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PROJECT MANAGEMENT RISK PRACTICES AND IMPLEMENTATION OF RENEWABLE ENERGY PROJECTS IN GEOTHERMAL WELLS IN OLKARIA NAKURU, KENYA

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ABSTRACT

Purpose: The main objective of this study was to examine the influence of Project Risk Management Practice on the implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru County, Kenya.

Methodology: This research was guided by a positivism paradigm as a research philosophy and adopted the descriptive research design since it utilizes elements for both the qualitative and quantitative in a study. the target population was 125 respondents and is comprising of the stakeholders in the geothermal industry ranging from the managers of drilling companies, the engineers, the rig operators, the community around the wells as well as government agencies involved in the drilling in Olkaria in Naivasha, Kenya. The study unit of observation was the 41 drilled wells currently in operation. A census was adopted as the sampling method across the population as most of the population across the industry is homogenous

Findings: The study found significant statistical evidence from the descriptive analysis to indicate the existence of Risk Management Planning influence implementation of renewable energy projects in geothermal wells in Olkaria Nakuru County. Risk Management Planning also had a positive significant influence on implementation of renewable energy projects in geothermal wells in Olkaria Nakuru County. Risk assessment was found to significantly influence implementation of renewable energy projects in geothermal wells in Olkaria Nakuru County by 0.365 or 36.5%. In addition, the findings indicated that risk assessment had a positive significant influence on implementation of renewable energy projects in geothermal wells in Olkaria Nakuru County.

Recommendations: renewable energy projects in geothermal wells in Olkaria Nakuru County should come have with well-structured document on how to conduct risk appraisals of all the projects before the commencement of the projects. The high-risk projects can either be avoided or mitigation measures put in place to address them from inception. Risk management function of renewable energy projects in geothermal wells in Olkaria Nakuru County is combined with internal audit function hence it lacks the independence to implement risk objectives effectively

Keywords: Project management practices, renewable energy projects, risk management planning, risk assessment

Background of the Study

According to Harichandan et al (2022), energy can never be created or destroyed but can only be converted from one form to the other. Energy whose source can never be depleted is said to be renewable while the energy whose sources get depleted with time is said to be non-renewable energy. Depending on the availability, different energy sources are considered before one chooses which specific form of energy to consider. Renewable energy sources include solar energy, wind energy, hydro energy, and even geothermal energy. These are the sources that can never run out due to an existing loop of activities. As long as we know, the sun will always rise and has always been rising, so this source of energy can never be depleted.

Geothermal energy is a form of heat energy that is stored in the earth's core. If this heat is transferred to the surface of the earth, it can be used to produce electricity and have other utilities such as heating. The heat can be used directly as it eases or can be tapped and used to produce geothermal electricity. Despite a lot of energy being available in the core, only a small portion of it has utility (Marzolf, 2014). Geothermal energy is environmentally friendly a hence is a great prospect for sorting out the energy shortage on the planet (Munoz et al. 2014).

In a study carried out by Mckenzie (2016), many pilot projects in geothermal production failed because of a lack of sufficient funds and poor projections. These led to stalling of projects and hence many nations shunned exploring these areas. In energy production, all countries are striving to go all green using renewable forms of energy, and as such geothermal energy is seen as one of the most convenient options to achieve this goal. As of 2022, Kenya was ranked at position seven by the international renewable energy agency's renewable energy statistics. Kenya currently has a geothermal production capacity of 863 MW with major Independent Power Producers (IPPs) coming into play the recent years to ensure that the country achieves its production potential.

In Kenya, geothermal exploration began in 1952(KPLC,2018) and was carried out by a consortium of different companies namely Babock and Wilcox ltd, the East African power and lighting company, and the power security corporation ltd. After the explorations, an agreement was made to build two wells in the Kenyan rift valley named well x1 and well x2 which were 950 meters and 1200 meters deep respectively. By June 1982, the wells had a capacity of 15 Mwe and this was commissioned as the OlKaria 1 unit 1 power plant. The drilling continued successfully and by the end of 1984, there were 33 wells whose production capacity stood at 45MWw. To date, there are about 300 drilled wells and the production capacity is at 836MWw. The geothermal potential fields have been divided into seven regions for ease of identification in the country. These are the Olkaria geothermal field, Eburu geothermal field, Menengai geothermal field, the Baringo project, Longonot geothermal field, barrier geothermal prospect, and akiraira geothermal prospects. KenGen is currently in charge of the wells and recently launched the Olkaria vi with an expected production capacity of 140 MW. The country is looking forward to having 2500 MW in production.

Statement of the Problem

Globally, there is a significant knowledge gap concerning the relationship between Project Risk Management practice and implementation of renewable energy projects. Several studies in the implementation of renewable energy projects in geothermal plants noted that a lack of proper risk management practice led to a halt in 70% of the drilling projects that had been undertaken in Columbia (Strober,2021). According to EPRA,75% of the geothermal wells currently active are situated in this region. Currently, the geothermal system in Olkaria supports approximately 790 MWe (installed capacity) with an additional ~ 250 MWe under development. The power plants are operated by KenGen and Orpower 4 Inc, (a subsidiary of Ormat Industries). In the last three years, over 10 wells have been drilled unsuccessfully in the area leading to massive financial burdens on the organizations (Nyandigisi, 2020).

The political move to have some government contracts with the IPP in the region also poses a risk of low turnover and hence has slowed down the exploration in the region. A report by the International Finance Corporation indicates that the social and political risks in the macroenvironment trickle down and the effects are felt in production. Risk management is an area that should be highly considered to ensure that the 2030 objectives are achieved. Therefore, it is against this background that this study seeks to establish the influence of risk management on the implementation of renewable energy projects in geothermal wells in Olkaria Nakuru, Kenya.

Objectives of the Study

The main objective of this study was to examine the influence of Project Risk Management Practice on the implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru County, Kenya

i. To examine the influence of Risk Management Planning on the implementation of renewable energy projects in geothermal wells in Olkaria Nakuru County, Kenya.
ii. To determine the influence of risk assessment on the implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru County, Kenya.

Theoretical Review

This section looks into the various theories that study variables. These theories explain how the variables relate to risk management and their roles in organizational setups.

Risk Management Theory

The risk management theory provides insights to the foundational concepts, the models as well as the techniques used to examine and understand the uncertainties that may occur and their impacts on organizations, individuals, or systems. The theory provides a framework that is well structured to assess the potential consequences and the likelihood of these occurrences. This helps facilitate informed decision making and implementation of proper risk management practice. The theory proposes different aspects pertaining risks such as the risk perception and attitudes; probabilistic models; decision making and risk management strategies, Risk management planning helps in setting up the guidelines on how the risks will be managed and highlights major areas such as context, scope and the criteria. Several key areas are emphasized within the risk management planning process. The aforementioned areas encompass the contextual framework within which risks are recognized and mitigated, the extent of risk management endeavors, and the standards employed to assess and rank risks. The implementation of guidelines and frameworks for risk management is crucial in fostering organizational cohesion and addressing potential risks in an efficient manner. (citation needed)

Theory of Risk Assessment

The theory of risk assessment was put forward by Boyer and Nyce in 2011. According to the theory, assessing risks identify the risks, determine their probability of occurring as well as reduce their impacts by spreading them across different sections. To support this Luganda (2019) put forward an analogy that perceived risk as a force that needed to be neutralized. The risk might be an opportunity that when shared across may be easier to exploit. The theory supports the perception that risk assessment influences the implementation of renewable energy projects in geothermal wells. When an opportunity is identified in the geothermal areas, it should be well exploited to ensure maximum production efficiency. The theory of risk assessment pertains to geothermal energy projects by highlighting the importance of identifying and analyzing potential risks that could potentially affect the efficiency of production. Through the implementation of a thorough risk assessment, project managers can acquire valuable insights pertaining to the likelihood and potential consequences associated with diverse risks. This allows individuals to formulate strategies to effectively manage or capitalize on risks as appropriate. For example, in the context of a geothermal energy project, the identification of a

technical risk, such as equipment failure, may prompt the risk assessment process to initiate the adoption of preventive maintenance plans or the investigation of alternative technologies as measures to mitigate the potential impact of the risk.

Conceptual framework

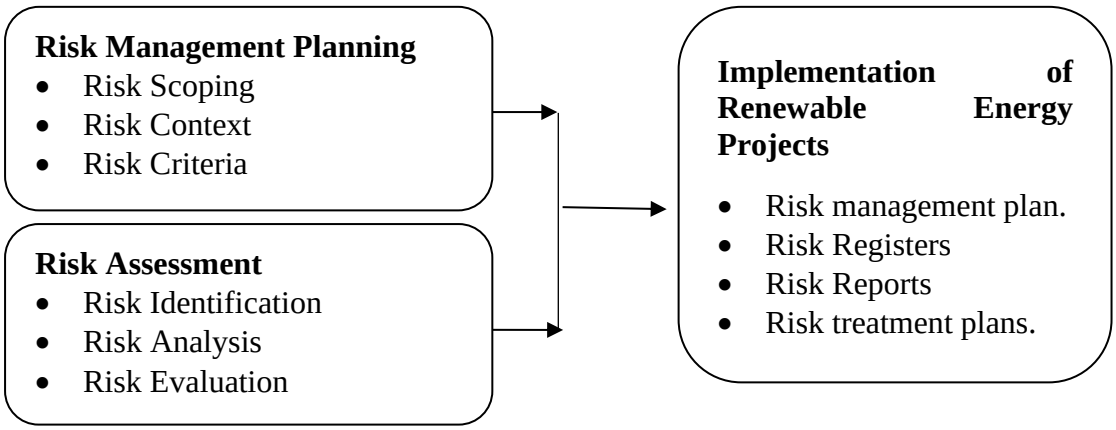

Figure 1: Conceptual Framework

Risk Management Planning

The risk management strategy outlines how the project's risk-related activities will be carried out, according to PMI (2017). It addresses the strategy, methodology, and implementation of risk management practices. The project management plan's risk management plan outlines the structure and methods for carrying out risk management tasks. A risk strategy, methodology, funding, scheduling, roles and responsibilities, risk categories, stakeholder risk appetite, definitions of risk likelihood and affects, probability and impact matrix, reporting formats, and tracking are all included in the risk management plan (PMI, 2017). A detailed document is created during risk management planning to outline the project team's methodology for handling risk management tasks. The purpose of this approach is to commit to a defined risk management plan and to inform different stakeholders about the risks. While it is less likely to fail if done extensively, this stage is not essential for guaranteeing project success. This step needs to be started when project planning is finalized and finished before the project is launched. Rahman (2018).

Prior to starting the risk management processes, a plan for risk management is created. This document, which lays out the risk management procedure and the strategic requirements, is created at the start of the project (PMI, 2017). In order to take appropriate action in producing tendering expenses, a risk management plan may occasionally be prepared during the estimating or tendering stage. The risk management strategy lays out the report type, frequency, and content as well as the roles of the various risk owners and the effect and probability criteria in terms of time, money, quality, and performance from both a quantitative and qualitative standpoint. The general introduction, project description, risk response, tools and methodologies, risk reports, and appendices are all included in the risk management plan. The risk management plan for a project should adhere to a specified although each project needs a customized version to address anticipated hazards and project-specific objectives, plans should generally adhere to a predetermined template for familiarity (Lester, 2017).

Risk Assessment

Every potential risk that could have an impact on the project is anticipated and then grouped according to its features. The goal of risk identification is to provide information about potential hazards, including their characteristics and specifics. To gather information regarding the risks, the procedure makes use of brainstorming sessions, interviews, SWOT analyses, and prior records (Lester, 2017). Risk identification is a collaborative process in which all aspects of the

project scope specification, as outlined in the contract or work breakdown structure, are scrutinized and analyzed to identify potential risks (PMI, 2017). The project hazards may be identified with the assistance of expert advice. The hazards can be divided into four primary categories: dangers related to the environment, technology, finances, and organizations. Even if some dangers may fit into more than one category, the risks can be further explored to widen their categories. Every risk that has been identified has a risk owner. Given the length of the risk list, specific screening criteria may be applied to further refine the risks, which is a step in the risk assessment process (Lester, 2017).

The goal of risk management is to recognize hazards and implement corrective and preventive actions to lessen their effects. Depending on the project's nature, there are many risk categories, including technical, social, financial, market, and business. Risk might originate from internal or external sources (Ayudhya & Kunishima, 2019). hazards unrelated to management, like as exchange rates, interest rates, and political situations, are included in the category of external hazards. Failure or data infringement are examples of internal risks (Faiz, 2020). Project risks are primarily divided into three categories, according to a PMI (2017): schedule, expenses, and performance. The schedule, budget, and performance of the project are eventually impacted by the various categories of risks that are present in projects, including legal, strategic, operational, and market risks. Postponing the project risks are another type of project risk that arises from unfinished or failed projects, as well as from the previously listed sources of schedule, cost, and performance (Iman & Borimnejad, 2017).

Implementation of Renewable Energy projects

According to Lehman (2016), one of the key indicators of success in any project is its ability to meet the production threshold that is expected of it and do that while maintaining the expected quality standards. Productivity is measured by dividing the output by the input and this is used to check the utilization of resources in doing the production. To improve productivity, quality improvement must be done to ensure the processes have less waste. A study done by Hayes and Clark (1986) shows a great improvement in the production levels in the companies that focused on improving their quality processes. Improved productivity will lead to cost leadership, which is one of the most efficient tactics in strategic management.

Empirical Review

This section deals with secondary literature and past studies of the constructs that were investigated in this study.

Risk Management Planning

Risk Management planning can be defined as the process of setting up the ground rules to guide the team in their risk management Endeavor. It is also a strategy used to ensure that all the opportunities in a project are well exploited. In risk management planning, the identified risks should be tracked throughout the project while being ready for any emerging risks. Risk mitigation as a strategy is also used to ensure that the probability of a risk occurring is low and this can be done through many different predictive measures. In the occurrence of a risk, the manager can opt to accept the risk, avoid the risk, transfer the risk or look for ways to reduce the risk (Dobson, 2015). In risk mitigation, risk acceptance does not help reduce the impact and effects of the risk but helps the project manager to be well prepared and aware of the occurrence of the risk and its probable impact. This is a strategy used when using other risk management processes that may be expensive and overboard. This can also be used for risks that are considered minor and whose impact is not very detrimental to the final project. Risk acceptance is considered a strategy as it provides advanced preparedness for the different risks and hence when the risks occur one is in a better position to handle them. Risk avoidance is the other ultimate strategy that will ensure that the risks that may stall the project or have great impacts are avoided if that can be done. This is considered the most expensive mode of risk mitigation (PMI, 2019).

Risk transfer is another risk mitigation strategy that involves moving the risks from the actual party affected into the hands of a willing third party. A risk could be transferred to an insurance company or even a premiums institution. Risk transfer helps reduce the damage that the risk might have caused in the future. This is an expensive strategy but helps in providing the needed working confidence by reducing the pressure of having to account for the risk. According to Doval (2019), risk transfer is effective as it provides psychological freedom to the parties involved in other project issues. Risk reduction can also be paired with risk transfer to ensure the number of consequent risks in a project that can occur is reduced to a minimum. Risk mitigation in project management is a skill that every project manager should have in their camp. Risks are prone to occur and without the necessary skills to handle the risks every aspect of the project may go wrong. One should be aware of the available measures to take and from the available measures they should choose the best fit for every project. In large projects, the risk management plan provides a standard procedure to identify, classify and even handle the risks. In smaller projects, the risks can be handled using given guidelines from previous similar projects (Kloppenborg, 2017).

Risk Assessment

Risk assessment is a technique that is used to help identify potential risk situations and look at the qualitative and the quantitative natures of the risks PMBOK (2017). This involves the redistribution of the risk events so that the risk impacts may be spread out. Huge increases in the impact of the occurring risks might reduce the confidence levels of the parties who are undertaking the risks and hence a shared-out risk ensures that less impact befalls the parties. The safety net created is important in ensuring that the parties involved have a way out in case the probability of the risk occurring is high and its impact might affect the overall outcome. To share risk among different parties, different considerations should be made in advance so that a reasonable risk-sharing formula is given. The risk distribution motive must be clear, and the benefits should be equally spread among all parties. Risk sharing allows parties that are reluctant to take risks to be able to accommodate the risks as their impacts are cushioned. Increased levels of risk sharing also help redistribute the inequalities that may occur among the different stakeholders involved in a project. A great example is sharing the burden of risks through car insurance premiums with the insurance cover providers helps reduce the burden on an individual in case the risk occurs (Cawley and Ruhm,2011).

According to Chaudhuri (2018), different factors affect the ability of an individual to distribute or share risks. These factors include the group commitment, the group size individual risk profile, prior risk experience, and nature of interactions. One party would be willing to share risk with another party in the scenario that they have built a relationship prior and hence can trust each other. Depending on the nature of the relationships, the parties involved can easily identify proper risk-sharing methods that will ensure optimum results for all the involved participants. Different types of risks will require different risk-sharing formulas depending on whether the risk is endogenous or exogenous. In endogenous risks, the risk sharing is done inside the risk occurrence perimeter and any third party will likely approach the risk adversely. Risk exposure is another very big factor that influences how vulnerable an individual will be to facing risks and this also will help determine their ability to share out the risks. Internal risks are easier to control and predict and hence can be easily shared out as compared to external risks whose nature of occurrence will be purely dependent on some other external factors (Attanasio et al. 2017). A collection of empirical evidence demonstrates that, in contrast to the normal assumption that many agents investigate their self-interests, a good number of individuals show a great concern for others (Sobel, 2018) Many individuals are willing to support redistribution even for the less fortunate even if the redistribution comes at a cost that they are required to offset (Fong 2018).

Research Methodology

This research was guided by a positivism paradigm as it is a strategy well rooted in the ontological principle (Sekaran & Bougie, 2010). In this approach, the phenomena being investigated should be relatively stable and have a factual basis for the accounts of the findings. This study adopted the descriptive research design since it utilizes elements for both the qualitative and quantitative in a study. In the research, our unit of analysis was based on production success in megawatts for the wells as well as completion rates. This design involves the collection of qualitative data and quantifying it in numerical forms (Cooper & Schindler, 2014). In this study, the target population was 125 respondents and is comprising of the stakeholders in the geothermal industry ranging from the managers of drilling companies, the engineers, the rig operators, the community around the wells as well as government agencies involved in the drilling in Olkaria in Naivasha, Kenya. The study unit of observation was the 41 drilled wells currently in operation. The unit of analysis was 125 respondents working in the wells. For this study, census was adopted as the sampling method across the population as most of the population across the industry is homogenous. A cross-sectional survey was undertaken of 100 respondents was the observation unit. A populace survey stands out as it enables the researcher to investigate and obtain information from small groups of people less than 200 (Samantha, Ken & Scott, 2017).

Research Findings

The study administered 125 questionnaires for data collection. A total of 102 were duly filled and returned representing a response rate of 81.6%.

Descriptive Statistics

Risk Management Planning

The first objective of the study was to examine the influence of Risk Management Planning on the implementation of renewable energy projects in geothermal wells in Olkaria Nakuru County. The study also was guided by the research question ‘What is the influence of risk management planning on the implementation of renewable energy in geothermal wells in Olkaria,Nakuru county ?’ From table 1 below the study found that Risk Management Planning on the implementation of renewable energy projects in geothermal wells in Olkaria Nakuru County (M = 3.38, SD = 1.12).

Table 1: Risk Management Planning

Risk Management Planning Indicators	Mean	Std Dev
The company carries out risk management planning before initiating projects	3.03	1.21
The risk management process impacts the final project management process	2.90	1.10
The firm assesses the geological risks involved in geothermal projects, such as reservoir quality and stability?	3.33	1.32
Do you employ to mitigate the risks associated with drilling and well construction in geothermal projects?	3.34	1.33
The firm identifies and manage risks related to resource depletion or decline in geothermal reservoirs over time?	3.14	1.19
The firm has contingency plans in place to address unexpected changes in geothermal resource availability or quality?	3.55	1.04
The firms benchmark its risk management practice against best practice	4.47	.50
The firm ensures the safety of personnel and equipment during geothermal drilling and operations, considering the unique challenges of geothermal sites?	3.52	1.34
The firm incorporates risk monitoring and control mechanisms throughout the lifecycle of a geothermal project, from exploration to operations	3.15	1.06
Average Risk Management Planning	**3.38**	**1.12**

The findings from Table 1 revealed that the firms benchmark its risk management practice against best practice (M = 4.47, Sd = 0.50). The firm has contingency plans in place to address unexpected changes in geothermal resource availability or quality? (M = 3.55, Sd = 1.04). The firm ensures the safety of personnel and equipment during geothermal drilling and operations, considering the unique challenges of geothermal sites? (M= 3.52, Sd = 1.34). Do you employ to mitigate the risks associated with drilling and well construction in geothermal projects? (M= 3.34, Sd = 1.33). The firm assesses the geological risks involved in geothermal projects, such as reservoir quality and stability. (M= 3.33, Sd= 1.32).

Risk Management Planning can be described as a strategy that is used to identify and to reduce the negative impact of risks on a project. It is also a strategy used to ensure that all the opportunities in a project are well exploited. In risk mitigation, the identified risks should be tracked throughout the project while being ready for any emerging risks. Risk mitigation as a strategy is also used to ensure that the probability of a risk occurring is low and this can be done through many different predictive measures. In the occurrence of a risk, the manager can opt to accept the risk, avoid the risk, transfer the risk or look for ways to reduce the risk (Dobson, 2015).

Risk Assessment

The second specific objective was to determine the influence of risk assessment on the implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru, Kenya. The study was also guided by the research question 'What is the influence of risk assessment on the implementation of renewable energy in geothermal wells in Olkaria, Nakuru county? From Table 2 the study found evidence risk assessment influence implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru, Kenya (M = 2.71, Sd = 1.06).

Table 2: Risk Assessment

Risk Assessment Indicators	**Mean**	**Std Dev**
The firm identifies and assesses the geological risks associated with geothermal energy projects, such as seismic activity or volcanic hazards?	3.20	1.12
The company assesses the risks related to drilling and well construction in geothermal projects, considering factors like wellbore stability and casing integrity?	3.62	1.27
The company evaluates the risks associated with fluid production and reinjection in geothermal reservoirs, including considerations for reservoir pressure management	3.46	1.26
The company incorporates stakeholder perspectives and concerns into the risk assessment process for geothermal energy projects and addresses social risks and community impacts	1.87	.91
The company assesses the risks associated with regulatory and policy changes that may impact the development and operation of geothermal energy projects	1.87	.86
The Company evaluates and mitigates the risks associated with geothermal surface facilities, such as power plants or transmission infrastructure?	2.43	.72
The company assesses the risks of geothermal reservoir performance decline over time, and the risk mitigation measures	2.56	1.29
Average Risk Assessment	**2.71**	**1.06**

From Table 2, the study found that the company assesses the risks related to drilling and well construction in geothermal projects, considering factors like wellbore stability and casing integrity? (M = 3.62, Sd = 1.27). The company evaluates the risks associated with fluid production and reinjection in geothermal reservoirs, including considerations for reservoir pressure management (M = 3.46, Sd = 1.26). The firm identifies and assesses the geological risks associated with geothermal energy projects, such as seismic activity or volcanic hazards

(M = 3.20, Sd = 1.12). The company assesses the risks of geothermal reservoir performance decline over time, and the risk mitigation measures (M = 2.56, Sd = 1.29). The Company evaluates and mitigates the risks associated with geothermal surface facilities, such as power plants or transmission infrastructure (M = 2.43, 0.72).

Risk assessment is a technique that is used to help identify potential risk situations and look at the qualitative and the quantitative natures of the risks PMBOK (2017). This involves the redistribution of the risk events so that the risk impacts may be spread out. Huge increases in the impact of the occurring risks might reduce the confidence levels of the parties who are undertaking the risks and hence a shared-out risk ensures that less impact befalls the parties. The safety net created is important in ensuring that the parties involved have a way out in case the probability of the risk occurring is high and its impact might affect the overall outcome.

Implementation of Renewable Energy Projects

The main objective of the study was to examine the influence of Project Risk Management Practice on the implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru, Kenya. The descriptive statistics aimed and describing implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru, Kenya. The findings from Table 3 established that to some extent project risk management practice influence implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru, Kenya (M = 2.95, Sd = 1.08).

Table 3: Implementation of Renewable Energy Projects

Implementation of Renewable Energy Projects	**Mean**	**Std Dev**
The company has a well-defined and documented risk management plan	1.87	.86
The companies risk management plan has well defined objectives and goals	2.43	.72
The risk management plan has well defined risk treatment methodology	2.56	1.29
The risk management plan is often reviewed and updated.	2.77	1.12
The risk management plan is often evaluated to check its effectiveness and make the necessary improvements	3.66	1.31
The organization has in place well defined risk metrics	2.16	.63
The company often collects and analyzes the risk metrics	3.66	1.31
The company has benchmarks and thresholds for the risk metrics	3.02	1.28
The risk metrics in place are effective and useful in risk monitoring	3.03	1.21
The company has mechanisms in place to ensure the accuracy of the risk metrics used	2.90	1.10
The organization has in place risk mitigation strategies well defined and documented	3.33	1.32
The organization has clearly defined the criteria for selecting the risk mitigation strategies	3.34	1.33
The risk mitigation strategies identified are effective in addressing the risk scenarios	3.14	1.19
The organization has in place measures to evaluate the cost effectiveness of risk mitigation measures	3.55	1.04
The organization communicates clearly on the risk mitigation progress to the relevant stakeholder.	3.03	1.21
set specifications.		
Average Implementation of Renewable Energy Projects	**2.96**	**1.13**

From Table 3 above, the study found that; The risk management plan is often evaluated to check its effectiveness and make the necessary improvements (M = 3.66, Sd = 1.31). The risk management plan is often evaluated to check its effectiveness and make the necessary improvements (M = 3.66, Sd = 1.31). The organization has in place measures to evaluate the cost effectiveness of risk mitigation measures (M = 3.55, Sd = 1.04). The organization has in

place risk mitigation strategies well defined and documented (M = 3.33, Sd = 1.32). The risk management plan is often reviewed and updated (M = 2.77, Sd = 1.12).

Inferential Statistics

The study conducted inferential analysis to determine the relationship between the independent variables and the dependent variables. They include regression, analysis of variance, and correlation analysis.

Correlation Analysis

Pearson correlation (*r)* was used to show the relationship between project risk management practices and implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru, Kenya.

Table 4: Coefficient of Correlation

Variables		Risk Planning	Risk Assessment
Implementation of renewable energy Projects	Pearson Correlation	.779**	.805**
	Sig. (2-tailed)	.000	.000
	N	107	107

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

Table 4 shows a correlation (r = 0.779; p<0.001) between Risk Management Planning and implementation of renewable energy Projects. This implies that the Risk Management Planning is positively correlated to the implementation of renewable energy Projects in Kenya. In addition, the correlation between these two variables was significant, that is p<0.5 implying a linear relationship between Risk Management Planning and implementation of renewable energy Projects. There is a direct association between Risk Management Planning and implementation of renewable energy Projects. There is a positive, significant, and weak correlation (r = 0.805; p<0.000) between risk assessment and implementation of renewable energy Projects. This implies that the risk assessment is positively correlated to implementation of renewable energy Projects. In addition, the correlation between these two variables was significant, that is p<0.5 implying a linear relationship between risk assessment and implementation of renewable energy Projects.

Regression Analysis

Further, the study ran the procedure of obtaining the regression coefficients, and the results were as shown on Table 5. The coefficients or beta weights for each variable allows the researcher to relative importance comparatively of the implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru, Kenya.

Table 5: Regression Results

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	B		
1	(Constant)	.215	.120		1.793	.076
	Risk Management Planning	.320	.086	.419	3.735	.000
	Risk Assessment	.365	.087	.476	4.199	.000

Findings in Table 5 showed that planning had coefficients of estimate which was significant basing on β_1 = 0.320 (p-value = 0.000 < 0.05). Also, the influence of Risk Management

Planning is more than the effect attributed to the error and supported by the t-critical =3.735 at a 5 per cent level of significance. Risk Management Planning influences performance by 0. 320 or 32%, thus we conclude that planning significantly influences implementation of renewable energy Projects. The findings also concur with Doval (2018) risk transfer is effective as it provides psychological freedom to the parties involved in other project issues. Risk reduction can also be paired with risk transfer to ensure the number of consequent risks in a project that can occur is reduced to a minimum.

In addition, the findings indicate that risk Assessment had coefficients of estimate which was significant basing on $\beta_2 = 0.365$ (p-value = 0.000 < 0.05). Also, the risk Assessment is more than the effect attributed to the error and supported by the t values where t calculated= 4.199 at a 5 per cent level of significance, thus we conclude that risk Assessment significantly influences implementation of renewable energy Projects by 0.365 or 36.5%. The findings are also supported by a study done by Chaudhuri (2018), different factors affect the ability of an individual to distribute or share risks. These factors include the group commitment, the group size individual risk profile, prior risk experience, and nature of interactions. One party would be willing to share risk with another party in the scenario that they have built a relationship prior and hence can trust each other. Depending on the nature of the relationships, the parties involved can easily identify proper risk-sharing methods that will ensure optimum results for all the involved participants.

The model can be fitted as below:

$$\gamma = .215 + .320X_1 + .365X_2 \ldots\ldots\ldots\ldots\ldots \text{(i)}$$

Conclusion

The first objective of the study was to examine the influence of Risk Management Planning on the implementation of renewable energy projects in geothermal wells in Olkaria Nakuru County. The study concludes that Risk Management Planning has a significant positive correlation with implementation of renewable energy projects in geothermal wells in Olkaria Nakuru County. Risk Management Planning also has a positive significant influence on implementation of renewable energy projects in geothermal wells in Olkaria Nakuru County. The second specific objective was to determine the influence of risk assessment on the implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru, Kenya. The study concludes that risk assessment has positive significant association with implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru, Kenya. The study also concludes that risk assessment has a positive significant influence on implementation of renewable energy Projects in geothermal wells in Olkaria Nakuru, Kenya.

Recommendations

The study revealed that there is poor culture of accepting projects with very high risks. As a remedy renewable energy projects in geothermal wells in Olkaria Nakuru County should come have with well-structured document on how to conduct risk appraisals of all the projects before the commencement of the projects. The high-risk projects can either be avoided or mitigation measures put in place to address them from inception. Risk management function of renewable energy projects in geothermal wells in Olkaria Nakuru County is combined with internal audit function hence it lacks the independence to implement risk objectives effectively.

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