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PROJECT RISK MANAGEMENT PRACTICE AND PERFORMANCE OF RENEWABLE E ENERGY PROJECTS IN NORTH EASTERN REGION, KENYA

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ABSTRACT

This study sought to establish the influence of project risk management practice on performance of renewable energy projects in North Eastern region in Kenya. Specifically, the study sought to: determine the influence of project risk identification; assess the influence of project risk response on performance of renewable energy projects in North Eastern region in Kenya. The study was underpinned by the control theory. The study focused renewable energy projects under KOSAP in North Eastern region of Kenya. Descriptive survey design was adopted. The target population included around 57 projects for Solar, and bio-energy in North Eastern Kenya. The unit of observation was 232 respondents that included of project managers from each of the 57 projects; project representatives from 10 renewable companies, 150 beneficiaries of the community facilities; and 15 representatives of the implementing agencies comprising of MoE, KPLC & REREC. A sample of 147 was drawn. The study found that risk identification and risk response had positive significant influence on performance of renewable energy projects in North Eastern region in Kenya. The study recommdended that renewable energy projects should use brainstorming, expert judgement, and historical data in identifying the risk of the projects. All the possible risks of the project should also be listed.

Keywords: Project risk management practices, risk identification, risk response, performance of renewable energy projects

Background of the Study

Affordable energy is vital to the socio-economic growth of any society as recognized by the United Nations Sustainable Development Goal (SDG) 7, which aims to ensure "universal access to affordable, reliable, sustainable and modern energy for all" by 2030. SDG7 seeks to increase the share of renewable energy (RE) in the global energy mix substantially by 2030 (the world Bank, 2020). About 75% of people without reliable energy access worldwide live within lower-income Sub-Sahara Africa (SSA). More than half of the electrified African population live in rural areas, typically low-density remote areas far from electricity grids, making decentralized energy systems a viable solution to bridge the energy access gap (IEA, 2019). Renewable energy projects offer prospects for sustainable development and meeting climate goals. However, new renewable energy projects, often driven by donor aid and foreign direct investment, have triggered several challenges, notably those related to conflicts. Despite decreasing capital costs, investments in renewable energy (RE) projects in developing countries are low due to unattractive risk-return profiles. Through understanding key risks drivers and their interactions, actionable insights can be drawn to mitigate investment risks, making energy more accessible (Abba, Balta-Ozkan, & Hart, 2022).

Low investment in RE project in developing countries is attributed to the projects being capital intensive with unattractive risk returns, limited financing channels, poor policies, changing market, risk and opportunities (Zeng, Liu, Liu, & Nan, 2017; Bhattacharyya, Palit, Sarangi, Srivastava, & Sharma, 2019).The guideline for effective risk management according to ISO 31000 include: establishing the context, risk identification, risk analysis, risk evaluation, and risk mitigation (Purdy, 2010). In establishing the context, the scope of the project, boundaries, location, stakeholders and their objectives, and the level at which the risks are considered acceptable. In analyzing the risks, the risk levels are determined based on likelihood and consequence. The risks are prioritized during the evaluation stage in order to determine their acceptability. Outputs from the previous stage determine the risks that require treatment which involves the implementation of controls to mitigate risks. The risks are reviewed and updated at each risk assessment and mitigation stage via stakeholder communication and consultations (Abba, Balta-Ozkan, & Hart, 2022).

The North and North Eastern region of Kenya is historically underserved and is performing below national average on development indicators. Poverty levels are high at 70%, compared to 58% national average. The road networks are poor to nonexistent; electricity access is at 7%; only 45% of households have access to safe water and, only 36% have access to improved sanitation. The area is arid or semi-arid and recurrent droughts create vulnerabilities for the population, 90% of whom rely on livestock. Over the past decade, losses in livestock populations due to drought related causes amounted to nearly US$1.08 billion. The Government of Kenya with World Bank support launched the US$1 billion North & North Eastern Development Initiative (NEDI) in 2018 that increased investments in the region with a special focus on transformative and integrated infrastructure investments and support to sustainable livelihoods. This together with other World Bank investments in the region amounts to over US$ 2 billion. NEDI covers ten counties: Garissa, Isiolo, Lamu, Mandera, Marsabit, Samburu, Tana River, Turkana, Wajir, and West Pokot. The initiative consists of six backbone projects with a portfolio of about US$1 billion: North Eastern Transport Improvement Project, Of-Grid Solar Access Project for Underserved Counties, Water and Sanitation Development Project, Climate Smart Agriculture Project, Development Response to Displacement Impacts Project, and National Safety Net Program Additional Financing. KOSAP project size is worth $150M (WorldBank, 2019).

KOSAP aims at increasing the access to modern energy services to enterprises, households, communities, and water pumping. The major components of the project include: installation of mini grids, stand-alone solar systems and cooking solutions, solar systems for water pumps for communities, and capacity building programme. By 2023 project was expected to benefit 1,272,500 individuals with electricity services which will include 1100 communities and with

a capacity of generating 96MW of renewable energy. That will include installation of 250,000 solar systems home, 150,00 cook stoves, 380 solar pumping systems, 784 health clinic, 207 secondary school (MoE, 2020). The Project will also facilitate the sale of 60,000 clean cooking stoves in the 14 Counties.

Statement of the Problem

According to the Kenya Bureau of Statistics (2019) only 19.3% of Kenyans use solar energy, 16.5% paraffin, 50.4% electricity, 2.8% wood, 0.1% generator, 0.2% LPG a household lighting energy source. In term of cooking, 55.1% use firewood, 7.8% paraffin, 11.6% charcoal, 23.9% LPG, and 0.2% biogas (KNBS, 2019). According to MoE (2020) some of the risk identified that hinder the achievement of energy efficiency in Kenya include: inadequate financing, operation risk, stakeholder cooperation risk, inadequate professional competency, inadequate research, development and innovations, political risk, and project implementation risk. The impact of those risk included, lack of budget for investing in energy efficiency projects, lack of adequate capacity, low stakeholder involvement, poor implementation performance, delay in implementation of strategies, and low implementation of energy efficiency actions (MoE, 2020).

Kenya relies heavily on renewables for roughly 90% of its power needs aiming to of lift this to 100% by 2030. However, the main power-sector weaknesses are the parastatal firms responsible for distribution (Kenya Power) and transmission (KETRACO). Kenya Power is vulnerable due to government interference, crime and corruption, and thus incur several losses annually (Economist Intelligence Unit , 2023). KOSAP has an objective of ensuring the marginalized communities have access to electricity where the Commission on Revenue Allocation (CRA) identified 14 counties which in total represent 70% of the total land area of the country and 20% of the population who are historically nomads and mainly rely on pastoralism. In addition, they have poor infrastructure, lack electricity, and other social services and not forgetting security issues. The 14 underserved counties include Mandera, Wajir, Garissa, Tana River, Samburu, Isiolo, Marsabit, Narok, West Pokot, Turkana, Taita Taveta, Kwale, Kilifi and Lamu(Ogunnaike & Harmon , 1994) (KOSAP, 2017).

Research Objectives

This study sought to establish the influence of project risk management practice on performance of renewable energy projects in North Eastern region in Kenya.

The study specifically sought:

i. To determine the influence of project risk identification on performance of renewable energy projects in North Eastern region in Kenya.
ii. To assess the influence of project risk response on performance of renewable energy projects in North Eastern region in Kenya.

LITERATURE REVIEW

Theoretical Review

The control theory was developed by Emerson in 1917 from thermostat model (Ogunnaike & Harmon , 1994). Control theory is divided into two parts; performance reporting and overall change control. Performance corrections agreed for the implementation processes, while change control changes are set for the planning processes. Cost control consider performance reporting, based on agreed performance baseline, and associated corrections to implementation (PMI, 2017). The theory ensures that there is a standard of project performance which is measured at the deliverable; the likely variance between the standard and the measured value is used for adjusting the project process so that the desired standard can be achieved (Koskela & Howell, 2002).

Theory of control involves measurement necessary for the realization of project costs, investigation of causes for cost overrun and elimination of its negative causes. In conventional project management, key control system comprises of comparing cost or schedule performance

with the baseline performance. This theory can be used alongside conventional project management system, therefore, control process through the thermostat model can be achieved concurrently (Koskela & Howell, 2002).

This theory is a guidance theory in the project cost control as it shows the capacity of the project to attend to specific cost problems that need to be reviewed within projects implementation. It further offers guidance on what areas need to be emphasized on during the project cost monitoring process (Donald & Preston, 1995). The use of this theory gives the advantage of offering cost information to the projects that could lead to additional explanations regarding the problem, the solutions and the best course of actions to be carried out in order to obtain the intended project cost results. In addition, the theory can be used to enhance project decision making and increase conceptions of solutions to any project difficulties (McClinttock, 1990).

In the context of completion of project, the project manager and the project teams have different interests. In order for the project manager to control cost and schedules during the project execution stage, he has to come up with different modes that ensure that the teams are compliant. The control mechanisms and rules must be aligned with the overall project goals as well as the goals of individual teams. Based on this understanding, project managers use the control model to focus on modes of monitoring and evaluation to enhance completion of projects. The theory was useful in linking risk identification, risk response, and how they influence performance of RE projects

Conceptual framework

The conceptual framework is illustrated in figure 1 below.

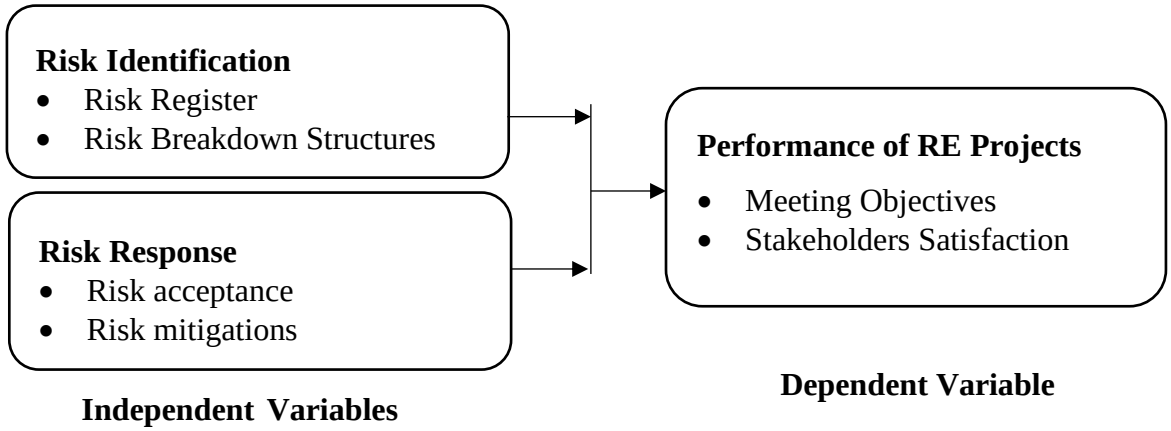

Figure 1: Conceptual Framework

Risk Identification

The PMI (2017) describes the process of Risk Identification as a team effort where individual risks for the projects, their sources, and their characteristics are identified and documented. Risk identification is the process of identifying the possible risks, characteristics and details of the risks. The aim is to identify the risks and take the necessary corrective and preventive measures to ensure they have minimal impact on the project and the project outcomes (Ayudhya & Kunishima, 2019). The project team examines the project scope and the Work Breakdown Structure (WBS) for possible risks that might affect the project. The Risk Register is a result of the risk identification process and the document is amended with the results from risk response planning and qualitative risk analysis. It is also updated and reviewed throughout the project (Altran, 2018).

According to PMI (2017) there are various tools and techniques for identifying risks. These include: document review, information gathering techniques, checklist analysis, assumption analysis, and diagramming techniques. According to Altran (2018) brain storming is the most appreciated technique for identifying risk in RE projects and it is also straight forward in terms

of data collection and sharing. The stakeholders generate and clarify the ideas for the potential risks. Delphi method is also used where the experts agree or disagree on the problem. Other methods include cause/effect diagrams, Hazard and Operational analysis (HAZOP), checklists and expert interviews.

The Risk Breakdown Structure (RBS) should be used as a checklist during brainstorming. In the initial stage risk identification should be done regardless of the techniques used. The information is then consolidated according to RBS and through RBS screening hidden risk issues that were previously unidentified might be raised. The risk identified need to be structured based on the RBS so that an overview of the risks identified are provided. The RBS is a reflection of the stakeholders' perspectives and is structured in order to distinguish the risks in conception, construction, operation or even abandonment of the project. The RBS provides numerous advantages throughout the risk management process. RBS supports risk identification exhaustively since it covers wide range of topics. Secondly, classification of the risks helps to statistically analyze the risks by risk categories and risk mapping. Finally, RBS proved a corporate database of all the feedback information on accurate risk identification, risk evaluation, the efficiency of the risk mitigation actions (Altran, 2018). The RBS is useful in checking whether the risks coverage is adequate as well identify any gaps in order to identify the areas where the risks are widely and less detailed.

Risk Response

Risk responses are the options, agreement of actions, and the strategies meant for addressing the project risk exposure and threating the individuals risks of the project (PMI, 2017). In managing risk, it involves planning for the risk responses, identification of the risk triggers, allocating the responsibility for dealing with the risk (Doval, 2019). According to PMI (2017), project risk response and control includes acceptance, mitigation, avoidance and transfer. As for positive risks, they can be exploited, enhanced or even shared. Doval (2019) posited that, since it not possible to have quick solutions for eliminating all the risks to the project, some risks may be needed and others are strategically managed as the project rolls along. Development of action plans is of essence to reduce the risks.

There are four principal risk strategies which include reduction, avoidance, control, and transfer (Doval, 2019; Lester, 2017). Risk avoidance is highly effective strategy and it involves elimination of activity producing the risk either entirely or at the beginning of the activity. However, the strategy is known to be impractical since some activities are crucial for the project and thus, eliminating them is impossible. According to Lester (2017) in Risk reduction strategy, the severity of the risk or the frequencies of the losses due to the risk are reduced through a change of operations that ensures reduction of the likelihood of a loss or reduction of the damages. Risk transfer strategy involves the transfer of the responsibility of a risk or an activity to another party. A good example is contractual risk transfer. Risk control strategy this is when a loss has occurred and the damages resulting from the risk are minimized. Risk responses that are appropriate and effective help to minimize individual threats, maximize opportunities, and ensure reduction of the risk exposure on the project overall (Bergsma, 2020).

Risk mitigation is a critical pillar of project performance. The risk mitigation aspects such as risk mitigation meetings, use of contingency plans, availability of safety systems, and quality assurance (Otieno & Mutiso, 2021). Risk Response is the reflection on whether the risks are accepted on their basis of level of exposure and the mitigating controls that are in place, or reduction of the risks through addition mitigations in order to bring it in line with the tolerance levels. It is the development of options and actions for enhancing opportunities and reduction of the threats to project objectives (Doval, 2019). A Risk Mitigation strategy entails several components that are important and they include a plan for identifying and analyzing risk as well as the process to determine the likelihood of the risk occurrence. In regard to risk management strategies, there are four options which include: acceptance, transference, avoidance and reduction.

Project Performance

Project performance can be measured and evaluated using a large number of performance indicators that could be related to various dimensions (groups) such as time, cost, quality, client satisfaction, client changes, business performance, health and safety Project performance can be defined as the capacity to achieve project goals within budget and time and maintain outcome of an intervention over time (Mensah, 2019). Risk management is important in increasing the sustainable value that is significant especially in construction activities which is surplus to cost of performing it. Risk management enhances the likelihood of maximizing of profits, minimizing of risks, and probability of achieving success in relation to the objectives of the project. Risk management enhances project performance through avoidance of: cost budget failure; meeting time and deadlines; and failure of meeting standards and quality. The gain from project risk management is not only for the project team but also for customers, end users, and clients of projects (Association for Project Management, 2018). The benefits of risk management include: formulation of appropriate strategy for cost estimation and schedule of work; a better perception of risk and their consequences and planning for a risk response and allocation of risks to responsible party; selection of a suitable contract; improved decision making; structuring of information for better modelling of future projects; and maximize the efficiency of project activities (Siang & Ali, 2017).

Empirical Review

Risk Identification and Performance of Projects

In a study by Kunya and Yusuf (2023) on the influence of risk management practices and performance of renewable energy projects in Nairobi County found risk identification to have a positive significant influence on performance of renewable energy projects in Nairobi County. They also established that risk identification had the highest influence on project performance at 67.7%. Ahmed (2019) in a study on 'risk management and project performance of UNDP projects in construction projects in Somalia' found that a close relationship between risk identification, risk response and performance of construction projects in Mogadishu Somalia.

Nguru and Yusuf (2018) studied the effect of project risk management practices on performance of projects undertaken by consulting civil engineers in Nairobi County. A descriptive cross-sectional study design was adopted where 256 civil engineers in Nairobi County were targeted. The study found insignificant effect between risk identification and project performance. The study recommended enhancement of the risk identification process in order to strengthen the current practices as well as invest more on risk identification.

Njuguna (2019) in a study on risk management practices and project performance in Nairobi County on 135 project managers. The study found that there is a positive influence of risk control on project performance in Nairobi City County. This was mostly because the organization was found not to identify the risks that were associated with the projects, even if the organization slightly separated the risks from their sources and adequately responded to the defined risks as indicated in the risk management plan. Organizations used risk control mechanisms such as risk response, risk identification, risk segregation and the use of a risk management plan.

Risk Response and Performance of Projects

Njuguna (2019) examined the influence of risk management practices on performance of projects in Nairobi County. The study operationalized risk management practices in to risk retention, risk prevention, risk control, and risk transfer. The study targeted 135 respondents working in the construction firms that comprised of project managers, risk managers, supervisors, and finance officers. It was found that risk management practices significantly influenced performance of projects in Nairobi County. The study found that risk transfer had the highest significant influence on performance of projects in Nairobi County. It was mostly applied and embraced among the firms that implemented project in Nairobi County. Risk prevention also significantly influence performance of projects and its adoption by organizations implementing projects has enhanced the completion of projects within budget,

scope and time schedule. Risk control also had a significant influence on performance of projects. Finally, risk retention also significantly influences on performance of projects. The study recommended integration of risk management practices in project implementation to ensure enhanced performance.

Kamunya (2021) examined risk management strategies and performance of projects in Nairobi County Kenya. The study sought to establish the effect of risk sharing, risk reduction, risk retention, and risk reduction on the performance of NGOs projects in Nairobi County. A total of 110 projects were sampled. The study found that a strong relationship between risk management strategies and project performance. The study also concluded that project performance is dependent on the careful selection of the choice of the risk management strategies. Nturanu and Mundia (2019) assessed the effects of risk avoidance strategy on the success of construction projects in the judiciary at Narok county courts. The study targeted 60 employees form Narok county courts and descriptive survey design was adopted. The study found a weak correlation between risk avoidance strategy and construction project success. Though risk avoidance strategy is important in project management in this study it wasn't significant thus, there is no statistical relation between project success and risk avoidance.

RESEARCH METHODOLOGY

Research Design

The study adopted descriptive survey research design. According to Creswell & Creswell (2017) descriptive design points toward causal understanding and to the mechanisms behind causal relationships as it describes the situation understudy.

Target Population

The population for this study included 57 renewable energy projects in North Eastern Kenya as noted by MoE that entail Solar, and bio-energy (Energy and Petroleum Regulatory Autority, 2020). The study specifically focused on KOSAP where the activities involved include installation of stand-alone solar panels, clean cooking solutions for households, and stand-alone solar systems for solar water pumps for the community. The unit of observation was project managers from each of the 57 projects. The unit of observation was 232 respondents comprising of: 150 beneficiaries of the community facilities; and 15 representatives of the implementing agencies comprising of MoE, KPLC & REREC, project manager from 57 projects, and 10 project representatives from renewable energy companies.

Sampling

Yamane formula was used to determine the sample size where 147 respondents were drawn. Stratified sampling was used in categorizing respondents in different cohorts of project managers, from the renewable energy projects employees, community beneficiaries, and representatives from various government agencies. Random sampling was used in selecting the respondents from the various cohorts of project managers, community beneficiaries, implementing agencies representatives, and the renewable energy representatives since all had equal chances.

Data collection and Analysis

The research data was collected by the use of primary data through questionnaires using a nominal scale. The study also used mixed method of data collection and analysis by use of semi-structured questionnaires in order to make the data to be more meaningful in seeking answers to the various research questions. Both descriptive and inferential statistics were used to analyze the data using SPSS version 26.

RESEARCH FINDINGS & DISCUSSION

Response Rate

A total of 147 project representatives involved in renewable projects under KOSAP in the North Eastern region of Kenya where 123 were duly filled and returned giving a response rate of 83.7%.

Pilot Study

A 10% (15) of the entire sample size (147) was used. Pre-testing helped to detect deficiencies like unclear directions, insufficient space to write response, wrong phrasing of questions, vague questions etc. the study checked for validity and reliability. The Cronbach's alpha coefficients for the study variables were above 0.7 and thus, found to be reliable. As for validity expert judgement was used to determine content and face validity.

Descriptives Analysis

This study aimed to examine the influence of project risk management practice on performance of RE projects in the North Eastern region in Kenyan. A Likert scale was used where the responses were coded as follows: 1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly Disagree.

Risk Identification

The second objective of the study was determining the influence of project risk identification on performance of renewable energy projects in Kenya. The study had a composite mean of 3.54 and standard deviation of .761. The findings indicate an agreement on the various aspects of risk identification activities in relation to performance of renewable energy in Kenya. The standard deviation of .761 also indicates a minimal deviation of the responses from the mean of 3.38. Ayudhya and Kunishima (2019) described risk identification as the process of identifying the possible risks, characteristics and details of the risks. The objective is to identify the risks and take the necessary corrective and preventive measures to ensure they have minimal impact on the project and the project outcomes. The PMI (2017) contended that, risk identification is a team effort where individual risks for the projects, their sources, and their characteristics are identified and documented. There are various tools and techniques for identifying risks. These include: document review, information gathering techniques, checklist analysis, assumption analysis, and diagramming techniques.

From Table 1, the study established that during early phases of the project, the individual risks are identified. This was agreed by 60.2% of the respondents and the mean of 3.51 further indicated the agreement. On whether the risk identification is continuous process to ensure all risks associate with the projects are identified, 39.9% agreed while 39.9% disagreed. Thus, the respondents couldn't make a clear decision on the statement. The mean (3.00) indicates an average neutral response on the statement. Respondents however agreed that risks are categorized based on their source and impact the on the project objectives. This was agreed by 50.4% of the respondents. The mean (3.50) also clearly indicates agreement on the statement.

The respondents agreed that brainstorming for identifying the risk of the projects. This was affirmed by 60.1% of the respondents though the mean (3.30) indicates a neutral stance on the statement. Experts are also involved in the process of identification of risks as agreed by a majority of 80.5% of the respondents. The mean (4.11) indicates agreement of the respondents on the statement. Historical data is also used to identify similar risks to the project as agreed by 69.9% and further supported by the mean (3.90) which indicates agreement. The respondents also agreed that risks are categorized into organization, environment, technical, and financial risks. This was agreed by 50.4% and the mean (3.41) indicating a slight agreement. Lastly, 60.1% agrees on the presence of a list of all the possible risks in the project. The mean (3.61) further supported the agreement.

Table 1: Risk Identification

Risk Identification	SD %	D %	N %	A %	SA %	MEAN	STD
During early phases of the project, the individual risks are identified.	9.8	19.5	10.6	30.1	30.1	3.51	1.357
The risk identification is continuous process to ensure all risks associate with the projects are identified.	9.8	30.1	20.3	30.1	9.8	3.00	1.180
The risks are categorized based on their source and impact they have on the project objectives.	0	20.3	29.3	30.1	20.3	3.50	1.035
The organization uses brainstorming to identify the risk of the projects.	30.1	9.8	0	20.3	39.8	3.30	1.741
Experts are involved in the process of identification of risks	9.8	0	9.8	30.1	50.4	4.11	1.216
The organization relies on historical data to identify similar risks to the project	9.8	0	20.3	30.1	39.8	3.90	1.217
The risks are categorized into organization, environment, technical, and financial risks.	9.8	19.5	20.3	20.3	30.1	3.41	1.355
There is a list of all the possible risks in the project	0	19.5	20.3	39.8	20.3	3.61	1.021
Average Risk Identification						**3.54**	**.761**

In what ways does risk identification process affect the performance RE projects?

Respondents were asked on how risk identification process have affected the performance of renewable energy projects in Kenya. The respondents agreed that the objective of the risk identification process is to identify all the projects risks and ensure that corrective and preventive measures are taken and there is minimal impact on the project. The respondents explained that when risks are clearly identified using the various techniques, the there is a high probability of the risks will be dealt with. However, some respondents mentioned that it is not possible to identify all the risks in the project. They gave an example of Covid-19 that took the world by surprise and affected everyone. However, on the same, the respondents mentioned that organizations as well as projects have taken lesson from the Covid-19 pandemic and they are more prepared for the unknown risks.

Risk Response

The second objective of the study was to assess the influence of project risk response on performance of renewable energy projects in North Eastern Kenya. The study had a composite mean of 3.41 and standard deviation of .966. The findings indicate a slight agreement on the various aspects of risk response activities in relation to performance of renewable energy in Kenya. The standard deviation of .966 also indicates a minimal deviation of the responses from the mean of 3.41. The PMI (2017) describes the risk responses as the options, agreement of actions, and the strategies meant for addressing the project risk exposure and threating the individuals risks of the project. It is not possible to have quick solutions for eliminating all the risks to the project, some risks may be needed and others are strategically managed as the project rolls along. Therefore, it is of essence to development of action plans to reduce the risks (Doval, 2019).

From Table 2 below, the respondents agreed that the project has documented response strategies to the risk that are identified. This was agreed by 51.3% of the respondents. The mean (3.23) indicates that the respondents were neutral on that statement. There is also a risk response plan

in place to help reduce the exposure of the risks. This was greed by 50.4% of the respondents though the mean (3.01) indicates that on average the respondents were neutral on the statement. It was also agreed by 69.9% the renewable energy project retain the positive risks in order to provide opportunity to improve performance of the project. This was also supported by the mean (4.00). The respondents also affirmed that the project team accepts to deal with risks that do not have appropriate responses. This was agreed by 50.45 though the mean (3.11) indicates on average the respondents were neutral on the statement. The action plans are of importance in reducing risks as agreed by 50.4% and the mean (3.41) indicates slight agreement on the statement. There is allocation of risks to owners who is responsible for the responsive action. This was agreed by 50.4% and the mean (3.41) indicates slight agreement. The respondent agreed that there is project consultancy to ensure risks are transferred to other parties. This was agreed by 39.8% and the mean (3.20) indicates on the average the responses were neutral. Lastly, there contractual agreement with third parties to transfer renewable energy risks was agreed by 60.2% of the respondents and further supported by the mean (3.71) indicating agreement on the statement.

Table 2: Risk Response

Risk Response	SD %	D %	N %	A %	SA %	MEAN	STD
The project has documented response strategies to the risk that were identified	9.8	19.5	19.5	40.7	10.6	3.23	1.172
There is a risk response plan in place to help reduce the exposure of the risks.	30.1	9.8	9.8	30.1	20.3	3.01	1.550
The renewable energy projects retain the positive risks in order to provide opportunity to improve performance of the project.	0	9.8	20.3	30.1	39.8	4.00	1.000
The project team accepts to deal with risks that do not have an appropriate response	19.5	20.3	9.8	30.1	20.3	3.11	1.450
Action plans are of essence to reduce the risks.	9.8	19.5	20.3	20.3	30.1	3.41	1.355
Every risk identified is allocated an owner who is responsible for the responsive action.	9.8	9.8	30.1	30.1	20.3	3.41	1.201
There is project consultancy to ensure risks are transferred to other parties.	9.8	19.5	30.9	20.3	19.5	3.20	1.241
The organization ensures there is contractual agreement with third parties to transfer renewable energy risks	0	19.5	20.3	30.1	30.1	3.71	1.099
Average Risk Response						**3.41**	**.966**

How is the risk response process on the RE projects?

For the renewable energy projects, the respondents mentioned that the risk plan plays a key role in responding to the project risks. The risk plans are allocated to individuals responsible for responsive action. The agreed response action and the risk identified are all documented in the risk registers. Generally, the risk response plans are useful in eliminating the risks, decreasing their probability of occurrence, and also reduce the impact of the risks on the project objectives. the respondents also mentioned the strategies used in responding to the risks which include

reduction, avoidance, control, and transfer. Some respondents mentioned that most of the time the renewable energy projects use avoidance strategy which tends to be highly effective as this involves the elimination of the risk completely. When the risk cannot be eliminated then the reduction strategy is applied where the severity of the risks is reduced through change of operations. Respondents also mentioned transfer strategy where the responsibilities of dealing with the risks are given to third party. This was achieved through consultancy where other organizations were contracted to handle the risks.

Performance of Renewable Energy Projects

The general objective of this study will be to examine the influence of project risk management practices on performance of renewable energy projects in North Eastern Kenya. The study had a composite mean of 3.49 and standard deviation of .925. The findings indicate a slight agreement on the various aspects of project performance activities in renewable energy in Kenya. The standard deviation of .925 also indicates a minimal deviation of the responses form the mean of 3.49. Project performance can be measured and evaluated using a large number of performance indicators that could be related to various dimensions (groups) such as time, cost, quality, client satisfaction, client changes, business performance, health and safety Project performance can be defined as the capacity to achieve project goals within budget and time and maintain outcome of an intervention over time (Mensah, 2019). 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. Risk management enhances project performance through avoidance of: cost budget failure; meeting time and deadlines; and failure of meeting standards and quality. The gain from project risk management is not only for the project team but also for customers, end users, and clients of projects (Association for Project Management, 2018).

From table 3 below, respondents agreed that project risk management practices have enabled completion of projects within the budget. This was affirmed by 69.9% and the mean (3.89). however, the respondents couldn't agree on whether the project risk management practices have helped to minimize cost overrun or underrun risks. Only 39.8% agreed and 39.9% disagreed. Further the mean (3.10) indicates neutral agreement. Respondents also agreed that project risk management process has ensured quality products and services. This was agreed by 60.2% of the respondents and supported by the mean (3.51). The respondents also agreed that the project risk management practices have ensured minimal project delays. This was agreed by 50.4% of the respondents though the mean (3.00) indicates averagely the responses being neutral. The respondents also agreed that the projects have witnessed few risks due to effective risk management process. This was agreed by 50.4% and supported by the mean (3.50). Lastly, respondents agreed that project risk are easily dealt with at early stages due to effective project risk management practices. This was agreed by a majority of 70.7% and supported by the mean (3.92).

Table 3: Performance of renewable energy projects

Performance of Projects	SD %	D %	N %	A %	SA %	MEAN	STD
Project risk management practices enable completion of projects within the budget.	0	10.6	19.5	39.8	30.1	3.89	.957
Project risk management has helped to minimize cost overrun or underrun risks.	9.8	30.1	20.3	20.3	19.5	3.10	1.296
Project risk management process has ensured quality products and services.	9.8	19.5	10.6	30.1	30.1	3.51	1.357
The organization has minimized project delays due to project risk management process.	9.8	30.1	20.3	30.1	9.8	3.00	1.180
The projects have witnessed few risks due to effective risk management process	0	20.3	29.3	30.1	20.3	3.50	1.035
The organization is able to deal with projects risk easily as they identified at early stage	9.8	9.8	9.8	20.3	50.4	3.92	1.371
Average Performance of Projects						**3.49**	**.925**

Correlation Analysis

The correlation can also be explained based on being significant or insignificant. Pearson correlation (r) was used to explain the correlation as shown in Table 4 below.

Table Error! No text of specified style in document. **: Coefficient of Correlation**

Variables		Risk Identification	Risk Response
Performance of RE projects	r	.844**	.662**
	Sig.	.000	.000
	N	123	123

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

From Table 4 Risk identification was also found to be very strongly correlated (r =.844 <1) and also significantly (P-value = .000<.05) with performance of renewable energy projects in Kenya. Risk response was also found to be strongly correlated (r =.662 <1) and also significantly (P-value = .000<.05) with performance of renewable energy projects in Kenya.

Inferential Analysis

Regression analysis helps to understand how a typical value of a dependent variable or criterion variable changes when any one of the independent variables is varied, while the other independent variables are held constant.

Table 5: Regression Results

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	.342	.164		2.085	.038
Risk identification	1.158	.048	.985	23.904	.000
Risk response	.388	.094	.377	4.154	.000

a. Dependent Variable: Performance of RE projects

Risk identification has a direct (β = 1.158) relationship with performance of renewable energy projects. Thus, ana increase in risk Identification by 1.158 will lead to an increase in project performance by a unit. However, the relationship is significant since the p-value .000<.05 and t-statistic (23.904) > ± (1.979) further indicates the significance of the Risk Identification on performance of renewable energy projects. Thus, risk identification significantly influences performance of renewable energy projects in North Eastern region. The study also established a positive statistical relationship between risk identification and performance of renewable energy projects in North Eastern region. The standardized beta coefficient (Beta) also indicated the level of influence where risk identification had a positive significant (98.5%) influence on performance of renewable energy project (.985). It was also the variable with the highest influence on performance of renewable projects. Simon and Mutiso (2021) also found a significant influence between risk identification and performance of agricultural project in Nakuru county. The study found that by identifying the risks in the project, budgeting for the identified risks, breaking down the risk based on severity level, continuous identification of high-risk areas ensured proper identification of the agricultural project risks.

Risk response has a direct (β = .388) relationship with performance of renewable energy projects. Thus, an increase in Risk response by .388 will lead to an increase in project performance by a unit. However, the relationship is significant since the p-value .001<.05 and the t-statistic (-3.420) > ± (1.979) further indicates the significance of the Risk Response on performance of renewable energy projects. Risk response significantly influences performance of renewable energy projects in North Eastern region. The study also established a negative statistical relationship between risk analysis and performance of renewable energy projects in North Eastern region. The standardized beta coefficient (Beta) also indicated the level of influence where risk response had a negative significant (37.7%) influence on performance of renewable energy project (.377). It was also the variable with the third highest influence on performance of renewable projects. The findings are also supported by Oranga (2020) who found significant relationship between risk management strategies and urban housing project in Kenya. The study established that risk avoidance, risk control, risk retention, and risk transfer are key strategies for the delivery of housing projects in Kenya.

From the results in Table 5, risk identification and risk response significantly influence performance of renewable energy projects in Kenya as their p-values of 0.000 was less than 0.05. Risk identification has the highest influence by 98.5% followed by risk response at 37.7%. The regression model was fitted as below.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon \ldots\ldots\ldots \text{(i)}$$

Where;

Y = Performance of RE Projects

X_1 = Risk identification (RI)

X_2 = Risk response (RR)

The model can thus be fitted as follows:

$$Performance\ of\ RE\ projects = -.342 + 1.158RI + .388RR \ldots\ldots (ii)$$

CONCLUSION

The first objective was to determine the influence of project risk identification on performance of renewable energy projects in North Eastern Kenya. The study found risk identification to significantly influence performance of renewable energy projects in Kenya. Risk identification had the highest influence on performance of renewable energy projects in North Eastern region in Kenya. The study therefore concludes that risk identification has a significant influence on performance of projects. The fourth objective was to assess the influence of project risk response on performance of renewable energy projects in North Eastern Kenya. The study established a positive significant relationship between risk response and performance of renewable energy projects in Kenya. Risk response also a positive significant influence on

performance of renewable energy projects in Kenya. Risk response had the third highest influence on performance of renewable energy projects in Kenya. The study concludes that risk response significantly influences performance of renewable energy projects in North Eastern region in Kenya.

RECOMMENDATION

The study also established risk identification to significantly influence performance of renewable energy project in Kenya. The study therefore recommends a proper identification of risks in renewable energy projects. The project should use brainstorming, expert judgement, and historical data in identifying the risk of the projects. All the possible risks of the project should also be listed. Finally, risk response had a significant influence on performance of renewable energy projects in Kenya. The study recommends of having clear risk response measures and strategies to ensure the performance of project is not affected. The response strategies should be documented. The risk triggers should also be identified to deal with the risk. Lastly, the risk should be allocated to risk owners who are responsible for responsive actions and also ensure that all stakeholders are involved in coming up with risk responses for the project risks. The study also recommends similar studies to determine the variation in project performance. Similar study should also be done in other different environments such water projects, health projects and other energy sources.

REFERENCES

Abba, Z., Balta-Ozkan, N., & Hart, P. (2022). A holistic risk management framework for renewable energy investments. *Renewable and Sustainable Energy Reviews, 160*, 1-18.

Altran. (2018). *'Risk quantification and risk management in renewable energy projects'.* Altran GmbH& Co. KG.

Association for Project Management. (2018). *APM Body of Knowledge,* (6th ed.). Association for Project Management: Buckinghamshire.

Ayudhya, B. I., & Kunishima, M. (2019). Assessment of risk management for small resisdential projects in Thailand. *Procedia computer Science, 164*, 407-413.

Bergsma, A. (2020). *Bullet Dodging: A risk management handbook for ICT projects.* National Library of Australia.

Bhattacharyya, S., Palit, D., Sarangi, G., Srivastava, V., & Sharma, P. (2019). Solar PV mini-grids versus large-scale embedded PV generation: a case study of Uttar Pradesh (India). *Energy Pol, 128*, 36-44.

Donald, T., & Preston, L. (1995). The Stakeholder Theory of the Corporation: Concepts, Evidence and Implications. *Academy of Management Review, 20*, 66-67.

Doval, E. (2019). Risk management process in projects. *Review of general management, 30*(2), 97-113.

Economist Intelligence Unit . (2023). *Investor interest in Kenya's renewable energy sector rises*. Retrieved from https://www.eiu.com/n/: https://www.eiu.com/n/Investor interest in Kenya's renewable energy sector rises

Energy and Petroleum Regulatory Autority. (2020). *Renewable Energy in Kenya*. Retrieved from epra.go.ke

EPRA. (2022). *Solar Energy-Renewable Energy*. (E. &. Authority, Editor) Retrieved from EPRA.co.ke

IEA. (2019). *Energy access outlook 2017, from poverty to prosperity*. (f. p. International Energy Agency (IEA). Energy access outlook 2017, Editor) Retrieved from www.iea.org: https://www.iea.org/data-and-statistics?country=WORLD&fuel=Renewables%20and%20waste&indicator=RenewGenBySource

Kamunya, J. (2021). *'Risk Management Strategies and performance of in NGOs in Nairobi City County, Kenya'.* MBA in project management, Kenyatta University.

KNBS. (2019). *Kenya Population and Housing Census.* Nairobi: Kenya National Bureau Statistics.

KOSAP. (2017). *Social Assessment Report.* Nairobi: Norken International Ltd.

Koskela , L., & Howell, G. (2002). The theory of projectmanagement explanation to Novel methods . *Proceedings IGLC* (pp. 6-15). Gramado: IGLC.

Kunya, I. O., & Yusuf, M. (2023). 'Risk Management Practices and Performance of Renewable Energy Projects in Nairobi County'. *World Journal of Innovative Research, 14*(4), 41-49. doi:https://doi.org/10.31871/WJIR.14.4.14

Mensah, J. (2019). Sustainable development: Meaning, history principles, pillars, and implications for human action: Literature review. *Cogent Social Sciences*, 9-21.

MoE. (2020). *Kenya National Energy Efficiency and Conservation Strategy.* Nairobi: Ministry of Energy.

Nguru, S. M., & Yusuf, M. (2018). Effects of Project Risk Management Practices on performance of consulting civil engineering: a case of Nairobi county. *International Journal of Civil and Structural Engineering Research, 6*(1), 91-98.

Njuguna, P. G. (2019). *Risk mangment practices and performance of projects in Nairobi city county Kenya.* MBA in Project management, Kenyatta University.

Nturanu, J. N., & Mundia, M. (2019). 'Effect of risk avoidance strategy on the success of construction projects in the judiciary at Narok county courts'. *The Strategic Journal of Business & Change Management,, 6*(2), 2138-2147Ogunnaike, B., & Harmon , R. (1994). *Process Dynamics, Modeling, and Control.* New York:: Oxford University Press.

Otieno, F. S., & Mutiso, J. (2021). 'Infleunce of project risk management on performance of agricultural projects in Nakuru County, Kenya'. *International Research Journal Publishers, 2*(2), 371-387.

PMI. (2017). *A Guide to the Project Management Body of Knowledge: PMBOK Guide* (6th ed.). Newtown Square, PA: Project Management Institute, Inc.

Purdy, G. (2010). ISO 31000:2009 - setting a new standard for risk management perspective. *Risk Analyisis, 30,* 881–886.

Siang, L. C., & Ali, A. s. (2017). Implementation of risk management in the Malaysian constuction industry. *Journal of Surveying, Construction & Property, 3*(1), 1-15.

The WorldBank. (2020). *sustainable-development-goal-on-energy-sdg7-and-the-world-bank-group*. Retrieved from www.worldbank.org: https://www.worldbank.org/en/topic/energy/brief/sustainable-development-goal-on-energy-sdg7-and-the-world-bank-group

WorldBank. (2019). *North and North Eastern Development Initiative.* Nairobi: The WorldBank.

Zeng, S., Liu, Y., Liu, C., & Nan, X. (2017). . A review of renewable energy investment in the BRICS countries: history, models, problems and solutions. *Renew Sustain Energy Revie, 74*. Retrieved from https://doi.org/10.1016/j.rser.2017.03.016