

Influence of Road Inventory and Condition Survey on Road Maintenance Projects Performance in the Kenya National Highways Authority

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Abstract: Roads provide mobility of goods and people from one point to another and are important for economic progress of any nation. In ensuring that roads continue to offer the desired utility within its design life, countries invest substantial financial resources for road maintenance. Road maintenance thus becomes an essential component of roads asset management. In ensuring effective maintenance planning, road condition and inventory surveys are utilized regularly to collect data that is used for needs assessment, planning and budgeting of road maintenance works. In Kenya, these road maintenance works continue to experience challenges in performance due scope creep and time and cost overruns related to planning deficiencies. The general objective of the study was to determine the influence of Road Inventory and Condition Survey on road maintenance projects performance in the Kenya National Highways Authority (KeNHA). Specifically, the study determined the influence of needs assessment, stakeholder engagement, risk management, and budgetary allocation on performance of road maintenance projects in KeNHA. The three-phase model, stakeholder theory, resource dependency theory, the iron triangle theory and principal agency theory were utilized in this study. A descriptive survey research design was used. The target population was all ongoing maintenance projects in KeNHA. The unit of analysis (292) comprised of contractor project managers, KeNHA project superintendent, Accountants, and departmental project managers in all on-going maintenance projects. The study utilized census method. The primary data was acquired using self-administered questionnaires. A pilot study was conducted using 29 respondents at the Kakamega region of Kenya Rural Roads Authority (KeRRA). The validity of the instrument was checked through consultation with the research supervisors and lecturers. The Cronbach Alpha coefficient with a threshold of 0.7 was used to determine the reliability of the research instrument. The findings of this study are important to transport and infrastructure policy makers, economic planners, Kenya Roads Board, Kenya National Highways Authority, Kenya Rural Roads Authority, Kenya Urban Roads Authority, and road users. The study examined the influence of needs assessment, stakeholder engagement, risk management, and budgetary allocation in relation to the performance of the road maintenance projects. The study determined that needs assessment had a statistically significant influence on performance on the road maintenance projects. The study concluded that there was a positive influence of needs assessment and the performance of road maintenance projects. The study determined too that there was no statistically significant influence of stakeholder engagement on the performance of the road maintenance projects. On influence of the risk management on the performance of the road maintenance projects the study determined that there was no statistically significant influence of the risk management on the performance of the road maintenance projects. The study additionally concluded that there was statistically significant influence of budgetary allocation on the performance of the road maintenance projects and that budgetary allocation was found to be positively associated with the performance of road maintenance projects. The study thus recommends further examination on stakeholder management and risk management to determine why these aspects within the road maintenance projects lacked statistical level of significant influence on road maintenance projects.

Key Words: Budgetary Allocation, Needs Assessment, Risk Management, Road Maintenance, Road Inventory and Condition Survey, Stakeholder Management.

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I. Background of the Study

Road Inventory and Condition data continues to be used for planning the world over. In Cambodia the Ministry of Public Works and Transport (MPWT) Location Referencing and Condition Survey (LRCS) completed in November 2004 as a component of the World Bank Road Rehabilitation Project was used to prepare a master

plan of road management. (JICA, Nippon Koei Co. Ltd, & Katahira & Engineers International, 2010). Road maintenance refers to activities required or undertaken to conserve as nearly, and as long, as possible the original condition of an road asset while compensating for normal wear and tear (Makdani, 2016). The World Bank report (2011) considers maintenance to generally cover four key activities: routine, periodic, special and development works. Analysis of Sub-Sahara Africa Gravel Roads Road Maintenance Management System's Monitoring and Need Assessment research in Tanzania by Mwaipungu and Allopi (2014) states that road maintenance needs assessment is one of the imperative tools of gravel roads maintenance management systems. The results of gravel roads road maintenance needs assessment enable the road maintenance engineer to do the following: Update the road inventory, assess the pavement condition, evaluate road maintenance needs, and prepare programmes and budget estimates.

A review of road inventory condition survey practice in the United States of America (USA) shows that condition assessment prioritizes immediate needs and long-term repair alternatives of every road surveyed and the projected costs of those repairs (Town and Country Engineering Inc, 2017). This provides a basis for Town officials to prepare plans for accomplishing these repairs within a set budget. In India, Ram and Pratheeba (2015) indicated that budget allocation constraints affect the performance of the road construction process. The availability of sufficient budgetary allocation is key in the provision of labour and material requirements for road maintenance projects Stakeholder management has been found to play a critical role in road projects (Mandala, 2018). Stakeholder management involves processes required to identify all people or organizations impacted by the project, analysing stakeholder expectations, and impact on the project, and developing appropriate management strategies for effectively engaging stakeholders in project decisions and execution (Snyder, 2013). In relation to risk management in project performance. Kumar, Sheikh, and Asadi (2017) in India indicated that the risk management is important in road maintenance projects as it assists in the identification and analysing of the risks that face road maintenance projects. This is key in enabling appropriate measures to be adopted for the project during project execution to reduce risks impact. In view of the absorption of large amounts of public money for maintenance of roads, the significance of performance of maintenance projects success cannot be gainsaid. According to Babalola et al (2015) successful construction projects are those projects finished

In Kenya, ninety-three percent (93%) of all freight and passenger traffic is carried by road (Chebon, 2011). The road network is extensive consisting of approximately 161,151.4 kilometres (out of which 10% is paved while the rest of the network is either gravel or earth roads). According to the KRB (2017) road inventory and condition survey data, the road network in Kenya is generally in poor condition (KRB, Annual Report and Financial statements for the year ending 30th June 2017, 2017). Increased use of road network creates an increased need for road maintenance works to ensure the roads are kept in motorable conditions. The continued increase in demand for road maintenance over time resulted in the establishment of Road Maintenance Levy Fund (RMLF) to be managed by the Kenya Roads Board (KRB). The RMLF derives revenue from of a fuel levy imposed on petroleum fuels, for the principal purpose of road maintenance (Ndichu, 2013). According to the Kenya Roads Board (KRB) Annual Public Roads Programme (APRP) for the year 2018/2019 over Kshs 68 billion was collected in the form of Road maintenance Levy Fund (RMLF) and allocated for maintenance of all government roads (Kenya Roads Board, Annual Public Roads Programme (APRP) 2018/2019, 2019). This is a substantial pie of the taxpayer's money that needs to be utilised in an efficient and accountable manner.

The biggest obstacle that faces Kenya is bringing the road network that is in a poor condition to an improved state while ensuring proper maintenance to other roads in good condition (Wafula, 2017). The maintenance of these roads is funded through the Road Maintenance Levy Fund (RMLF) which is managed by Kenya Roads Board (KRB). The Kenya Roads Board, a parastatal under the Ministry of Transport, Infrastructure, Housing and Urban Development (MOTIHUD), disburses funds to road agencies and provides oversight on planning and expenditure of the road maintenance funds.

According to the KRB APRP of 2018-2019 financial year, KeNHA allocated over Kshs 37 million for purposes of Annual Road Inventory and Condition Survey (ARICS). According to the Annual Public Roads Programme Planning and Evaluation manual (2017), all road agencies shall carry out Annual Road Inventory and Condition Survey (ARICS) to determine the maintainable part of their road network and to collect data to prepare the ARWP. The ARICS is conducted annually for planning and helps in the assessment of roads maintenance requirement based on the conditions of the roads. ARICS is what informs the preparation of the annual road works programmes. The ARWPs should be submitted to KRB by 30th September of each year (Kenya Roads Board, Annual Public Roads Programme Planning and Reporting Manual, 2017). The Road Inventory and Condition Survey collects data that describes the physical elements of the road system and road assets and their conditions and the changes markedly over time. This data includes information on road condition, pavement traffic information, and the number of lane kilometres.

The Kenya Roads Board allocates funds to the road agencies in accordance with the allocation criteria set out in the Kenya Roads Board act 1999 and in line with the constitution of Kenya 2010. The agencies include Kenya National Highways Authority (KeNHA) to maintain national trunk roads, Kenya Rural Roads Authority (KeRRA) to manage rural roads and roads in small towns and Kenya Urban Roads Authority (KURA) to manage

roads in cities and municipalities, Kenya Wildlife Service (Responsible for roads in National parks and reserves) and County governments in charge of county roads (KRB, Annual Report and Financial statements for the year ending 30th June 2017, 2017).

According to Kenya Roads Board (2019), the funding for road works follows approval of Annual Road Work Plan (ARWP) by KRB. The ARWP is guided by annual budgets ceilings provided by KRB and provides a framework within which all agencies' roads shall be maintained. It is a requirement by KRB that all agencies undertake Annual Road Inventory and Condition Survey (ARICS) before preparation of the ARWP. ARICS data helps in assessing the road maintenance needs and cost estimates which are used in prioritization and preparation of a Specific, Measurable, Attainable, Realistic and Time bound (SMART) Annual Road Work Plan.

Omai (2016) states that there is a need to determine the initial condition of the roads and rank them in order of priority before embarking on road maintenance. The findings of his study indicate that road condition survey is the most vital component considered as a road maintenance criterion. It further states that locating road assets and their conditions accurately is important for planning and informs budget making process. In Kenya, road inventory and condition survey help in maintaining, managing, and valuing assets, reviewing, and coordinating construction projects, Route planning, Accident reporting and analysis and Management of road assets and a spatial condition.

The role of budget allocation on the performance of road maintenance projects is examined by diverse authors. Osman and Kimutai (2019) asserted that budget allocation is a critical factor in the road maintenance projects in Kenya. In the same context, Osman and Kimutai (2019) noted that availability of sufficient budget and its prudent usage play a major role in the road maintenance projects in the country. Gitahi (2015) noted that road maintenance projects being public projects are subjected to the budgetary constraints and dynamics of public expenditure. In the same context, Gitahi (2015) indicated that budget allocation with respect to road projects is often inhibited by sudden budget reductions in response to difficult fiscal conditions, funds being released on time, and actual expenditures being below agreed budgetary allocations.

In Kenya, just like the rest of the world, the need for stakeholder management in the road maintenance projects is recognized. Ndunda, Nyang'au, and Kwamboka (2017) noted the importance of meeting stakeholder expectations, and stakeholder involvement levels in enhancing the performance of the road maintenance projects. This has been associated with the stakeholders influencing the resources allocation, and project implementation levels thus impacting on the road maintenance performance levels. Maintenance projects continue to be faced by several risks that need to be managed including time overruns, scope creep, cost overruns and poor quality (Ndunda, Nyang'au, & Kwamboka, 2017).

Kenya National Highways Authority (KeNHA) is a statutory body established by the Roads Act 2007 and is responsible for the management, development, rehabilitation, and maintenance of the national trunk roads comprising classes S, A and B roads, totalling approximately 18,549 kilometres distributed as follows: 6,630 Km International Trunk Road (A), 11,679 Km National Trunk roads (B) and 40 Km superhighways (S). (KeNHA, 2017). According to KeNHA, 2018, the Kenya National Highways Authority management structure consists of the following directorates: directorate of Planning and safety, directorate of development, directorate of policy strategy and compliance, directorate of road asset and corridor management, directorate of corporate services and directorate of audit services (KeNHA, 2018). The responsibility of road maintenance of roads falls under the directorate of road asset and corridor management. Further the directorate of road asset and corridor management consists of 13 departments that includes ten (10) regional offices in charge of regional network road maintenance of national trunk roads (class B roads) and three (3) corridor units (A, B, C) in charge of the international trunk road network (Class A roads) (KeNHA, 2018).

II. Statement of the Problem

Road maintenance is essential in preserving roads in their originally constructed condition, protect adjacent resources and user safety, and providing efficient, convenient travel (Kenya Roads Board, Annual Public Roads Programme (APRP) 2018/2019, 2019). KRB audit report of 2021 established that roads road maintenance in Kenya is often neglected or improperly performed. From the report, while road condition survey has become a routine and mandatory exercise in the planning and budgeting of Road Maintenance Levy Fund (RMLF), problems continue being experienced in terms of timely delivery of projects, cost overruns and continued change in scope of works due to emergencies impeding greatly on project performance. As an example, a review of the progress of works for the KeNHA contract for periodic maintenance of Lodwar-Kalokol road project in Turkana County in June 2019 showed the percentage of physical works completed was 84% against 100% project completion time which is attributed to stakeholder management. During the same period, the project for routine maintenance of Masara-Muhuru Bay had slow progress attributed to contractor performance challenges. A review of the KeNHA Annual Report 2016/2017 indicates that budget shortfalls crowd out development and maintenance budgetary allocations impacting great on project performance (KeNHA, 2017). Several scholars have researched on project performance and construction aspects. Ngugi (2017) examined the determinants of successful completion of road maintenance projects in Kenya: a case study of Kenya National Highways Authority.

Obwocha in 2018 evaluated the influence of funding and stakeholder's management on project performance, the focus though was on rehabilitation projects and not maintenance projects. These studies have provided inconclusive results on the influence of needs assessment, budgetary constraints, stakeholder engagement and risk management on performance of maintenance projects undertaken by Kenya National Highways Authority.

III. Objectives of the Study

The objectives of the study are as follows;

- (i) To determine the influence of needs assessment on performance of road maintenance projects in Kenya National Highways Authority.
- (ii) To establish the influence of stakeholder engagement on performance of road maintenance projects in Kenya National Highways Authority.
- (iii) To establish the influence of on risk management on performance of road maintenance projects in Kenya National Highways Authority.
- (iv) To determine influence of budgetary allocation on performance of road maintenance projects in Kenya National Highways Authority.

IV. Research Hypotheses

The hypothesis of the research included.

- (i) H₀₁: Needs assessment has no significant influence on performance of road maintenance projects in Kenya National Highways Authority.
- (ii) H₀₂: Stakeholder engagement has no significant influence on performance of road maintenance projects in Kenya National Highways Authority.
- (iii) H₀₃: Risk management has no significant influence on performance of road maintenance projects in Kenya National Highways Authority.
- (iv) H₀₄: Budgetary allocation has no significant influence on performance of road maintenance projects in Kenya National Highways Authority.

V. Empirical Review

The role of needs assessment on the road projects was examined by Suthanaya (2017) in a study based in Bali province of Indonesia. The study's objectives were to explore the road maintenance priority based on the Multi-Criteria Approach in Indonesia. The study found that road maintenance is undertaken in the province based on rank assigned to the specific road segment which is often found on road pavement conditions. The study noted that the difficulties encountered in Indonesia lies in the inability to prioritize for road maintenance works, roads damaged to the same extent. Amongst the factors that can be used for the purposes of road maintenance aspects in Indonesia included road condition, traffic condition, socio-cultural accessibility, and institutional aspects amongst others.

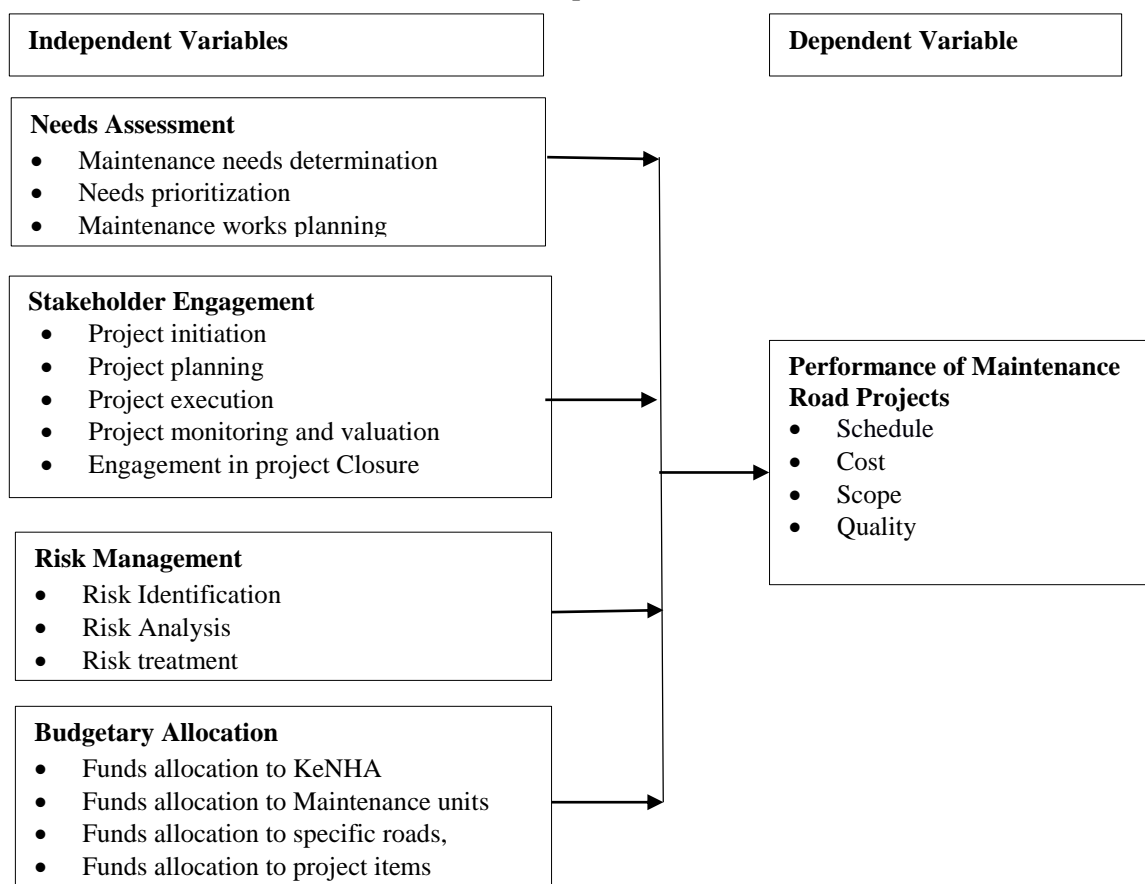
The role of stakeholders on the road project performance aspects has been examined by diverse scholars. In Vietnam, Nguyen (2017) undertook a study that sought to examine the influence of stakeholders on the road infrastructure development aspects. The study objectives were to explore the influence of stakeholder management on the performance of road infrastructure projects. The study was quantitative in nature and the study was in the context of the Private Public Partnerships (PPPs) in road infrastructure. Amongst the identified stakeholders in the road infrastructure projects in Vietnam included government agencies, private companies, consultants, construction companies, financial institutions and insurance companies amongst others.

The influence of risk management aspects has been examined across the world by diverse scholars. In India, Kumar, Sheikh, and Asadi (2017) examined the influence of evaluation of risk management in the road construction projects. The study objectives included identification of risks associated with road construction projects, likelihood of occurrence of such risks and suggestion of effective ways of overcoming risks. The study thus sought to examine the various risks associated with road construction projects, analyze the likelihood of occurrence of these risks, and suggest the effective ways of dealing with these risks. The study used the structured questionnaire for data collection purposes. Kumar *et al.*, (2017) identified various risks associated with the road infrastructure including technical changes, inefficient planning, and site risks such as the existing traffic, unforeseen events, site contamination, and unforeseen soil conditions amongst others. The study concluded that some of these risks may be associated with the planning aspects in the risk arising aspects amongst other aspects.

The budgetary allocation aspects on the road projects has been examined by diverse scholars including Hayat (2014), Naimanye and Whiteing (2016), Bhosale, Gujar, Jadhav, and Chavan (2017), and Gitahi (2015) amongst others. The study by Gacheru (2015) focused on the determinants of project delays in construction projects. The study objectives included influence of construction project financing, construction project planning, contractor's experience, and supervision of work on the project delay aspects. The study found that the need for the national governments to increase the funding to KeNHA to enable it complete its projects. Githua and Wanyoike (2015) undertook a study that sought to examine factors influencing community water projects in Njoro

Sub County. The objectives of the study were the examination of influence of budget on project performance aspects on community water. The study found and concluded that the sufficiency of budgetary allocation is key in the project performance dynamics. In another study, Ngari and Ndiritu (2017) undertook a study on youth development projects in Embu county. The study objectives included to examine the influence of the quality of project information systems on project performance. The study found that budgetary allocation was key in the accessing and use of the project information system that further led to the project performance aspects

VI. Conceptual Framework



VII. Research Methodology

The descriptive survey research design was utilized for the study. The descriptive survey research design is conducted for the purpose of describing the characteristics of the research phenomenon in a detailed manner without any manipulation of the variables (Drummond & Murphy-Reyes, 2018). The target population of the study was the 133 on-going maintenance projects undertaken by KeNHA in Kenya as shown in Table 1.

Table 1: Target Population

Department	Projects
1. Coast Region	9
2. Lower Eastern Region	6
3. Northeastern Region	5
4. Upper Eastern Region	5
5. Central Region	10
6. Nairobi Region	7
7. South Rift Region	9
8. North Rift Region	9
9. Nyanza region	13
10. Western Region	9
11. Corridor A	16
12. Corridor B	20
13. Corridor C	15
Total	133

Source: Kenya National Highways Authority (KeNHA), (2019)

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The sample consist of KeNHA staff involved directly with project management aspects of road maintenance projects. The sample size was 292 as in Table 2.

Table 2: Sample Size

	Population
Contractor Project Managers	133
KeNHA Project Superintendents	133
KeNHA Departmental Project Managers	13
KeNHA Accountants	13
Total	292

VIII. Data Analysis

The response rate of the study was examined, and results presented in Table 3. The study presented 292 structured questionnaires to the respondents. The study received back 245 questionnaires achieving a response rate of 83.9%. According to (Gathii et al., 2019) a response rate of above 80% is considered adequate for the study.

Table 3; Response Rate

Distributed Questionnaires	Returned Questionnaires	Response Rate
292	245	83.9%

Needs Assessments and Performance of Road Maintenance Projects

Needs assessment influence on the performance of road maintenance projects was examined using five indicators. The indicators of needs assessment included diverse aspects undertaken on the road maintenance needs including being determined before maintenance projects are undertaken, prioritized before maintenance projects are undertaken, determined in a timely manner, determined in a quality manner, and being given attention by KeNHA management. The results of the study were provided in Table 4.

Table 4; Descriptive Analysis for Needs Assessment

	1	2	3	4	5	Total	
	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %	Mean	Std. Dev.
Road maintenance needs are always determined before maintenance projects are undertaken	0 0.0%	3 1.2%	57 23.2%	113 46.1%	72 29.4%	4.04	.761
Road maintenance needs are prioritized before maintenance projects are undertaken	1 0.4%	3 1.2%	53 21.6%	110 44.9%	78 31.8%	4.07	.788
Road maintenance needs are determined in a timely manner	3 1.2%	11 4.5%	76 31.0%	103 42.0%	52 21.2%	3.77	.876
Road maintenance needs determined are quality nature	1 0.4%	7 2.9%	54 22.0%	113 46.1%	70 28.6%	4.00	.814
Road's road maintenance needs determined are given attention by KeNHA management	0 0.0%	3 1.2%	37 15.1%	116 47.3%	89 36.3%	4.19	.730

As shown by the means, the respondents indicated that needs assessment is undertaken to a high extent. This is justified by respondents indicating a high extent in road maintenance needs being determined before maintenance projects are undertaken ($M= 4.04$, $SD= 0.761$), a high extent to which road maintenance needs are prioritised before maintenance needs are undertaken ($M= 4.070$, $SD= 0.788$) a high extent in timely determination of maintenance needs ($M= 3.77$, $SD= 0.876$), a high extent score in quality of determined maintenance needs ($M=4.00$, $SD= 0.814$) and a high score in attention given to maintenance needs by KeNHA Management ($Mean= 4.19$, $SD= 0.730$).

Stakeholder Engagement and Performance of Road Maintenance Projects

The stakeholder engagement levels on the performance of road maintenance projects were examined using five indicators. This indicator touched on diverse stages in project management in which stakeholder involvement was being undertaken including at project initiation stage, project planning, project execution, project monitoring and project closure stages. The results were presented in Table 5.

Table 5; Descriptive Analysis of Stakeholder Engagement

	1	2	3	4	5	Mean	Total Std. Dev
	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %		
Stakeholder identification and involvement is always undertaken during project initiation for road maintenance	4 1.6%	26 10.6%	79 32.2%	72 29.4%	64 26.1%	3.68	1.029
Stakeholders are always involved during project planning phase in road maintenance projects at KeNHA	8 3.3%	34 13.9%	85 34.7%	70 28.6%	48 19.6%	3.48	1.060
Stakeholders are always involved in the project execution phase in maintenance projects at KeNHA	6 2.4%	22 9.0%	92 37.6	80 32.7%	45 18.4%	3.56	.973
Stakeholders are always involved in project monitoring and evaluation of road maintenance projects at KeNHA	9 3.7%	31 12.7%	99 40.4%	64 26.1%	42 17.1%	3.41	1.032
Stakeholders are always involved in the project closure aspects of road maintenance projects at KeNHA	9 3.7%	44 18.0%	79 32.2%	63 25.7%	50 20.4%	3.41	1.113

The study results revealed that stakeholder identification and involvement undertaken during project initiation for road maintenance was done to a high extent (M=3.68, SD= 1.029). Stakeholder involvement during project planning phase of road maintenance projects achieved a score of Mean score of 3.48 and standard deviation of 1.060 indicating that the respondents agreed to a high extent that there was stakeholder involvement in road maintenance aspects during project planning phase. The study found out that there was high extent in which stakeholders were involved in project execution phase in maintenance projects at KeNHA (M= 3.56, SD = 0.973). The study also revealed that stakeholder involvement at project monitoring and evaluation process was undertaken to a high extent (M= 3.41, SD =1.032). Finally on stakeholder involvement in the project closure aspects of road maintenance projects at KeNHA, the study showed a high extent achievement (M= 3.41, SD = 1.113).

Risk Management and Performance of Road Maintenance Projects

The risk management influence on the performance of road maintenance projects was examined using the five indicators. The set of five indicators utilised for the measurement of the risk management practices including risk identification process, risk analysis process, risk treatment, risk management and risk monitoring aspects being undertaken during the road maintenance projects at KeNHA. The results were presented in the table 6 below.

Table 6; Descriptive Analysis for Risk Management

	1	2	3	4	5	Mean	Total Std. Dev
	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %		
The risk identification process is often undertaken for maintenance projects at KeNHA	5 2.0%	13 5.3%	67 27.3%	94 38.4%	66 26.9%	3.83	.957
The risk analysis process is always undertaken for identified risks in road maintenance projects at KeNHA	4 1.6%	15 6.1%	70 28.6%	101 41.2%	55 22.4%	3.77	.924
Diverse plans are made for risk treatment for the identified risks during implementation of road maintenance	5 2.0%	19 7.8%	84 34.7%	82 33.5%	54 22.0%	3.66	.975
The risk management strategies for risks in road maintenance projects are always successful	2 0.8%	13 5.3%	102 41.6%	87 35.5%	41 16.7%	3.62	.854
The risk monitoring aspects is undertaken for all identified risks at KeNHA	3 1.2%	13 5.3%	87 35.5%	99 40.4%	43 17.6%	3.68	.869

On the risk identification process often being undertaken for maintenance projects at KeNHA, the results indicated that the same was undertaken to a high extent (Mean =3.83, SD= 0.957). The study also shows that risk analysis process always being undertaken for identified risks in road maintenance projects at KeNHA was to a high extent (M=3.77, SD =0.924). On examining whether diverse plans were made for risk treats for the identified risks during implementation of road maintenance projects at KeNHA. The results indicated that this was being undertaken to a high extent (M =3.66, SD =0.975). The study further found that the risk management strategies for risks in road maintenance projects are always successful in nature to a high extent (M=3.62, SD =0.854). Finally, the study sought to examine the risk monitoring aspects being undertaken for all the identified risks at KeNHA. The results indicated that the same was undertaken to a high extent (M=3.68, SD =0.869).

Budgetary Allocation and Performance of Road Maintenance Projects

The study examined the influence of the budgetary allocation on the performance of road maintenance projects using five indicators. The indicators for the study were funds allocation according to Road Inventory and condition survey, allocation of sufficient of funds to road maintenance projects, allocation of sufficient funds to specific tasks, funds allocation in a timely manner, and funds allocation based on the project costs.

Table 7; Descriptive Statistics for Budgetary Allocation

	1	2	3	4	5	Total	
	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %	Mean	Std.
Road maintenance projects are allocated funds according to Road Inventory and Condition Survey.	8 3.3%	23 9.4%	45 18.4%	99 40.4%	70 28.6%	3.82	1.055
Road maintenance projects in KeNHA are always allocated sufficient funds	11 4.5%	35 14.3%	105 42.6%	62 25.3%	32 13.1%	3.28	1.013
The specific tasks within road maintenance projects at KeNHA are allocated sufficient funds	4 1.6%	28 11.4%	102 42.0%	71 29.0%	39 15.9%	3.46	.949
Funds allocation to road maintenance projects is undertaken in a timely manner	2 0.8%	11 4.5%	82 33.5%	86 35.5%	63 25.7%	3.81	.903
Road maintenance projects are always allocated funds based on the projected costs	5 2.0%	17 6.9%	74 30.2%	89 36.7%	59 24.2%	3.74	.971

According to the study allocation of road maintenance funds according to Road Inventory and condition survey occurred to a high extent (M=3.82, SD=1.055). On whether the road maintenance projects in KeNHA were always allocated sufficient funds, the respondents felt the same was being undertaken to a moderate extent (M=3.28, SD = 1.013). According to the study, specific task within road maintenance projects were allocated sufficient funds to a high extent (M=3.46, SD=0.949). The study found out that funds allocation to road maintenance projects was being undertaken in a timely manner to a high extent ((M=3.81, SD =0.903). The study further determined that road maintenance projects were always allocated funds based on the projected costs to a high extent (M=3.74 and SD=0.971).

Performance of Road Maintenance Projects

The performance of road maintenance projects with respect to key constraints was duly examined. The study indicators for the performance of the road maintenance projects were road maintenance projects being completed in a timely manner, within allocated budget, to the specified quality, within the required scope, and with the end user being satisfied with the maintenance projects. The results were presented in Table 8 below.

Table 8; Descriptive Statistics for Road Maintenance Projects

	1	2	3	4	5	Total	
	Freq. %	Freq. %	Freq. %	Freq. %	Freq. %	Mean	Std. Dev.
Road maintenance projects are always completed in a timely manner	4 1.6%	3 1.2%	70 28.6%	113 46.5%	54 22.0%	3.86	.830
Road maintenance projects are always completed within the allocated budgets	2 0.8%	7 2.9%	67 27.3%	107 44.1%	61 24.9%	3.89	.839
Road maintenance projects are always completed to the specified quality	0 0.0%	6 2.4%	51 20.8%	121 49.8%	66 26.9%	4.01	.762
Road maintenance projects are always completed to the required project scope	0 0.0%	3 1.2%	58 23.7%	107 44.1%	76 31.0%	4.05	.774
Road maintenance projects at KeNHA have the end users satisfied with the projects	1 0.4%	0 0.0%	61 25.0%	112 46.1%	70 28.6%	4.02	.759

The respondents indicated that the road maintenance projects were always completed in a timely manner to a high extent (M=3.86, SD =0.830). The study revealed that road maintenance projects were always completed within allocated budgets to a high extent (M= 3.89, SD= 0.839). On whether road maintenance projects were always completed to the required project scope. The study respondents answered to a high extent (M=4.05, SD =0.774). Finally, on end users satisfaction with the project, the study found that this was to a high extent (M=4.02, SD=0.759).

Inferential Statistics

The inferential statistics examines the correlational analysis and the regression analysis aspects. Correlational analysis was used to examine the association between the variables. On the other hand, the regression analysis was used to examine the predictive influence of the independent variables on the dependent variable.

Correlational Analysis

The correlational analysis was undertaken in the study. According to (Salvatore & Reagle, 2019), the correlational analysis is used for the purposes of determining the association between a given variable and another variable. This examines on whether a change in one variable is associated with a change in another variable.

Table 9; Correlational Analysis

		Needs Assessments	Stakeholder Engagement	Risk Management	Budgetary Allocation	Performance of Road Maintenance Projects
Needs Assessments	Pearson Correlation	1	.509**	.624**	.447**	.589**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	244	244	244	244	244
Stakeholder Engagement	Pearson Correlation	.509**	1	.700**	.476**	.421**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	244	244	244	244	244
Risk Management	Pearson Correlation	.624**	.700**	1	.484**	.502**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	244	244	244	244	244
Budgetary Allocation	Pearson Correlation	.447**	.476**	.484**	1	.491**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	244	244	244	244	244
Performance of Road Maintenance Projects	Pearson Correlation	.589**	.421**	.502**	.491**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	244	244	244	244	244

** . Correlation is significant at the 0.01 level (2-tailed).

The correlational analysis also examined on whether there was a statistically significant correlational analysis between variables at 5% (0.05) level of significance. According to (Marston, 2012) if the achieved p value is less than or equal to 0.05 (5%) then a conclusion is to infer a statistically significant relationship between the variables. The achieved correlational analysis results between needs assessment and performance of road maintenance projects stood at $r=0.589$ and $sig=0.000$; stakeholder management and performance of road maintenance projects ($r=0.421$ and $Sig=0.000$); risk management and performance of road maintenance ($r=0.502$ and $sig=0.000$) and budgetary allocation and performance of road maintenance project ($r=0.491$ and $sig = 0.000$). The results of these correlations between independent variables (needs assessment, stakeholder engagement, risk management and budgetary allocation) and performance of the road maintenance projects were statistically significant at 5% (0.05) since p value is less or equal to 0.05 in all the contexts. The high correlation between the various independent variables and the road maintenance projects at KeNHA can be attributed to policies and work procedures as embedded in operating procedures in KeNHA. KeNHA places great emphasis on the needs assessment, stakeholder engagement, risk management, and budgetary allocation in their project lifecycle. These measures then lead to increased improvement in the project performance in respect to the road maintenance projects as they ensure that the needs of the projects are considered and the diverse requirements for the execution of the road maintenance projects catered for. (KeNHA, 2018).

Regression Analysis

The study undertook a regression analysis to examine the predictive influence of the budgetary allocation, stakeholder engagement, needs assessment and risk management on the performance of the road maintenance projects. The regression analysis results constitute of the model summary (Table 10) which has results for correlational coefficient and coefficient of determination (R Square), ANOVA results (Table 11) which has the F statistic results, and the coefficients results (Table 12) which has results for t statistics and unstandardized coefficients.

Table 10; Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.650 ^a	.422	.412	.48186

a. Predictors: (Constant), Needs Assessment, Stakeholder Engagement, Risk Management, Budgetary Allocation

The study examined the results for correlational coefficient. According to (Montgomery et al., 2013), the correlational coefficient in a linear regression analysis provides the correlation between the independent variables together and the dependent variable. The correlational coefficient in this study examined the correlation between budgetary allocation, stakeholder engagement, needs assessment and risk management together against the performance of road maintenance projects. (Fahrmeir et al., 2013) further notes that a high correlational coefficient is ideal as it also associated with a higher coefficient of determination. This study achieved a correlation coefficient of 0.650 which indicated that there was a strong correlation between budgetary allocation, stakeholder engagement, needs assessment and risk management cumulatively and performance of road maintenance projects.

Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable

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(Performance of road construction projects) that is explained by the 4 independent variables (Contractors' competency, construction parties' financial management and conflicts).

The study further examined the adjusted coefficient of determination (Adjusted R Square). According to (Welc & Esquerdo, 2017), the adjusted R square in a multiple linear regression analysis is utilized for the purpose of determining the variance in the dependent variable that is attributable to the independent variables cumulatively. The adjusted R square was utilized in this study to determine the variance of the road maintenance project performance that was attributable to budgetary allocation, stakeholder management, needs assessment and risk management practices together. The study achieved an adjusted coefficient of determination (R Square) of 0.422 which indicated that 42.2% of the variance in the performance of roads maintenance projects was associated with Budgetary Allocation, Stakeholder Engagement, Needs Assessment, and Risk Management cumulatively. This means therefore that 57.8% of the variance in the performance of road maintenance projects was due to factors not factored in this study. Therefore, further research should be conducted to investigate more factors affecting performance of road maintenance projects at the Kenya National Highways Authority.

The study further undertook an omnibus test of significance through the one-way ANOVA in which the results were presented in Table 11 below.

Table 11; ANOVA

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	40.537	4	10.134	43.645	.000 ^b
	Residual	55.494	239	.232		
	Total	96.031	243			

a. Dependent Variable: Performance

b. Predictors: (Constant), Needs Assessment, Stakeholder Engagement, Risk Management, Budgetary Allocation

In determining whether the model was a good fit for data, the study utilized the analysis of variance In this study, the one-way ANOVA was utilized to examine on whether Budgetary Allocation, Stakeholder Engagement, Needs Assessment, Risk Management cumulatively were statistically significant predictors of performance of road maintenance projects. The F-critical (2.42) was less than the F-calculated (44.595) and the P value (0.000) was determined to be below the significant level, signifying that the model could be used in predicting the influence of Budgetary Allocation, Stakeholder Engagement, Needs Assessment, Risk Management on performance of road maintenance projects. Further since p value was less than 0.05 then a decision was made to reject the null hypothesis and conclude that the regression model had an overall significance and could predict the dependent variable. Having determined that the regression model was a good predictor of the dependent variable then the two-tailed t test process was undertaken to determine on whether individual variables were statistically significant predictors of the dependent variable.

Table 12; Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
1	(Constant)	1.218	.213	5.725	.000
	Needs Assessment	.396	.065	6.046	.000
	Stakeholder Engagement	.009	.050	.013	.190
	Risk Management	.105	.063	.130	1.678
	Budgetary Allocation	.204	.049	.247	4.210

a. Dependent Variable: Performance of Road Maintenance Projects

From the regression findings, the substitution of the equation

($Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4$) becomes:

$$Y = 1.218 + 0.396 X_1 + 0.009X_2 + 0.105X_3 + 0.204X_4 + \epsilon$$

Where Y is the dependent variable (performance of road maintenance projects), X1 is Needs Assessment, variable, X2 is Stakeholder Engagement, variable, X3 is Risk Management and X4 is the Budgetary Allocation while ϵ is the error term.

The two-tailed t test at 5% (0.05) level of significance was used in the hypothesis testing of the four variables of the study.

The first hypothesis of the study was as follows

H₀₁: There is no statistically significant influence on the needs assessment on the performance of the road maintenance projects

The t test results revealed that $t_{0.025}(239) = 16.046$, $\text{sig} = 0.000$. According to ((Smith, 2012), the null hypothesis in a two tailed t test is rejected if the p value is less than or equal to 0.05. Since the achieved p value (0.000) is less than 0.05 then a decision was made to reject the null hypothesis and conclude that needs assessment had a statistically significant influence on the performance of the road maintenance projects. The examination of the unstandardized coefficients of the needs assessment revealed that the coefficient stood at 0.396 which indicated that a unit change in needs assessment led to 0.396 change in the performance of the road's maintenance projects. The needs assessment at KeNHA plays a role in ensuring performance of the road maintenance projects are met. This achieved through ensuring that all the project needs are factored in road maintenance projects. This then leads to a holistic execution of the road maintenance projects while meeting the beneficiaries' expectations and ensuring cost efficiency aspects.

The second hypothesis for the study was on the second variable as follows.

H₀₂: There is no statistically significant influence on the stakeholder engagement on the performance of the road maintenance projects.

The two tailed t test results stood at $t_{0.025}(239) = 0.190$ $\text{sig} = 0.849$ leading to the acceptance of the null hypothesis (H₀₂) since p value is less or equal to 0.05. This led to the conclusion that there was no statistically significant influence of the stakeholder engagement on the performance of the road maintenance projects. According to Maina (2021), variables that lack statistically significant influence on dependent variable are not further analyzed for practical significance of the regression coefficients. The lack of statistically significant influence on the stakeholder engagement on the performance of the road maintenance projects at KeNHA could be attributed to the lack of sufficient stakeholder engagement in the road maintenance projects relative to the new roads projects that have more complex dynamics. The road maintenance projects could be viewed as being routine in nature and therefore not requiring extensive stakeholder engagement.

The third hypothesis for the study which touched on the third variable was as follows.

H₀₃: There is no statistically significant influence on the risk management on the performance of the road maintenance projects

The two tailed t test for the third hypothesis stood at $t_{0.025}(239) = 1.678$ $\text{Sig} = 0.095$ leading to the acceptance of the null hypothesis (H₀₃) since p value is greater than 0.05. This led to the conclusion that there is no statistically significant influence of risk management on the performance of the road maintenance projects. These risks could be attributable to the road maintenance projects at KeNHA being more routine in nature and without the complexity associated with new road construction projects. This would imply that the risk management process that is undertaken for these road maintenance projects is not elaborate as the road maintenance projects are not faced with comparatively grave risks such as those found in new road projects undertaking. Further it could mirror the understanding of technical staff on risk management since the concept is recent in nature

The final research hypothesis for the study examined the budgetary allocation as follows.

H₀₄: There is no statistically significant influence on the budgetary allocation on the performance of the road maintenance projects

The two tailed t test results stood at $t_{0.025}(239) = 4.210$, $\text{sig} = 0.000$ leading to the rejection of the null hypothesis (H₀₄) since p value is less or equal to 0.05. This led to the conclusion that there was statistically significant influence of budgetary allocation on the performance of the road maintenance projects. It was further observed that the regression coefficient of budgetary allocation stood at 0.204 leading to the conclusion that a unit increase in budgetary allocation was associated with 0.204 increase in performance of road maintenance projects. KeNHA being a public entity always face diverse financial resources constraints associated with public funding. The availability of financial resources in this context then becomes a critical predictor of the road maintenance projects performance as funds available dictate both the pace and the quality of the maintenance work undertaken.

IX. Discussion of Findings.

The study found that there was significant relationship between needs assessment and project performance. The findings agreed with Mwaipungu and Allopi (2014) that that road maintenance needs assessment enabled the updating of the road inventory, assess the pavement condition, evaluate road maintenance needs, and prepare programmes and budget estimates. In addition the study identified road maintenance needs are prioritized before maintenance projects were undertaken this concurs with Banobi & Jung, 2019, Ojiambo, 2018, and Susilowati & Amalia, 2017 amongst others. The top management prioritization of project is associated with the project performance improvement due to the allocation of resources both human resources and financial resources Naik & Kasare, 2017; Wang et al., 2015. The study determined that road maintenance needs were determined in a timely manner. This has been noted by diverse scholars including Seboru, 2015 and Dessalegn

Belay, 2017 amongst others. The study further determined that road maintenance needs determined are quality in nature. This has been emphasized by diverse scholars. According to Gitahi, (2015) needs assessments provide the structure and tools to collect information and to guide other important decisions.

The study established that there was no significant relationship between stakeholder engagements. This goes against studies by Ndunda, Nyang'au, and Kwamboka (2017) found that the stakeholders' activities had statistically significant relationship with the implementation of the rural roads in Machakos. The results can be due minor challenges in maintenance works which are considered routine in nature. The study determined that stakeholder identification and involvement in project initiation is undertaken in maintenance projects. This agrees with by Opong, Chan, & Dansoh, 2017 that found that the stakeholder's need to be identified early stages of the projects to be able to manage them effectively throughout the project cycle. The study results on involvement of stakeholders in project execution are in agreement with diverse scholars including Biskupek, 2016, as well as Espacios & Autores, 2019. These scholars noted that stakeholder involvement during the project implementation process impacted on diverse aspects of project execution which further impacted on the project performance aspects. On stakeholders involvement in project monitoring and evaluation, the results of this study affirm those of Kiumbe et al., 2018, Mulyungi, 2018, as well as Maalim, 2017 amongst others. Kiumbe et al., 2018 indicates that the level of stakeholder participation has an influence on the project performance with greater participation levels leading to an improved project performance aspect.

This study found out that there was no significant relationship between risk management and performance of road maintenance projects. This goes against the findings of Gakusi, Sartori, and Maliti (2015) and Kumar, Sheikh, and Asadi (2017) which concluded that risk management is a key factor influencing road maintenance projects. The study findings on the risk identification process being conducted in road maintenance projects is in agreement with Hezekia & Ochieng, 2018 which found out that risk identification has been found to have influence on the project performance through better risk management and mitigation practices being proactively implemented. On risk analysis, risk treatment and the success of risk management strategies, the study affirms the findings of *Anggraini, Hatmoko, & Handajani* (2019) which examined the quantification of the risks potential of road projects during the construction period.

The study found that there was significant relationship between needs assessment and project performance. This is affirmed by the study of Githua and Wanyoike (2015), which concluded that sufficiency of budgetary allocation is key in the project performance dynamics. This is further affirmed by Ndunda, Nyang'au, and Kwamboka (2017) in a study based in Machakos that noted the need for adequate budgetary allocation for the purposes of ensuring road construction projects construction completion aspects.

Scholars that have empirically linked the sufficiency of the funds on the project performance aspects include (Sumaiyya & Pranay, 2016) and (Murithi et al., 2017). (Sumaiyya & Pranay, 2016) study found that the inadequate funds were associated with delays in projects due to distorting the project schedules and pace of the workmanship aspects. These findings were also consistent with those of (Murithi et al., 2017) who linked the inadequacy of funds to the project delay aspects. The timeliness of the funds allocation have been cited as a key influencer of the roads performance aspects. (Roshani et al., 2018) study ranked the timeliness of the funds allocation as one of the key components of the project performance aspects.

The study found out that road maintenance projects completion in a timely manner and within allocated budget was undertaken to a high extent. Road maintenance projects were also found to be completed to specified quality and scope to a high extent. The findings of the study further discovered to a high extent that road maintenance projects have the end users in mind. Scholars such as (Razi et al., 2021), and (Rajadurai & Vilventhan, 2021) noted that the timeliness of the road maintenance projects completion is critical in order to ensure stakeholder satisfaction and mitigate against the possibilities of cost escalations. The road maintenance projects at KeNHA are undertaken in a timely manner with a view of ensuring that there is no cost escalation during road maintenance projects (KeNHA, 2017).

Achievement of project budget is one of the critical components of project performance and even more critical to the road maintenance projects due to the costs involved. (Issa et al., 2021), and (Meharie et al., 2021) note the importance of projects being completed within budgets in order to enhance value for money. The completion of the roads projects by KeNHA within allocated budgets is informed by the need to achieve cost efficiencies at the organization and ensure that there are clean technical and financial audits (KeNHA, 2018). Meeting of the project scope is critical for enhancing the stakeholder satisfaction and ensuring that the objectives of the project are met. (Matu et al., 2020) and (Omondi, 2020) note the importance of the stakeholder satisfaction levels as one of the objectives of the critical measures of the project performance. The correlation analysis between the independent variables and dependent variable shows a positive relationship for needs assessment, stakeholder engagement, risk management and budgetary allocation. A coefficient of determination of 0.422 shows that needs assessment, stakeholder engagement, risk management and budgetary allocation accounts for 42.2% of performance of road maintenance projects.

X. Conclusions of the Study

The study concludes that needs assessment significantly influences performance of road maintenance projects at the Kenya National Highways Authority. The study found out that road maintenance needs are always determined in advance of projects, are adequately prioritized, are determined in a timely manner, are quality in nature and are given attention by top management. The study also concludes that stakeholder engagement has no significant influence on performance of road maintenance projects at the Kenya National Highways Authority. The study also found out that stakeholders were highly involved in the all-project phases: initiation, planning, execution, monitoring and evaluation and project closure.

In evaluation of risk management influence on performance of road maintenance projects, the study found out that there was no significant influence. The study found out that risk identification, risk analysis, risk treatment and risk monitoring and evaluation are carried out for road maintenance projects at KeNHA. Further, the study findings conclude that there is significant influence of budgetary allocation on performance of road maintenance projects at KeNHA. The study further discovered the following: maintenance projects are allocated funds according road inventory and condition survey, maintenance projects are always allocated sufficient funds, specific tasks within road maintenance projects are allocated sufficient funds, road maintenance projects are undertaken in a timely manner and maintenance projects are allocated funds based on projected costs. Finally, the study concludes that road maintenance projects are always completed on time, within allocated budgets, within scope, to specified quality and with the end users in mind.

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