadequate amounts of funding for repair and maintenance, thus leading to a substantial portion of the country's Ksh 3.5 Trillion networks being in a state of disrepair (Mushori et al., 2020). Decline on government expenditure and road funds collection could be the main contributors as have been witnessed in the recent past. For instance, in 2020 asset maintenance declined from Ksh 592.9M to Ksh. 494.8M, similarly to Fuel Levy Fund declined by 38.5%

to KSh 53.5 billion in 2021/22 and transit toll collection from KSh 550 million in 2020/21 to KSh 539 million in 2021/22. Despite the decline in revenue and expenditures, road passenger and freight traffic output project a growth to KSh 1,785.4 billion in 2021. The overall condition mix of road assets maintenance over the past decade has increased, with poor network declining to 37.01% from 58.87% however this is still significant and requires a big investment to bring that network to maintainable standards.

### **Research Objective**

To establish the effect of road assets maintenance on the performance of road agencies in Kenya

### **Research Hypothesis**

**H<sub>01</sub>:** There is no significant relationship between road assets maintenance and performance of road agencies in Kenya

## **LITERATURE REVIEW**

### **Theoretical Literature**

#### **The Administrative Management Theory**

Henri Fayol established a comprehensive model of management consisting of fourteen key principles in the year 1925. This model is widely acknowledged as a major advancement in the field of administrative management theory. The model places considerable emphasis on the relationship between supervisors and their organizations in order to get an understanding of the goals of these organizations, develop efficient tactics for attaining those objectives, and motivate employees to perform at their highest potential. According to Fayol's theory, management is characterized by several distinct elements. These include the division of labor, the exercise of authority and discipline, the unity of command and direction, prioritizing group interests over individual interests, compensation, centralization, the scalar chain, maintaining order, equity, stability in employee tenure, initiative, and fostering a sense of camaraderie (Fayol, 1930). These aforementioned attributes are the key factors that differentiate management from other organizational frameworks.

Henri Fayol views are seen as antiquated when compared to the prevailing ideas in contemporary culture, which prioritize leadership over management across many situations. The planning functions he has remain pertinent to the field of management, since they continue to be used for the purpose of overseeing tasks and personnel. The aforementioned functions served as the fundamental principles for the administrative school of management, which revolved on the six core functions of forecasting, planning, organizing, commanding, and coordinating. The present theory will function as a foundation for the independent variable "road assets maintenance" and will help to elucidating how the enhancement of predictable and controllable behaviors inside road agencies may lead to improved management of road assets, as per the specific criteria outlined in the research.

#### **Agency Theory**

The agency theory, which was first developed by Stephen Ross and Barry Mitnick (Mitnick, 1975), places an emphasis on the significance of distinguishing between ownership and control, which results in the emergence of an inherent agency problem. The concept proposes the existence of a connection between the most important stakeholders, who are the shareholders, and the management boards, who serve in the capacity of spokespeople for the firm. According to the conceptual framework, shareholders, who are the principal owners of the company, choose managers to act as their agents so that the managers may carry out their responsibilities on their behalf. According to Mitnick and 1975's research, shareholders give management total influence over the execution of business activities. However, it is often seen that managers and agents frequently face obstacles while attempting to accomplish the obligations that have been allocated to them. This phenomena, which is generally referred to as the divergence of interests as suggested by the theory, may be



observed very frequently.

This study explores the relationship between the government (as the principal) and the road agencies (as the agents) responsible for road asset maintenance. The Agency Theory provides a framework to analyze how the government delegates authority to the road agencies and how the agencies act in the best interest of the government and the public. The Agency Theory emphasizes the need for monitoring and control mechanisms to ensure that agents act in the best interest of principals. In the context of the study, it can be applied to evaluate how the regulatory framework and budgetary allocation enable effective monitoring and control of road agencies' performance. It examines whether there are mechanisms in place to hold road agencies accountable for their actions. The Agency Theory focuses on aligning the incentives of principals and agents to achieve desired outcomes. In the study, it can be used to assess how budgetary allocation and regulatory frameworks incentivize road agencies to perform well in terms of road asset maintenance. It examines whether the incentives provided by the government effectively motivate the road agencies to meet performance targets.

## **Empirical Literature Review**

### **Road Assets Maintenance and Organizational Performance**

In their research, Sodikov and Jamshid (2019) investigated the road asset management systems in developing countries, focusing specifically on Uzbekistan. This research examined the primary concerns surrounding the effective management of current assets in a manner that optimizes public benefit, taking into account the constraints imposed by limited financial resources. The road asset management system was evaluated with regards to four key components, namely objectives, budget, asset, and performance. The study identified various issues that need to be addressed at different levels of analysis in policy-making. These include the establishment of long-term goals, the expansion of road networks, the development of traffic safety action plans, the assessment of environmental impacts, considerations for economic development, and other related factors. At the budget level, it is important to plan for yearly and multi-year financing, breakdown the budget, and estimate costs. Data management is crucial and involves tasks such as collecting inventory and condition data, managing databases, and analyzing traffic data. Performance modeling is necessary to predict future conditions and conduct network-level analysis. Programmed optimization is essential for conducting economic, environmental, and risk analyses, as well as multi-criteria analysis. Finally, implementation programs are needed to carry out the construction, maintenance, and operation of road assets. The current study assessed the effect of road assets maintenance on the performance of road agencies in Kenya.

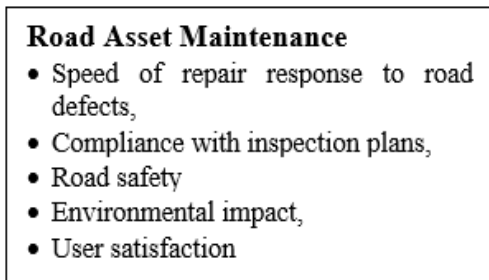
During the years 2004–2008, Bal et al. (2013) carried out exploratory research on stakeholder involvement in the building and construction industries in the countries of Sweden, Australia, the United Kingdom, Italy, and the United States of America. They were able to collect information on the processes for communicating with stakeholders by conducting interviews with practitioners who were engaged in initiatives relating to sustainability. Based on these findings, one may draw the conclusion that a process consisting of six steps is required for effective stakeholder involvement. These steps include the following: identification of stakeholders, mapping of stakeholders to sustainability objectives, prioritisation, management, performance assessment, and execution of targets. It was also brought to everyone's attention how important it is to understand the sustainability agendas of stakeholders and to measure their success using key performance indicators. The current study assessed the effect of road assets maintenance on the performance of road agencies in Kenya

Kamau and Human (2015) conducted research in order to establish the extent to which monitoring and evaluation contributed to the successful completion of a project in Kenya. In order to discover the major elements that have an influence on the monitoring and evaluation methods, the researcher made the decision to perform an in-depth examination of the relevant literature. Even more, the things we already talked about were separated into four separate groups: how well the monitoring and evaluation team did their job, the monitoring strategy that was used, how much political influence there was, and what stage of the project it was in. According to the findings of the research, having support from management is an essential component in guaranteeing the effectiveness of monitoring and evaluation efforts. The current study examined the effect of

road assets maintenance on the performance of road agencies in Kenya.

### Conceptual framework

#### Independent variable



#### Dependent variable

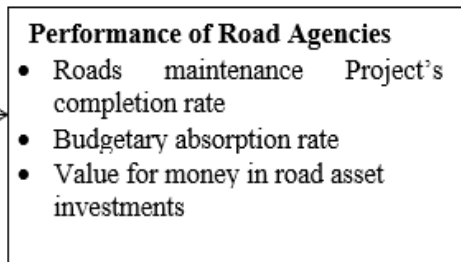


Figure 1: Conceptual Framework

## RESEARCH METHODOLOGY

### Research Philosophy

The term "research philosophy" was coined by Saunders (2017), who described it as "a system of assumptions and ideas underlying the creation and evolution of knowledge in a specific area of study." According to Saunders (2017), the positivist premise that objective facts provide the greatest scientific evidence is likely to result in a large choice of quantitative research methodologies. This is expected to be the case since the positivist assumption assumes that objective facts give the best scientific evidence. The present research used a positivist philosophical framework by integrating established theories to formulate hypotheses, then subjecting them to evaluation and validation via the examination of study findings. Moreover, the researcher used positivist philosophy by maintaining objectivity in relation to the study components, using quantitative data analysis procedures, and thus achieving generalizability in the targeted research outcomes.

### Research Design

Research design can be described as an organized plan for achieving the goals of a study and how to answer its associated questions (Saunders et al., 2019). This study will adopt a cross-sectional survey research design because the design is best suited for finding out the prevalence of a phenomenon, situation, problem, attitude or issue, by taking a cross-section of the population as it stands at the time of the study (Kumar, 2014). This study used the cross-sectional survey technique, which is typically associated with a deductive approach to answer questions regarding who, what, where, how much or how many (Cooper & Schindler, 2006).

### Target Population

Target population of a study, as operationalized by Banerjee and Chaudhury (2010), is an entire group from which the researcher's information interest is required to be ascertained. The study target population comprised of the three road agencies in Kenya namely KeNHA, KeRRA, and KURA; Public Service Performance Management & Monitoring Unit (PSPMMU); and Kenya Road Board (KRB) as unit of analysis. The unit of observation comprised of management and staffs of these agencies, and drawn from Supply Chain, Finance and Engineering departments that are involved in road maintenance.

### Sample Size and Sampling Design

Sampling is defined as a process of selecting a part of the total population present the whole group. According to Kothari and Gang (2014), this is done in order to create a miniature version of the larger population. In order to acquire an accurate representation of the population, the study applied Role's Sample Determination formula (Charan & Biswas, 2013; Singh & Masuku, 2014) shown below.

$$n = \frac{N}{1 + Ne^2}$$

Where: n = the sample size

N= the target population

e = margin of error (e≤0.05)

The computed sample size taking 0.05 as the sampling margin of error, and target population of 151 therefore, is 153 as shown below.

$$n = \frac{251}{1 + 251(0.05)^2} = 154.22427 \cong 154$$

The study divided the population into stratum based on the department for each road agency. The population of each subcategory or stratum was then determined and used to estimate weight or proportion that was then used to compute the respondents to be drawn from each stratum. Thus, the proportionate sampling was adopted in selecting the respondent as shown in the sample frame Table 1. In addition, purposive sampling method was used in identifying two senior evaluation officers/managers for interview purposes from PSPMMU and KRB to provide data for triangulation of main research result and findings.

Table 1: Sample Frame

Department Category	Road Agency	Population (N)	Weight (N/251)	Sample
Supply Chain	KeNHA	24	0.0956	11
	KURA	25	0.0996	15
	KeRRA	23	0.0916	14
Finance	KeNHA	21	0.0837	13
	KURA	25	0.0996	15
	KeRRA	22	0.0956	11
Engineers	KeNHA	35	0.1394	21
	KURA	33	0.1316	20
	KeRRA	41	0.1633	24
Performance & Monitoring Unit	PSPMMU	2		2
Regulator	KRB	2		2
Total		<b>251</b>	1.0000	154

### Data Collection Procedures

This research utilized primary data in order to answer the study's specific aims. A questionnaire was employed for this purpose due to its ability to allow respondents to fill it out without assistance, anonymously, and being relatively cheaper and faster than other methods while reaching a bigger sample size (Creswell, 2009).

### Pilot Testing

According to the opinions of Cooper and Schindler (2014), the phase of the research process that is devoted to the gathering of data often begins with the pilot testing of the data collection instrument. The researcher carried out a pilot study at in three road agencies namely KURA, KeRRA and KeNHA. The choice of the pilot population was justified in that they also form the study population thus high degree of homogeneity in characteristics and attributes. Mugenda and Mugenda (2012) pointed out that the sample size to be utilised for testing is governed by cost, time and efficiency, however 5-10% of the study sample is accepted. The pilot test used was 10% of the study sample, which is 15 respondents (10% of 154).

### Research Model

The proposed empirical model to examine the statistical importance of the independent variable (road assets maintenance) on the dependent variable (road agencies performance) is shown in equation I:

$$PERF = \beta_0 + \beta_1 RAM + \varepsilon$$

Where; PERF = is the Performance of road agencies,

RAM = is the Road assets maintenance,

B<sub>0</sub> = is the intercept,

β<sub>1</sub> = is the regression coefficients,

ε = is the Error term

## DATA ANALYSIS AND RESEARCH RESULTS

### Demographic Characteristics

The outcomes as shown in Table 2 shows that 3 respondents indicated that they hold a doctoral (PhD) degree, which represented 2.5% of the respondents, while 74 of the respondents had a Master's degree which represented 60.7% of the respondents, those with a Bachelor Degree were 42 representing 34.4% of the respondents. Finally the respondents with a Diploma were 3 representing 2.5% of the respondents.

Table 2: Demographic Characteristics

Demographic Profile		Frequency	%
Highest level of education	Doctoral (Ph.D)	3	2.5
	Masters	74	60.7
	Bachelor Degree	42	34.4
	Diploma	3	2.5
Number of years worked with the agency	1 - 5 Years	14	11.5
	6 - 10 Years	23	18.9
	11 - 15 Years	79	64.8
	16 - 20 Years	6	4.9
Years worked in your current	1 - 5 Years	58	47.5



<b>position/appointment</b>	6 - 10 Years	38	31.1
	11 - 15 Years	25	20.5
	16 - 20 Years	1	0.8

According to the findings in Table 2, the respondents who had worked in the agency for a period of 1-5 years were 14 representing 11.5% of the respondents, the respondents who had worked in the agency for a period of 6- 10 years were 23 representing 18.9% of the respondents. The respondents who had worked in the agency for a period of 11 - 15 years were 79 representing 64.8% of the respondents while the respondents who had worked in the agency for a period of 16 - 20 years were 6 representing 4.9% of the respondents.

### Descriptive Statistics

Descriptive statistics were utilized to correctly portray the distribution of scores or measures in the research using indices or statistics. The type of statistics or index used will depend on the study's variables and the scope of the measurements. For road asset maintenance, this section provides a descriptive analysis.

### Descriptive Statistics for road asset maintenance

The road asset maintenance variable was assessed using a five-point Likert scale, with 1 denoting the lowest score - “Strongly Disagree” - and 5 denoting the highest – “Strongly Agree”. A detailed assessment of the data confirmed that the respondents recorded a high rating on the various statements used to gauge road asset maintenance. The results are shown in Table 3.

Table 3: Descriptive Results \_ Road asset maintenance

	<b>Statement</b>	<b>D</b>	<b>N</b>	<b>A</b>	<b>Mean</b>	<b>STD</b>
RAM1	This organisation rigorous track roads defect across the country for inclusion in maintenance planning.	10 (8.7%)	5 (4.3%)	100 (87.0%)	4.15	0.82
RAM2	This organisation adheres to a rigorous procedure for maintenance that corresponds to speed of road defects.	7 (6.1%)	10 (8.7%)	98 (85.2%)	4.02	0.797
RAM3	The organisation has established standards for road inspection planning and plans compliance.	9 (7.8%)	11 (9.6%)	95 (82.6%)	4.42	0.654
RAM4	This organisation ensures engineering fundamentals are compliance with inspection plan.	7 (6.1%)	10 (8.7%)	98 (85.2%)	4.32	0.659
RAM5	The transport network is given worth through the assets of each road, demonstrating the significance of efficient movement of goods and people.	10 (8.7%)	8 (7.0%)	97 (84.3%)	4.2	0.842
RAM6	The capital worth of every road asset is ascertained by assessing the cost of restoring the asset to its original state or the cost of replacing it with an equivalent.	5 (4.3%)	7 (6.1%)	103 (89.6%)	4.02	0.909

RAM7	This body's method of road maintenance involves furnishing the necessary means to make the judgement needed to satisfy the public's requirements in a more systematized and adjustable manner.	12 (10.4%)	10 (8.7%)	93 (80.9%)	4.02	0.904
RAM8	During the road maintenance damaging effects of construction (noise, dust and vibration) are maintained to minimal or acceptable level.	15 (13.1%)	12 (10.4%)	88 (76.5%)	3.76	0.834
RAM9	There is elaborate measures in place to ensure that road assets maintenance has least destruction on ecosystem and prioritization of preservation of ecological features.	17 (14.8%)	14 (12.2%)	84 (73.0%)	4.02	0.760
RAM10	The road asset preservation system tracks the functioning of the road asset versus the predetermined desired outcomes or performance objectives (ARICS).	18 (15.7%)	15 (13.0%)	82 (71.3%)	4.14	0.884

The results presented in Table 3, show that 100 respondents representing 87.0% of the respondents agreed that the organisation rigorously track roads defect across the country for inclusion in maintenance planning, 5 respondents representing 4.3% were neutral while 10 respondents representing 8.7% of the respondents disagreed as shown by a mean score of Mean = 4.15 and SD = 0.82, 98 respondents representing 85.2% of the respondents agreed that organisation adheres to a rigorous procedure for maintenance that corresponds to speed of road defects, 10 respondents representing 8.7% of the respondents did not give any opinion while 7 respondents representing 6.1% of the respondents disagreed as shown by a mean of 4.02 and SD of 0.797, 95 respondents representing 82.6% of the respondents agreed that the organisation has established standards for road inspection planning and plans compliance, 9 respondents representing 7.8% disagreed while 11 respondents representing 9.6% of the participants did not give their opinion (Mean = 4.42; SD = 0.654), 98 respondents representing 85.2% of the participants agreed that the organisation ensures engineering fundamentals are compliance with inspection plan, 10 respondents representing 8.7% of the participants did not any opinion while 7 respondents representing 6.1% of the participants disagreed (Mean = 4.32; SD = 0.659).

Regarding the statement that the transport network is given worth through the assets of each road, demonstrating the significance of efficient movement of goods and people, 97 of the respondents representing 84.3% agreed, 8 respondents representing 7.0% were neutral and 10 respondents representing 8.7% of the respondents disagreed with the sentiment (Mean = 4.2; SD = 0.842), 103 respondents representing 89.6% of the respondents agreed that the capital worth of every road asset is ascertained by assessing the cost of restoring the asset to its original state or the cost of replacing it with an equivalent, 7 respondents representing 6.1% of the respondents were neutral and 5 respondents representing 4.3% of the respondents disagreed with the sentiment (Mean = 4.02; SD = 0.909), 93 respondents representing 80.9% agreed that this body's method of road maintenance involves furnishing the necessary means to make the judgement needed to satisfy the public's requirements in a more systematized and adjustable manner, 10 respondents representing 8.7% of the respondents were neutral and 5 respondents representing 4.3% of the respondents disagreed were neutral while 12 respondents representing 10.4% of the respondents disagreed (Mean = 4.02; SD = 0.904), 88 respondents representing 76.5% of the respondents agreed that during the road maintenance damaging effects of construction (noise, dust and vibration) are maintained to minimal or acceptable level, 12 respondents representing 10.4% remained neutral while 15 respondents representing 13.1% of the participants disagreed with the sentiment (Mean = 3.76; SD = 0.834).

Also, 84 respondents representing 73.0% of the participants agreed that there is elaborate measures in place to ensure that road assets maintenance has least destruction on ecosystem and prioritization of preservation of

ecological features, 14 respondents representing 12.2% of the participants were neutral while 17 respondents representing 14.8% of the participants disagreed (4.02; SD = 0.760). Lastly, 82 respondents representing 71.3% of the participants agreed that the road asset preservation system tracks the functioning of the road asset versus the predetermined desired outcomes or performance objectives (ARICS), 18 respondents representing 15.7% of the participants disagreed while 15 respondents representing 13.0% of the participants were neutral (Mean = 4.14; SD = 0.884).

### Descriptive Statistics for Performance of Road Agency

A five-point Likert scale was used to evaluate the Performance of Road Agency variable from the evaluation, with 1 signifying the lowest score, Strongly Disagree, and 5 denoting the highest score, Strongly Agree. An in-depth review of the data revealed that the respondents scored highly on the many statements used to gauge institutional sustainability as reflected in Table 4.

Table 4: Descriptive Statistics for Performance of Road Agency

		D	N	A	Mean	Std dev
PRA1	The agency has been achieving its set annual road maintenance targets.	8 (6.9%)	7 (6.1%)	100 (87.0%)	3.8	0.572
PRA2	Over the past five years, the agency has been registering an increase in the length of road assets maintained or kilometres done.	9 (7.8%)	6 (5.2%)	100 (87.0%)	4.02	0.704
PRA3	The agency has been achieving excellence (Above 95%) absorption rate of annual budget on road assets maintenance.	8 (7.0%)	9 (7.8%)	98 (85.2%)	3.75	0.888
PRA4	Over the past five years, the agency has maintained a steady increase in budget absorption rate for road assets.	14 (12.2%)	6 (5.2%)	95 (82.6%)	3.87	0.813
PRA5	The agency has been registering effectiveness and efficiency in resource utilization, and thus reduction in costs of operations.	15 (13.0%)	8 (7.0%)	92 (80.0%)	3.57	0.852
PRA6	The organization has improved achieving value for money in road asset investments.	7 (6.0%)	18 (15.7)	90 (78.3%)	3.86	0.778
PRA7	The agency return on investment has been progressing in the last five years.	8 (7.0%)	12 (10.4%)	95 (82.6%)	3.8	0.749
PRA8	The customer satisfaction index has been improving.	9 (7.8%)	13 (11.3%)	93 (80.9%)	3.9	0.673
PRA9	The cost incurred in completing business processes has been reduced considerably.	9 (7.8%)	15 (13.0%)	91 (79.1%)	3.49	0.867
PRA10	Service delivery to the stakeholders has increased in the last five years.	9 (7.8%)	11 (9.6%)	95 (82.6%)	4.14	0.696

The results presented in Table 4, show that 5 respondents representing 6.9% of the participants disagreed that the agency has been achieving its set annual road maintenance targets., 7 respondents representing 6.1% of the participants were neutral while 100 respondents representing 87.0% of the participants agreed with the sentiment (Mean = 3.8; SD = 0.572), 9 respondents representing 7.8% of the participants disagreed that over the past five years, the agency has been registering an increase in the length of road assets maintained or kilometres done, 6 respondents representing 5.2% of the participants were neutral while 100 respondents representing 87.0% of the participants agreed (Mean = 3.75; SD = 0.704), 98 respondents representing 85.2% of the participants agreed that the agency has been achieving excellence (Above 95%) absorption rate of annual budget on road assets maintenance, 9 respondents representing 7.8% of the participants were neutral while 8 respondents representing 7.0% of the participants disagreed (Mean = 3.75; SD = 0.888), 95 respondents representing 82.6% of the participants agreed that over the past five years, the agency has maintained a steady increase in budget absorption rate for road assets, 14 respondents representing 12.2% of the participants disagreed while a few 6 respondents representing 5.2% of the participants were neutral (Mean = 3.87; SD = 0.813).

Also, the results showed that 92 respondents representing 80.0% of the participants agreed that the agency has been registering effectiveness and efficiency in resource utilization, and thus reduction in costs of operations 8 respondents representing 7.0 of the participants were neutral, 15 respondents representing 13.0% of the participants disagreed (Mean = 3.57; SD = 0.852), 90 respondents representing 78.3% of the participants agreed that the organization has improved achieving value for money in road asset investments, 18 respondents representing 15.7% of the participants were neutral while 7 respondents representing 6.0% of the participants disagreed (Mean = 3.86; SD = 0.778). Additionally 95 respondents representing 82.6% of the participants agreed that the agency return on investment has been progressing in the last five years, 12 respondents representing 10.4% of the participants were neutral while 8 respondents representing 7.0% of the participants disagreed (Mean = 3.8; SD = 0.749). Further 93 respondents representing 80.9% of the participants agreed that the customer satisfaction index has been improving, 13 respondents representing 11.3% of the participants were neutral while 9 respondents representing 7.8% of the participants disagreed (Mean = 3.9; SD = 0.673). Also 91 respondents representing 79.1% of the participants agreed that the cost incurred in completing business processes has been reduced considerably, 15 respondents representing 13.0% of the participants were neutral while 9 respondents representing 7.8% of the participants disagreed (Mean = 3.49; SD = 0.867). Lastly, 95 respondents representing 82.6% of the participants agreed that service delivery to the stakeholders has increased in the last five years, 11 respondents representing 9.6% of the participants were neutral while 9 respondents representing 7.8% of the participants disagreed with the sentiment (Mean = 4.14; SD = 0.696).

### Study Hypothesis Testing

#### Road assets maintenance and the performance of road agencies in Kenya

Objective one examined the effect of road assets maintenance on the performance of road agencies in Kenya. Null hypothesis 1, which stated there was no significant relationship between the road assets maintenance on the performance of road agencies in Kenya, was examined and tested using multivariate regression model. The outcomes of the regression model summary are shown in Table 5.

Table 5: Road assets maintenance on the performance of road agencies in Kenya

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.447 <sup>a</sup>	.200	.193	.584	2.086

- a. Predictors: (Constant), Road Asset Maintenance
- b. Dependent Variable: Performance of Road Agency

The result of summary of model revealed: R value of 0.447, R-Square 0.200; and Adjusted R-Square 0.193. The coefficient of determination (R-Square) value indicated that 19% of performance of road agencies can be

explained (accounted for) by road assets maintenance.

The ANOVA for Road Asset Maintenance is displayed in Table 6.

Table 6: ANOVA (F-Test) Analysis for Road assets maintenance

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	10.210	1	10.210	29.924	.000 <sup>b</sup>
Residual	40.945	120	.341		
Total	51.156	121			

a. Dependent Variable: Performance of Road Agency

b. Predictors: (Constant), Road Asset Maintenance

ANOVA results revealed F-Calculated (1, 121) = 29.924 which is greater than F-Critical (1, 121) = 2.78 at 95% confidence level. The findings further confirm that the regression model of performance of road agency is significant and supported by F = 29.924, p=0.000<0.05.

Result of regression coefficients beta values are shown in Table 7.

Table 7: Relationship between Road asset maintenance performance of road agency

Model	Unstandardised Coefficients		Standardized Coefficients	t	P-value
	B	Std. Error	Beta		
(Constant)	1.918	.362		5.297	.000
Road Asset Maintenance	.468	.086	.447	5.470	.000

a. Dependent Variable: Performance of Road Agency

b. Predictors: (Constant), Road Asset Maintenance

Result from Table 7 indicates that road assets maintenance has an unstandardized beta coefficient of 0.468, t-statistic value t=5.470 and probability value of p<0.005. This finding implies that road asset maintenance has a partial contribution of 0.468 on performance of road agencies. The contribution is significant as the probability value is less than 0.05. The summary of model for estimating performance of road agencies based on road asset maintenance is shown below.

$$(i) \dots \dots \text{Performance of road agencies} = 1.918 + 0.468 (\text{Road asset maintenance} )$$

As a result, the null hypothesis ( $H_{01}$ ), which posited there is no significant relationship between road assets maintenance and performance of road agencies in Kenya was rejected. Consequently, the researcher concluded that there is indeed a significant effect of Road asset maintenance on the Performance of road agencies in Kenya.

## RESULTS DISCUSSIONS

The study results are in agreement with Kamau and Human (2015) who conducted research to establish the extent to which monitoring and evaluation contributed to the successful completion of a project in Kenya. The



researcher conducted a study of the relevant literature in order to identify characteristics that impact monitoring and evaluation. These factors were then categorised into the following four groups: the strength of the monitoring and evaluation team, the monitoring strategy, political influence, and the project lifecycle stage. According to the findings of the research, having support from management is an essential component in guaranteeing the effectiveness of monitoring and evaluation efforts.

The maintenance of road assets has a significant impact on the performance of road agencies in Kenya, as is abundantly clear from the results shown above. These findings concur with those of Kipkurui and Obura (2018), who found that road asset management, is a positive and significant predictor of the performance of road agencies in Kenya and that it accounted for 81.7% of the variation in performance. Kipkurui and Obura (2018) also found that road agencies in Kenya are responsible for 81.7% of the variance in performance. In a similar vein, the findings supported the findings of Zanule (2015), who found that conventional road asset maintenance considerably reduced traffic congestion and deaths in Uganda, in addition to improving the overall performance of road agencies.

Additionally the study results agrees with those of Priyatiningsih and Sutrisno (2020) who conducted research that investigated the relationship between the road infrastructure asset management approach and its environmental implications. The objective of this research is to identify a suitable approach for managing road infrastructure assets by using an integrated asset management system and implementing asset management regulations that can effectively meet the expectations of the public. The findings demonstrate various dimensions of asset performance as perceived by the user. These dimensions encompass productivity, efficiency, effectiveness, resource utilization, and institutional factors. This performance is integrated within the asset management system, which is guided by management authority policies. These policies encompass service delivery aspects such as quality and mobility, as well as risk management and resource maintenance.

## CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the first objective of the study examined the effect of road assets maintenance on the performance of road agencies in Kenya using a simple regression model. The findings revealed that the organization rigorously tracks road defects nationwide and includes them in maintenance planning. Moreover, the organization adheres to a strict maintenance procedure that aligns with the speed at which road defects occur. The establishment of standards for road inspection planning and compliance, as well as ensuring engineering fundamentals are in line with the inspection plan, were also observed. Furthermore, the study confirmed the presence of a moderate positive and significant correlation between road asset maintenance and the performance of road agencies in Kenya. This indicates that effective road asset maintenance contributes significantly, accounting for approximately 20% of the overall performance of road agencies in the country. These results highlight the importance of prioritizing road asset maintenance as a means to enhance the performance of road agencies in Kenya. Improved maintenance practices and adherence to established standards can lead to better overall performance, ensuring safer and more efficient road networks for the public. The findings of this study provide valuable insights for policymakers and road agency officials to guide decision-making and resource allocation in order to optimize road asset maintenance and ultimately enhance the performance of road agencies in Kenya.

The suggestions were made based on the results derived from each individual objective. Based on the conclusion drawn from the study, it is recommended that the senior management of road agencies in Kenya prioritize road asset maintenance. This is because such maintenance activities have been found to have a substantial and positive impact on the performance of these agencies, as well as their overall effectiveness and efficiency in resource utilization. Effective road asset management plays a crucial role in mitigating traffic congestion and reducing deaths, while also improving the overall safety and convenience of transit and recreational driving experiences.

The present study provides evidence of a positive association between the maintenance of road assets and the performance of road authority. The research demonstrates its validity by the persistent association seen between the level of road asset maintenance and the distribution of budgetary resources, as well as their influence on the performance of road agencies. At the policy level, it is essential for the government to

prioritize the deployment of adequate financial resources and the promotion of innovation in the upkeep of road assets. The implementation of this technique is of utmost importance in the reduction of expenses and the efficient provision of value to the populace. Furthermore, it is essential for the government to strengthen regulatory measures for road agencies in order to maximize their operational performance and attain higher levels of effectiveness and efficiency. The attainment of this objective may be optimally achieved by the implementation of robust policies, the promotion of innovation and modernization of infrastructure, and the establishment of best practices within a realistic legal framework.

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