Risk Management Practices and Performance of Renewable Energy Projects in Nairobi County

Idris Omuyula Kunya, Dr. Muchelule Yusuf

Abstract— For effective management process an inclusive evaluation of all the phases of project life cycle should be included. Thus, decisions that are made at each stage should be clear of the risks which may be encountered. Taking risks is an everyday and a common occurrence to the extent that we tend to ignore some. However, with projects there is no luxury of ignoring the risks since projects are unique in nature and a prone to the risk from the beginning to the end. In the renewable energy industry increase in economic activities and the rise in population has led to high energy in demand. The high energy costs are supplemented by the unreliable supply infrastructure. 'The challenges that are faced in the renewable energy has affected its adoption in Africa and Kenya in particular. These challenges form part of the risks in the renewable energy sector, this study aimed to investigate the influence of Risk management practices on the performance renewable energy projects in Nairobi County. The study specifically targeted to examine the influence of risk management planning; determine to what extent Risk identification; on the performance of renewable energy projects in Nairobi County. The study was guided by the theories of: Prospect Theory and Stakeholders Theory. The study targeted renewable project in Nairobi County. That is 67 projects for Wind, Solar, and bio-energy in Nairobi and 15 registered renewable companies. A census was applied as the number of respondents 149 comprising of project managers and project representative. Questionnaire was the main tool for collecting primary data. A pilot study was conducted on a 10% of the sample. The study conducted both descriptive and inferential analysis. The study used regression model to establish the relationship between risk management practices and performance of renewable projects in Nairobi County. The study established that there was significant positive correlation between the risk management process and performance of renewable energy projects in Nairobi County. The study also found positive relationship between the independent variables (Risk management planning and risk identification). Risk management practices has a strong correlation with performance of renewable energy. Risk management process explained 79.6% of performance of energy projects in Nairobi County. The study also established that risk management planning significantly influence on performance of renewable energy projects. Risk identification also had a positive significant influence on performance of renewable projects. Risk identification had the highest influence at 67.7% followed by risk management planning at 55.5%. The study recommends enhancement of risk management practices to ensure improvement of performance of renewable energy projects. The study findings will be useful to the project practitioners, researchers and policy makers.

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*Index Terms—*Risk Management Planning, Risk Identification, renewable energy projects, Risk management practices.

I. INTRODUCTION

The economic growth has put the supply of electricity under immense pressure with high demands of power of up to 18.9% annually. The country has focused on development of hydroelectric and geothermal power through the implementation of the 'Least Cost Power Development Plan'. Concerns on electricity production has resulted due to the low production capacity and the growing demand where up to 39% is produced from hydropower in Kenya and thus faces difficulties in summer months with low water levels. Thus, the capacity gaps are to be filled through thermal generation from fossil fuels which is very expensive. Increase in economic activities and the rise in population has led to high energy in demand. The high energy costs are supplemented by the unreliable supply infrastructure. Imported crude petroleum for 25% and due to fluctuations and power outages prompts the declaration of sustainable, reliable, and affordable domestic energy as a priority in the national policy [1].

A project risk is a condition of uncertainty that, if it occurs, will affect the project objectives negatively or positively. Risks can be effectively managed to mitigate their impact on project performance or project objectives. Risks are implicit in issues and uncertainties related to the organization productivity, political situation, market competition, environmental issues, and contractual rights and others [2]. The PMBOK proposed six risk management processes: 'risk management planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk responses planning and risk monitoring and control [2]. In risk management, project risk is inherent and this poses the biggest challenge in determining the type of risk and how to prioritize. Thus, risk management is considered an essential process by project managers to ensure a successful project management process. Risks can be managed effectively to mitigate the adversely impact on objectives of the project though risks are inevitable in all projects. Risks sources include inherent uncertainties and organization related issues such as inflation, market competition, profit margins, political situations, contractual rights, and even weather changes. Quantitative risks methods accord the opportunity to decide on the project that is risky as well as planning for the sources of potential risks found in projects hence managing the source. Uncertainty is measurable while risk is immeasurable [3].

A. Statement of the Problem

The economic growth has put the supply of electricity under immense pressure with high demands of power of up to 18.9% annually. The country has focused on development of hydroelectric and geothermal power through the implementation of the 'Least Cost Power Development Plan'. Concerns on electricity production has resulted due to the low production capacity and the growing demand where up to 39% is produced from hydropower in Kenya and thus faces difficulties in summer months with low water levels [1]. Thus, the capacity gaps are to be filled through thermal generation from fossil fuels which is very expensive. Risk management practice is currently assumed to be reactive, unstructured and casual in many industries such as construction which results in to lack of capacity in managing risks appropriately. Major barriers for effective risk management systems include lacking of an integrative mechanism of managing risks among stakeholders of projects, lack of system formality, and lack of rigor in application of risk management as it is done on other project management processes [4]. According to [5] though Kenyan market offers many opportunities for renewable energy development, institutions that deal with energy has made project profitability to be difficult with only 10MW projects left. Further, the fierce competition from big companies such as D. Light and Mobisol has made it difficult for new entrants. In addition, local expert on renewable energy is 50% expensive for companies undertaking the projects. Infrastructural risks, regulatory barriers, climate change have posed as challenges that have affected the performance of renewable energy in Kenya and in specific Nairobi Metropolitan. The Least Cost power development plan has targeted to commission a mixture of energy sources to reduce the power production costs and ensure reliable supply of renewable energy where the contribution will be gas fire (11%), wind (9%), diesel (9%), coal (13%), geothermal (20%), hydroelectric (5%), imports (9%) and nuclear (19%). The system expansion for 2011-2031 was estimated to be USD 41.4 bn [5]. Despite the opportunities Nairobi Metropolitan still has not full taken advantage of renewable energy due to the afore mentioned risks. Various studied have conducted on risk management both locally and internationally. [6] studied the 'effect of risk management at project planning phase on performance of construction projects in Rwanda. [7] studied the effect of risk management practices on performance of consulting engineers and engineering firms. However, while these studies are of importance to the researcher, none of them was done on 'risk management practices on performance of renewable energy projects in Nairobi County hence a knowledge gap'. It is therefore this gap which the researcher sought to fill by providing answer to the question: what effect does risk management practices have on the performance of renewable energy projects in Nairobi County?

B. Objectives of the Study

The main objective of the study was to investigate the influence of Risk management practices on the performance renewable energy projects in Nairobi County'.

The following specific objectives guided the study:
i). To examine the influence of Risk management Planning on the performance renewable energy projects in Nairobi County.

ii). To determine to what extent Risk identification, influences the performance renewable energy projects in Nairobi County.

II. LITERATURE REVIEW

The study will be guided by the prospect theory by Amos Tversky and Daniel Kahneman. The theory explains how individuals tend to be risk averse when things are going as expected or planned, and when losing they tend to be risk seeking just like an example of a leader who is in the middle of the crisis. This is in other words about judgement and decision making. The prospect theory is designed to explain the common pattern of choices that it is descriptive and empirical in nature. Prospect Theory is a psychological account that describes how people make decisions under conditions of uncertainty [8]. The stakeholder theory emphasizes that values are necessary for doing any business. Managers must understand the shared sense of the value they create, and what attracts core stakeholders together. Thus, managers ought to be clear on how they want to do business more specifically the kind of relationship with their stakeholders needed to ensure attainment of objective [9]. The authors of the accepted manuscripts will be given a copyright form and the form should accompany your final submission.
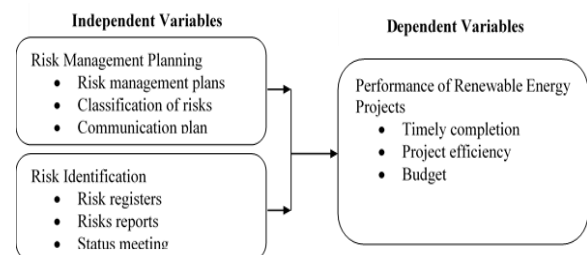
A. Conceptual Framework

Fig 1:Conceptual Framework

i). Risk Management Planning

According to [2] the risk management plan defines how the risk activities will be carried out in the project. It deals with the plan, approach and execution of risk management activities. The risk management plan, part of the project management plan, provides a description of how risk management activities will be carried out and structured. The risk management plan includes: a risk strategy; methodology; funding; timing; roles and responsibilities; risk categories; stakeholder risk appetite; definitions of risk probability and impacts; probability and impact matrix; reporting formats; and tracking [2]. During risk management planning a detailed is produced to explain how the project team will approach the risk management activities in the project. This process aims at informing various stakeholders of the risks and for establishing for a commitment for clear strategy on risk management. This step is not crucial for ensuring success of projects and if it is done extensively the project is less likely to fail. The step should start after finalization of project planning and to be completed before the project initiation [10].

A risk management plan is developed before embarking on the risk management procedures. his document is developed

at the beginning of the project and sets out the strategic requirements and the risk management process [2]. In some cases, a risk management plan is developed during the estimation or at the tendering stage to take adequate measures in generating tendering costs. The risk management plan first defines the scope as well as the areas for applying risk management and more specifically the types of risks to be investigated. A risk management plan is used in the project process to specify the technique that will be used to identify and assess risks. Whether a SWOT analysis or a more rigorous quantitative technique such as the Monte Carlo method. The risk management plan sets out the content, frequency and type of reports, the roles of different risk owners, impact and probability criteria from a quantitative and qualitative perspective in terms of time, cost, quality and performance. The risk management plan includes: general introduction, project description, risk response, tools and techniques, risk reports and appendices. A project's risk management plan should follow a given template for familiarity, although each project requires a tailored version to cover expected risks and project-specific requirements [11].

ii). Risk Identification

All possible risks that may affect the project are predicted and later categorized based on their characteristics. Risk identification aims at informing of possible risks, their characteristics as well details about them. The process uses brainstorming, interviews, SWOT analysis and previous records as methods to collect information about the risks [10]. Risk identification is a team effort where the project scope specification is as in the Work breakdown structure or contract is thoroughly examined and every aspect investigated to identify a possible risk [2]. Expert opinion may be used to help identify the project risks. The risks may be categories into four main areas namely: environment, technical, financial and organization risks. The risks may be further examined to expand their categories though some risks may fall in more than one category. The risk owner for each identified risk is identified. Since the risks list is very long, certain criteria may be used to screen the risks to refine them which is another stage of risk assessment [11].

Risk management aims to identify risks and take preventive and corrective measures to ensure their impacts are minimized. Risk categories vary depending on the nature of project such as technical, social, market, financial, and business. The sources of risk may be internal or external [4]. The external risks include those risks that are not related to management such as political issues, interest rates, an exchange rate. The internal risks may include violation of data or failure [12]. According to a [13] project risks are mainly categorized as schedule, costs, and performance. The other types of risks in projects such as operational, legal, governance, strategic, and market risks ultimately have an impact on the schedule, cost, and performance of the project. Project deferral risks is also an example of project risk due to failure or project that are incomplete and is also due to the aforementioned sources of cost, performance, and schedule [14].

ii). Performance of Projects

Project performance measures consist of positive achievement of results and delivery of the result within the specified contractual time frame and within the budget allocated with respect to cost reduction. Project performance refers to meeting goals and objectives while meeting customer satisfaction and meeting technical requirements. The fundamental measure of a successful project is that it delivers what it is designed to deliver to the business as an output product or service. In addition, factors such as meeting the deadline, working within the budget, agreed scope and quality contribute to the success of the project [2]. [15] opined that the benchmark for measuring the project performance is the implementation stage as gives guidelines on how the project activities and the project participants focus only on the project goal. This means opinion difference among project stakeholders can lead to project failure. According to [16] project initiation accounts for 80% of project activities and resource utilization and it is therefore a benchmark for the success or failure of project. [16] further added that four dimensions for project performance include factors such as time, cost, quality, and production efficiency.

A proper risk management system is not only an efficient tool but also an effective tool used in project-oriented organizations to ensure success of projects. To ensure an accurate risk management system, there has to be a criterion for performance measurement. The main goal for performance measurement system is for analysis and assessment of the project objectives in financial and non-financial terms. It is during evaluation where the results from the evaluation can be used to ensure efficient and effective allocation of resources. The accurate measurement of risk management system performance in projects is important for ensuring the project success. Risk performance measurement are helpful in reduction of the risk factors that are associated with the project. Risk performance management should also be included in the risk management system to ensure that an appropriate system is selected. It is important to remember that risk management alone cannot ensure the success of projects, an up-to-date performance assessment is key to understanding the status of the risk management plan [10].

B. Empirical Review

The empirical review provides scholarly literature on the issues under study.

i. Risk Management Planning and Performance of Projects

[17] studied the 'influence of project risk management on performance of agricultural projects in Nakuru county' and recommended the inclusion of a risk management plan in the design of agricultural projects in Nakuru county. The study showed that risk assessment and identification do significantly impact on project performance. Study further emphasizes regular and ongoing training that will help project managers improve their skills and competencies in the risk management process. The agricultural sector should also provide opportunities to project team members for those with

ambition to advance in their education to advance their careers to enable them have the necessary knowledge in project management to identify the potential risk at early stages.

ii). Risk Identification and Performance of Projects

[18] in their study on 'the critical analysis and benefits of evaluating project risk management efficiency'. Project management provides the preliminary approach for the quality of project risk management through assessing the adequacy of risk responses mitigating the subsequent effect that it has on the success rate of interventions completion of projects. The study concluded that the risk identification had the greatest impact on the implementation of coastal road construction projects region. In a study by [19] on the 'effects of risk management practices on IT project success in Thailand' viewed IT project success in terms of process and product performance. The study found that risk identification had a significant influence on both process and product performance. Risk identification had the second greatest influence after risk response planning on predicting the influence on the process performance on IT projects in Thailand. Risk identification was also found to have the greatest influence in explain the product performance of IT projects in Thailand. [7] examined the 'effects of project risk management practices on performance of consulting civil engineers in Nairobi county'. It was established that Risk identification didn't significantly influence performance.

III. RESEARCH METHODOLOGY

The study adopted a descriptive research design. Descriptive research design is used to describe an event or phenomena as it exists at present and is appropriate when the study is concerned in specific predictions, narrative of facts and characteristics concerning individuals or situations [20]. The population for this study included renewable energy projects in Nairobi County Area. According to Energy Petroleum Regulatory Authority (EPRA) there around 67 projects for Wind, Solar, and bio-energy in Nairobi [21]. Further, there are 15 registered renewable companies as reported by [21]. The respondents of the study were 2 project managers from each of the 67 projects (134) and also project representatives from 15 renewable companies [22]. Thus, a total of 149 respondents were used for the study. These were targeted because they hand the first-hand information on renewable energy projects. Since the population was small, a census was done. [23] opined results in a census survey can still be generalized to the entire population since the study uses a 100% total population.

IV. RESEARCH FINDINGS AND DISCUSSIONS

A. Response Rate

The study administered 149 questionnaires for data collection. A total of 119 were duly filled and returned representing a response rate of 79.87%. [23] suggested that a response rate of 30-50% is adequate in a study to give reliable results. Thus, the response rate of 79.87% was appropriate for

the data analysis in this study. The results of the response rate are as shown in Table I below.

Table I: Response Rate

Questionnaires	Frequency	Percent
Returned Questionnaires	119	79.87
Non-returned questionnaires	30	20.13
Total	**140**	**100**

A. Descriptive Statistics

i). Risk Management Planning

The first objective of the study was to examine the influence of Risk Management Planning on performance of renewable energy project in Nairobi County. The study also was guided by the research question 'what is the influence of Risk Management Planning on the performance of renewable energy projects in Nairobi County? From table 4.10 below the study found that there is Risk management planning in renewable energy projects in Nairobi County (M = 3.79, SD = 1.346). [16] described Risk planning as an important principle of assessment and management of risks in a project. It includes key steps and activities such as identification, evaluation, analysis and response. [10] opined that during risk management planning, a detailed plan is produced to explain how the project team will approach the risk management activities in the project. This process aims at informing various stakeholders of the risks and for establishing for a commitment for clear strategy on risk management. A risk management plan is therefore developed before embarking on the risk management procedures. This document is developed at the beginning of the project and sets out the strategic requirements and the risk management process. In some cases, a risk management plan is developed during the estimation or at the tendering stage to take adequate measures in generating tendering costs [11].

The findings from Table 4.10 revealed that the risk management plan described the activities of the risk management process (M = 3.56, Sd = 1.529). A detailed procedure on how the project team will approach the risk management activities in the project was also produced (M = 4.07, Sd = 1.298). The project stakeholders were also informed of the risks and also established a commitment for a clear risk management strategy (M= 4.09, Sd = 1.322). The risk management plan was also produced at start of the project (M= 3.72, Sd = 1.410) though it wasn't clear on whether the risk management plan was produced before embarking on the risk management procedures (M =3.35, Sd = 1.214). The risk management plan defined the scope and the areas for applying risk management as well as types of risks to be investigated (M= 3.98, Sd= 1.582). The risk management plan was used in the project process to specify the technique that was used for identifying the project risks (M = 3.48, Sd = 1.068). finally, the study found that the renewable energy projects had a risk management plans that were used in the entire process of risk management (M = 4.06, Sd = 1.348)

Table II: Risk Management Planning

Risk Management Planning Indicators	Mean	SD
The risk management plan describes activities of the risk management process.	3.56	1.529
A detailed procedure is produced on how the project team will approach the risk management activities in the project	4.07	1.298
Stakeholders are informed of the risks and establishing a commitment for clear strategy on risk management.	4.09	1.322
A risk management plan is developed before embarking on the risk management procedures	3.35	1.214
Risk management plan is produced as the start of the project	3.72	1.410
The risk management plan defines scope and the areas for applying risk management and more specially the types of risks to be investigated	3.98	1.582
The risk management plan is used in the project process to specify the technique that will be used for identifying the project risks	3.48	1.068
The project has a risk management plan that is used in the entire process or risk management	4.06	1.348
Average Risk Management Planning	3.79	1.346

ii).   Risk Identification

The second specific objective of this study was to determine to what extent does Risk Identification influences the performance of renewable energy projects in Nairobi County. The objective also aimed at answering the research question 'what extent does Risk identification influence the performance renewable energy projects in Nairobi County'. From Table III below the study found that there is Risk identification as a risk management process in ensuring performance of renewable projects in Nairobi County (M= 3.83, Sd = 1.411). According to [10] Risk identification aims at informing of possible risks, their characteristics as well details about them. Risk identification is a team effort where the project scope specification is as in the Work breakdown structure or contract is thoroughly examined and every aspect investigated to identify a possible risk. Expert opinion may be used to help identify the project risks [11]. [4] opined that risk management aims to identify risks and take preventive and corrective measures to ensure their impacts are minimized. Risk categories vary depending on the nature of project such as technical, social, market, financial, and business.

The [2] described some are various tools and techniques for identifying risks. These include: document review, information gathering techniques, checklist analysis, assumption analysis, and diagramming techniques. The quality and consistency of the plans the assumptions of the projects and project requirements provide the project with the risk indicators. The information gathering techniques for risk identification include: brainstorming, Delphi technique, interviews, SWOT, and root cause identification [24]. Expert opinion may be used to help identify the project risks. The

risks may be categories into four main areas namely: environment, technical, financial and organization risks [11]. [18] in their study on critical analysis and evaluation of project risk management efficiency found that risk identification had the greatest impact on implementation of construction projects. Similarly, [19] in their study on the effects of risk management practices on IT project success in Thailand found risk identification to have significant influence on process performance. The study also found that risk identification with the second greatest influence after risk response planning. In addition, [17] found risk identification to have a significant influence on performance of projects. However, [7] in their study on the effect of project risk management practices on performance of consulting civil engineers in Nairobi county found risk identification to have an insignificant influence on performance.

Table III: Risk Identification

Risk Identification Indicators	Mean	SD
Project risks are categorized based on their characteristics.	4.12	1.322
The WBS is used in identification of the possible project risks	3.38	1.406
The project risks are communicated risk owners after they are identified.	4.09	1.359
SWOT analysis is used in identifying the project risks	3.60	1.459
Brainstorming is used to come up with the possible project risks	3.99	1.113
The sources of project risks are also identified	3.87	1.511
Expert opinion is used to help identify the project risks	4.11	1.463
Document review is one of the tools used in identification of risks	3.48	1.652
Average Risk Identification	3.83	1.411

The study found that project risks were categorized based on their characteristics (M = 4.12, Sd = 1.322). The project risks were communicated to risk owners after they were identified (M = 4.09, Sd = 1.359). SWOT analysis was used in identifying the project risks (M =3.60, Sd = 1.459) in addition to brainstorming that was used to come up with the possible project risks (M = 3.99, Sd = 1.113). Expert opinion was used to help identify the project risks (M = 4.11, Sd = 1.463). However, the study didn't clear indicate on the use of WBS in identification of project risks (M = 3.38, Sd = 1.406). There was also slightly agreement that document review was one of the tools used in identification of risks (M = 3.48, Sd = 1.652). Finally, the study found that sources of project risks were also identified (M = 3.87, Sd = 1.511). [25] found a significant close relationship between risk identification on performance of construction projects in Mogadishu Somalia. [26] found risk identification was considered before project initiation while [6] in Rwanda found risk identification was done during planning stages of construction projects.

iii).   Status of performance of renewable projects

The main objective of the study was to investigate the influence of Risk Management Process on the performance of renewable energy projects in Nairobi County. The descriptive

statistics aimed and describing the status of the renewable projects in Nairobi County. The findings from Table 4.14 established that to some extent Risk management processes influenced performance of renewable projects in Nairobi County (M = 3.73, Sd = 1.199). Project performance measures consist of positive achievement of results and delivery of the result within the specified contractual time frame and within the budget allocated with respect to cost reduction [2], [16], [27].

According to [10] a proper risk management system is not only an efficient tool but also an effective tool used in project-oriented organizations to ensure success of projects. Risk performance measurement are helpful in reduction of the risk factors that are associated with the project. Risk performance management should also be included in the risk management system to ensure that an appropriate system is selected. It is important to remember that risk management alone cannot ensure the success of projects, an up-to-date performance assessment is key to understanding the status of the risk management plan.

Table IV: Performance of Renewable Energy Projects

Performance of Projects Indicators	Mean	SD
The project has witnessed few risks due to effective risk management practices	4.07	1.153
The organization is able to deal with projects risk easily as they identified at early stage	3.40	.999
The project has witnessed few risks due to effective risk management process	3.46	1.128
Implementation of the risk management practices has helped ensured projects are completed in time.	3.82	1.434
The renewable projects are efficient	3.35	1.463
Project risk management practices enable completion of projects within the budget.	4.20	1.077
Project risk management has helped to minimize cost overrun or underrun risks.	4.03	1.215
Project risk management practices have ensured quality renewable energy products	3.54	1.119
Average Status of Performance of Projects	3.73	1.199

From Table IV the study found the renewable energy project have witnessed few risks due to effective risk management practices (M = 4.07, Sd = 1.153). Implementation of the risk management practices helped to ensure projects were completed in time (M = 3.82, Sd = 1.434). Project risk management practices enabled completion of projects within the budget (M = 4.20, Sd = 1.077). Project risk management helped to minimize cost overrun or underrun risks (M = 4.03, Sd = 1.215). Further, project risk management practices ensured quality renewable energy products (M = 3.54, Sd = 1.119). The renewable

energy projects slightly witnessed few risks due to effective risk management process (M = 3.46, Sd = 1.128). However, the study did not establish whether the project risks were dealt with easily as a result being identified earlier (M = 3.40, Sd = 0.999). In addition to that, it was clearly established from the study whether the renewable energy projects were efficient (M = 3.35, Sd = 1.463).

C. Inferential Analysis
i). Correlation Analysis
Correlation is an analysis that measures the magnitude of linear association between two variables and the direction of the association. Table IV show a correlation (r = 0.424; p<0.001) between Risk management planning and performance of renewable energy project in Nairobi County. This implies that the Risk management planning is positively correlated to the performance of renewable energy project in Nairobi County. In addition, the correlation between these two variables was significant, that is p<0.5 implying a linear relationship between Risk management planning and performance of renewable energy project in Nairobi County. There is a direct association between risk planning and performance of construction projects [28]. There is a positive, significant, and weak correlation (r = 0.267; p<0.003) between Risk Identification and performance of renewable energy project in Nairobi County. This implies that the Risk Identification is positively correlated to the performance of renewable energy project in Nairobi County. In addition, the correlation between these two variables was significant, that is p<0.5 implying a linear relationship between Risk management planning and performance of renewable energy project in Nairobi County.

Table V: Coefficient of Correlation

Variables		Performance of Renewable projects
Risk Management Planning (RMP)	Pearson Correlation	.424**
	Sig. (2-tailed)	.001
	N	119
Risk Identification (RI)	Pearson Correlation	.267**
	Sig. (2-tailed)	.003
	N	119

ii) Regression Analysis
Further, the study ran the procedure of obtaining the regression coefficients, and the results were as shown on the Table VI. The coefficients or beta weights for each variable allows the researcher to relative importance comparatively of the Risk Management Practices.

The following regression model will be used;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon \qquad (i)$$

Where; Y= Project Performance (PREP);

β_0 = Constant (Coefficient of intercept) e_0 = Error term

X_1 = Risk Management Planning (RMP)

X_2 = Risk Identification (RI)

PREP= 10.987+ .623RMP+.789RI   .(ii)

Table VI: Regression Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	B		
1 (Constant)	10.987	1.324		8.279	.000
RMP	.623	.199	.555	3.128	.003
RI	.789	.168	.676	4.696	.000

Findings in Table VI showed that Risk management planning had coefficients of estimate which was significant basing on $\beta1 = 0.623$ (p-value = 0.003 < 0.05). Also, the influence of Risk management planning is more than the effect attributed to the error and supported by the t-calculated = 3.128 > t-critical =1.658 at a 5 percent level of significance. Risk management planning influences performance by 0.555 or 55.5%, thus we conclude that Risk management planning significantly influence performance of renewable projects in Nairobi County. The findings also concur with [28] who found a direct association between Risk planning and performance of construction projects. In addition, the findings indicate that Risk Identification had coefficients of estimate which was significant basing on $\beta2 = 0.789$ (p-value = 0.000 < 0.05). Also, the Risk identification is more than the effect attributed to the error and supported by the t values where t calculated= 4.696 > t critical =1.658 at a 5 percent level of significance, thus we conclude that Risk Identification significantly influence performance of renewable projects in Nairobi County by 0.676 or 67.6%. The findings concur with [18] in their study on 'the critical analysis and benefits of evaluating project risk management efficiency' that risk identification had the greatest impact on the implementation of road construction projects.

i). Model Summary

In Table VII, the correlation coefficient (R) of 0.891 shows that there is a positive joint correlation between Risk Management Process (Risk Management Planning, Risk Identification, Risk Analysis, & Risk Monitoring & Control) with performance of renewable energy projects in Nairobi County.   From the study findings, the correlation determination is R^2 value (0.794). The study results imply that Risk Management Planning, Risk Identification, Risk Analysis, & Risk Monitoring & Control jointly accounted for 79.40% of the performance of renewable energy projects in Nairobi County as represented by the R^2. This therefore means that other factors not studied in this research contribute 20.6% performance of renewable energy projects in Nairobi County. This implies that these variables are very significant and need to be factored to performance of renewable energy projects in Nairobi County.

Table VII: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.891[a]	.794	.778	.32415

a. Predictors: (Constant), Risk Management Planning, Risk Identification, Risk Analysis, & Risk Monitoring & Control

V.   SUMMARY OF FINDINGS

i). Risk Management Planning and Performance of renewable energy projects

The first specific objective of the study was to examine the influence of Risk Management planning on performance of renewable energy project in Nairobi County. The study found significant statistical evidence from the descriptive analysis to indicate the existence of Risk Management Planning activities in the renewable energy project in Nairobi County. The study found that the risk management plan described the activities of the risk management process. A detailed procedure was produced on the approach to be used by the project team on the risk management activities in the project. The project stakeholders were also informed of the risks and also established a commitment for a clear risk management strategy. The risk management plan was also produced at start of the project though it wasn't clear on whether the risk management plan was produced before embarking on the risk management procedures. The risk management plan defined the scope and the areas for applying risk management as well as types of risks to be investigated. The risk management plan was used in the project process to specify the technique that was used for identifying the project risks. All the renewable energy projects had risk management plan for the entire risk management process. From the inferential analysis, Risk management planning had a weak positive correlation with performance of renewable energy projects. Risk management planning also had a positive significant influence on performance of renewable energy project in Nairobi County. Risk management planning influenced performance by 0.555 or 55.5%

ii). Risk Identification and Performance of renewable energy projects

The second objective of the study was to determine to what extent Risk identification, influences the performance renewable energy projects in Nairobi County. The study found significant statistical evidence from the descriptive analysis to suggest the existence of Risk Identification activities in renewable energy projects in Nairobi County. The study also found that the project risks were categorized based on their characteristics. The project risks were also communicated to risk owners after they were identified. The renewable energy projects used SWOT analysis, brainstorming, document review, and expert opinion to identify the project risks. However, the use of WBS in identification of project risks was not clear Finally, the sources of project risks were also identified. From the inferential analysis Risk Identification had a weak, positive, and significant correlation with performance of renewable

energy project in Nairobi County. In addition, the findings indicated that Risk Identification had a positive significant influence on performance of renewable energy project in Nairobi County. Risk Identification was found to significantly influence performance of renewable projects in Nairobi County by 0.676 or 67.6%.

VI. CONCLUSION

The main objective of the study was to investigate the influence of Risk management process on the performance renewable energy projects in Nairobi County. From the findings the study concludes that Risk Management process (Risk Management Planning, Risk identification, Risk Analysis, and Risk Monitoring & Control) have significant positive correlation with performance of renewable energy projects in Nairobi County. The findings are also supported by [29] who found a positive correlation between risk management practices and projects success in construction projects in Lagos Nigeria. Study also concludes that risk management process significantly influences performance of renewable energy projects in Nairobi County. The findings are also supported by [30] who found risk management strategies to enhance productivity of projects in Malaysia. Similarly, [25] found close relationship between risk identification, risk response and performance of construction projects in Mogadishu Somalia. On the contrary, A study by [31] on the effect of project risk management strategies on the performance of Isuzu East Africa (E.A) limited in the automotive industry found that there was no significant effect of risk management on performance.

The first objective of the study was to examine the influence of Plan risk management on the performance renewable energy projects in Nairobi County. The study concludes that Risk Management Planning has a significant positive correlation with performance of renewable energy projects in Nairobi County. Risk Management Planning also has a positive significant influence on project performance. The findings also concur with [17] who found risk planning to have significant influence on performance of agricultural projects in Nakuru County. Similarly, [14] in their study of effects of project risk planning on performance of construction projects in Kigali Rwanda found risk planning significantly influence performance of construction projects.

The second objective of the study was to determine to what extent Risk identification influences the performance renewable energy projects in Nairobi County. The study concludes that risk identification has positive significant association with performance of renewable energy projects in Nairobi County. The also concludes that Risk identification a has a positive significant influence on performance of renewable projects in Nairobi County. The findings are also supported by a study done by [19] on the 'effects of risk management practices on IT project success in Thailand' who found risk planning to have second highest influence on performance of IT projects in Thailand. Similarly, [18] in their study on the critical analysis and benefits of project risk management efficiency found risk identification with the greatest impact on implementation road construction projects.

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