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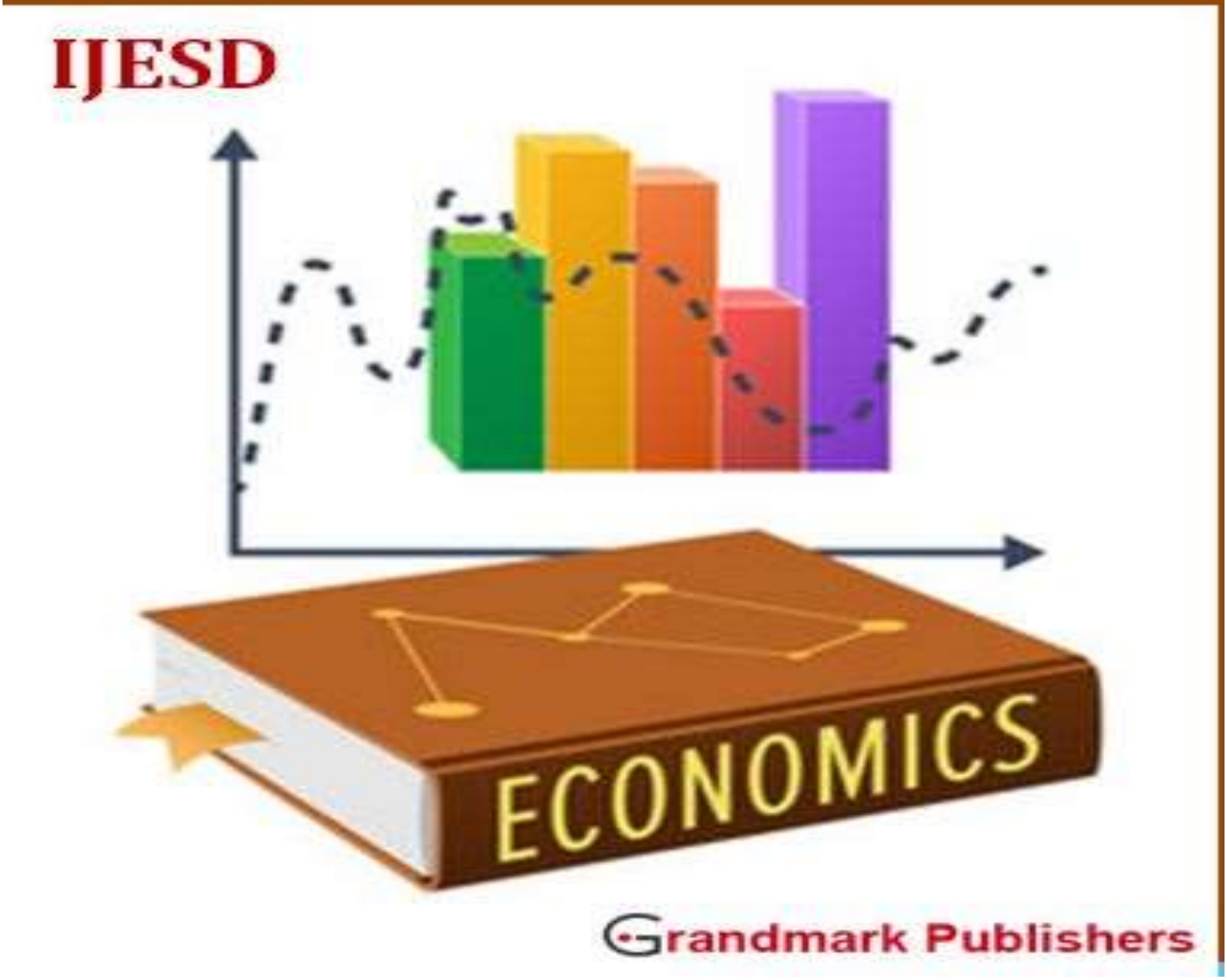

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2021

Grandmark Publishers

International Journal of Economic and Sustainable Development
ISSN:2314-2896
Volume 2, Issue 1, pg. 115-133, 2021:https://grandmarkpublishers.com

DETERMINANTS OF SUSTAINABILITY OF WATER PROJECTS IN MURANG'A COUNTY, KENYA

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Abstract

Most water projects have been initiated and not completed within agreed timelines; costs are mostly inflated, and technical requirements not obeyed and hence most of the projects are not sustainable over the long term. Specifically, in Murang'a County, despite numerous efforts to develop the area through creation of projects, lack of project sustainability has been hampered by lack of accessible water sources. Though several water project plans have been set up in the area, it still continues to experience increased scarcity of water which further worsens the living conditions. The main objective of the study was to determine the determinants of sustainability of water projects in Murang'a County. The study specific objectives were to determine the influence of project team competencies on sustainability of water projects in Murang'a County and to assess the influence of project financing on sustainability of water projects in Murang'a County. The project was steered by the Demings theory and Resource Based View Theory. The study used the descriptive research design in conducting the study and population comprised of all water projects undertaken by Muranga Water and Sanitation Company (MUWASCO). Both primary and secondary means was used in data collection. The data collected was edited and coded using Statistical Package for Social Sciences (SPSS). The study used descriptive and inferential statistics for analysis. Inferential techniques of correlation and regression analysis adopted at 5% significance level. The study findings were presented through table's charts and Figures. The study findings were presented through table's charts and Figures. A good response rate of 86.4% was witnessed and all the four variables met the reliability threshold of 0.7. Inferential statistics was used to make predictions or inferences about the population from observations and analyses. The study findings indicated that the two variables that is project team competencies and project financing positively and significantly affect sustainability of water projects in Muranga County.

Key Words: *sustainability, team competencies, project financing*

Background of the Study

It has been observed for long time that life of human beings relies on the availability of natural resource base and the fulfilment of the needs of human beings are critically contributed by human nature. The availability of this kind of knowledge has led to understanding the relationship between human nature from a different perspective. There is already significant pressure on the water resources on planet earth as indicated by depletion and pollution of aquifers and degradation of wetlands and this pressure is expected to go high in the coming days due to growth of human populations and anticipation of increased economic growth and climate change (Connor, 2012).

Nevertheless, in Kenya the scarcity of water is still the number one ranking issue (Chepyegon, & Kamiya, 2018). Sustainable Development Goal (SDG) 6 makes sure that water and sanitation is available and managed well. According to UN (2019), globally people who cannot access facilitated clean water are around 2.1 billion and sanitation services lacks among 4.5 billion people, in every five years its recorded that 340,000 children who are below five years die annually from diarrhoea related maladies, water scarcity already out of 10 people affects four, considering the natural disasters 90% are related to

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ISSN:2314-2896
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water and 80% of dirty water gets back into the ecosystem without any treatment or recycling. The SDGs have brought in a different focus on service delivery and sustainability unlike Millennium Development Goals (MDGs) which has been focussing on access and infrastructure delivery thereby setting higher and broader expectations (WASREB, 2018).

Looking at the case of Maragua constituency, in Muranga County, it was once well-watered with streams, major rivers passing through the major wards but has since dried up over time. The area is slowly turning to semi-arid with little agricultural activities taking place. Unpredictable weather patterns and harsh climatic conditions being experienced as a result of global warming are in no doubt big contributors to the suffering being experienced in the region (Ndung'u, 2016). Attempts to improve the conditions of the area through water projects have proved futile which drifts the attention to the implementation process of these projects.

Changing constraints, sudden events, increasing requirements and fluctuating resource flows are part of projects implementation. Local participation and management are also presumed to be instrumental for sustainable water resources (Dube 2012, Kamruzzaman et al. 2013). There are many benefits of these water projects, understanding the factors that determine sustainability and implementation process is imperative and this proposed study aimed at shedding more light into this.

Increasing the proportion of accessing water which is safe for drinking and sanitation in the world forms part of the seventh Millennium Development Goal (United Nations, 2010).Despite the fact that there is significant progress in the international community on water access and sanitation there is still little success in rural areas as compared to town areas (United Nations, 2011).

While the GDP has risen at an average of 3.5% from 1960 to 2012 (World Economics, 2014) much of the growth has come at a cost socially and environmentally. Population, urbanization, industrialization and increase in production as well as consumption have generated increasing demands for fresh water resources. Global demand for water is expected to increase in all sectors (WWAP, 2012) and by 2030 the world is projected to experience water deficit of 40%.

Worldwide nearly three billion people depend on groundwater resources to satisfy their daily water needs, and millions of farmers use ground water to sustain their livelihoods as well as contribute to food security (UNESCO, 2012). According to Gleeson et al., 2012, underground water aquifers are being over-exploited with supplies diminishing at an estimated rate of 20% leading to serious consequences of saltwater intrusion in coastal areas (USGS, 2013).

Our natural resources are burdened with the demands of a growing world population and the need for clean water. In addition, most developing countries are increasing the rate of water consumption making water security one of an unrelenting issue. It is very necessary to look at the impact when the availability of water for irrigation, crop production and also in wide range of use in rural livelihood agricultural communities in order to address the poverty problem reduction.

According to (UNECE/OECD, 2014) coordination at different levels on national river basin and sub-basin joint planning is important for sustainable management of water resources. There is a strong believe among many scientists that the areas fed by rains and natural wetlands have a potential for productivity benefits in the coming days. Scientists have proved that most technologies related to harvesting water and irrigation hold a potential for increased crop output. The challenge is how the farmers adopt them as the risk and costs seem to be high as compared to the gains. Globally, agriculture consumes 70% of available freshwater resources used in irrigated systems and is inefficient and environmentally unsustainable (USAID, 2014).

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If we do a comparison between Northern Africa countries and Sub-Saharan Africa, the levels of progress towards MDGs on water differs. North Africa is close to meeting the set target of 94% with coverage of 94%. In Sub-Saharan Africa 40% of the total population of 783 million cannot access clean drinking.

If data is collected from 35 countries in Sub-Saharan Africa and analysing it shows a significant difference between the poor and the rich populations. Statistics indicate that in urban areas rich families use 90% of clean water with piped water used by around 60% in their houses as compared to non-existent of piped-in water in 40% of households in rural areas. African Ministers Council on Water was created purposely to advocate on matters related to water and sanitation since it's crucial for social and economic growth. The key objective of the council was to mobilize countries and all stakeholders to address in the best way possible the water challenges in Africa (Amani, 2015). In 2010, Mauritania had 52% of people living in the urban area accessing improved water which was the lowest share as compared to countries like Egypt, Mauritius, Niger, and Seychelles which had a 100% share of access to water in urban population (UNICEF/WHO, 2012).

Whereas, in sub-Saharan Africa irrigation contribute 5% to cereal grain production. Many lands are affected by lack of water for irrigation, loss of wetlands to water depletion and pollution and emerging water-borne diseases (Hofisi, 2013). Quality of water may have more impact on human health than quality water. However, water quality keeps declining because of pollution. According to (USAID, 2014), two-thirds of the world's population is likely to be under severe water stress conditions which would adversely communities and ecosystems especially in developing countries. This underscores the importance of managing scarce freshwater resources that human life is so much dependent on.

In Kenya the renewable water resources are not adequate to meet the needs of Kenya according to Mekonnen *et al.* (2011). This is the starting point of Kenya's vision 2030. According to Knoema, 2016, renewable water resources per capita of Kenya have declined from 2,541 to 617.7 cubic meters from 1972 to 2017 per year. Kenya is ranked 109 out of 172 on cubic kilometres of renewable water. Countries like Russia, Brazil, USA, Canada, and China are listed as top five (World Factbook, 2015). Kenya therefore, needs to figure out how to improve cubic kilometre of renewable water surface area for water to refill naturally.

The government in 1974 came up with an aggressive and ambitious Water Act of 1974 hoping that they availed water to a nearest point that all households can access by 2000. The rate of water access in Kenya has been improving at a rate of 4% every five years. To attain the target set under vision 2030 the growth should be rather 4% annually and not after every 5 years. Demand of water in most towns in Kenya is higher than supply. Statistics shows about 17 million (43%) of Kenyans cannot access clean water. Lack of adequate water is a key issue in Kenya for many years as a result of many years of regular droughts, water supply managed poorly, contaminating available water, and increasing water demand. In most urban areas in Kenya is polluted. It has been a major contributor to water borne diseases (WASREB, 2018).

Since March 2013, Kenya has had a brand-new governance layer to deal with: the counties – 47 of them, each with their own governor, parliament and ministers. There is also a new Water Act (2016) that has drastically revised roles and responsibilities in water resources management (WRM) and water supply (RoK, 2017). Though this devolution process is applauded by many since it distributes power more equally over the country, it also causes challenges in the field of coordination, governance and distribution of resources, especially since there is a chronic lack of reliable, accessible data that can inform policy and investments. In Kenya, lack of adequate financing and poor cost recoverability by water companies are the main challenge to sustainable water project (WASREB, 2018).

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Kwena and Moronge (2015) carried out a study to establish the determinants of rural water projects taking into consideration water Projects in Kajiado County supported by Netherlands development organization. The study established that there is a strong positive influence on sustainability of rural water sustainability attributable to units of change of all the independent variables. The study found sector policy was important for achieving sustainability of rural water supply projects in the study area. The study further found the participation of women groups and community leaders is desirable for achieving sustainability.

Statement of the Problem

Kenya faces challenges in realizing vision 2030 of ensuring that water is clean and can be accessible by all people (RoK, 2017). It's the right of every citizen to get clean water and sanitation as per 2010 constitution (WASREB, 2019). The UN stipulate water access as a human right that member states should ensure is enjoyed by citizens (UN, 2019). Despite these ambitious objectives, the ratio of people with access to water source remains low due to up to 33% failure of water projects (UNDP, 2018). Further, while Kenya's MDG goals was to have 70% of the population access water by 2015, up to 43% of rural population lack access to clean water (UNDP, 2012). Population growth, increased demand for and rising cost of energy, increased urbanization, watershed and environmental degradation, natural disasters, conflict, climate change, and weak water governance are putting water resources under increasing pressure.

In Muranga County, the percentage of residents with water coverage is 47% with 100% of water projects in the County not being sustainable since their cost coverage is less than 130% (WASREB, 2018). Murang'a County has also the second lowest sewerage coverage in Kenya with only 3% of population covered and thus compromising the quality of water used by residents (WASREB, 2018). The undergoing coupled with diminishing water resources and the ever-increasing population and rapidly expanding water demand creates a water projects sustainability challenge. Furthermore, Murang'a county development and economic empowerment has been hampered by lack of access to water.

In the draft Mid Term Plan for 2018-2022 for the water sector, a key lesson learnt included unsustainable water projects operating with a reliance on fuel due to high costs of power despite several projects in the rural area being developed with fuel powered systems (Devolution, 2018). From the County Water Points Database 2016, drilling of new boreholes as one of water projects in Muranga County has continued with non-operational boreholes being abandoned or revived at high costs. The value for money in these investments is not realized when the wash assets are not sustainable. It is therefore necessary to find determinants and contributing factors that have undermined the sustainability of water projects in Murang'a County.

Though several water project plans have been set up in the area, the Murang'a County continue to experience scarcity of water which further worsens the living conditions. This is despite many water projects being undertaken by National Government, County Government and Non-governmental organizations over the years. Whereas there have been successful water projects, majority have not been sustainable (Ndung'u, 2016, WASREB, 2018). To alleviate the water shortages and be able to improve the general welfare of the residents of Murang'a County, it is therefore, vital to study the factors that are contributing to sustainability of water projects. It is on this premises that the current study is anchored.

Specific Objective

i. To examine the extent to which team competencies affect sustainability of water projects in Muranga County.
ii. To assess how project financing affects sustainability of water projects in Muranga County.

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ISSN:2314-2896
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LITERATURE REVIEW

Theoretical Review

The proposed study was steered by the following theories; Deming's theory; Resource Based View Theory

Deming's Theory

One of the notable scholars who has been accredited with quality control movement is W. Edwards Deming, (1986). He was an American Engineer, Statistician and a Professor who helped develop techniques used by the US Department of Labour Statistics. He is particularly famous for his contribution to Japan's innovative, high quality products in the manufacturing Industry. The theoretical principle of the Deming approach of project management via TQM involves conception of structural system that nurtures teamwork and learning for expediting the implementation process. This resulted in the constant perfection of products, processes and services as well as satisfaction of employees which ultimately lead to successful projects and firm survival (Al-Shamheed, 2018). Deming emphasised on the obligation of top management to assume the frontrunner position in changing systems and processes.

According to Deming (1986), leadership occupies a very significant place in ensuring successful implementation of projects and subsequent continuous improvement since it's the top management who are mandated to create and communicate a vision that led an organization towards total quality management. The leadership of an organization bears the responsibility of most if not all quality related problems and they should give workers well-defined criteria of what is considered satisfactory work and provision of means of achieving it. The criteria could include the existence of a conducive working environment where workers can work free from fear of blame or being criticised for technical problems (Luburic, 2014).

To transform and improve the effectiveness of project implementation, product production, and service delivery, Deming (1986), offered 14 principles to managers. Some of these principles which are relevant to the present study include; managers should create reliability of purpose that is aimed towards the improvement of product and/or service delivery. That is, the projects undertaken should be aimed towards creating a competitive and successful outcome and/or providing jobs or other lasting solutions. Secondly, managers should end reliance on inspections to realise quality. That is, the project should have inbuilt quality before it is implemented. He further claimed that effective business transformation is a product of organization-wide quality appraisal, supplier quality control, competitive benchmarking, and coordination within the organization.

The theory is essential to the study since effective and successful management and sustainability of any project is usually an aspect of total quality management, and water projects are no exception. TQM entails a systematic and integrated organizational wide plan for heightening the quality of services delivered by an organization (Neyestani, 2017). A review of the literature indicates that total quality management is a multi-faceted concept covering a variety of topics and perspectives. This theory is particularly relevant to this study because total quality management perspective of project implementation and control is conceivably most useful in understanding the relationship between successful projects and how to effectively achieve such success or sustainability.

Resource Based View Theory

In 1984 Wernerfelt developed the theory and was expanded by Hart in 1995, Helfat (2003) and Martin (2015). The theory grew out of Penrose's study in 1959 on unused managerial resources as the primary driver of growth. Resources are either property based or knowledge based (Wiklund & Shepherd, 2003).

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Penrose recognized that managerial resources are both drivers and limitations to expansion of a firm. This stream of literature was expanded in the 1970s and early 1980s on the heels of significant diversification and firm expansion (Rubin1973, Teece 1980, 1982). According to Wernerfelt, 1984 those resources that maintain value in a given firms' markets and other resources ability to mobilize and combine these resources in a specific way to determine a firms competence. The theory advices top managers to select the least-constraining device to manage relations with their exchange partners that allowed them to minimize uncertainty and dependence and maximize their independence. This theory is relevant in project management as it emphasizes on the significance of having many opportunities in an effort of ensuring sustainability of projects. It cautions that if dependence comes from relying on a one-source supplier, then an obvious answer is to find and sustain alternatives. This theory is pertinent to tackle financial constraints and encouraging on the marketing approach and avenues to be used in order to guarantee a sustainability of projects.

Resource dependency theory emphasizes on the organization's ability to institute methods to access resources (Van Witteloostuijn & Boone, 2006). Resource dependency theory assumes that the firm makes the right choices to achieve objectives. According to this theory, firms are not able to accumulate all financial resources internally and therefore depend on finances from other organizations in their environment to access the limited resources (Sirmon, Hitt & Ireland, 2007). For the firms to survive or prosper, financial resources must be obtained from external sources (Barringer & Harrison, 2000).

Small and medium project firms in Kenya face a shortage of capital (Nabintu, 2013). Mortgage financing is therefore is one method for these firms to access external funds in line with the resource dependency theory (Boot, 2000). Following such an argument, firms or developers that face capital constraints can use relationship lending as a strategy for accessing or acquiring resources.

This theory was applied by Wit (2008) and concluded that for a project to be deemed sustainable, parameters of measurement include joint research and development contracts, licensing and franchising agreements, shared manufacturing and marketing arrangements, minority investments, and equity swaps. Specifically, companies operating in industries that are heavily dependent on male employees such as the construction industry are likely to harbor sustainability of projects. This theory instigates the second research objective which seeks to assess the effect of project financing on sustainability of water projects in Murang'a County.

Conceptual Framework

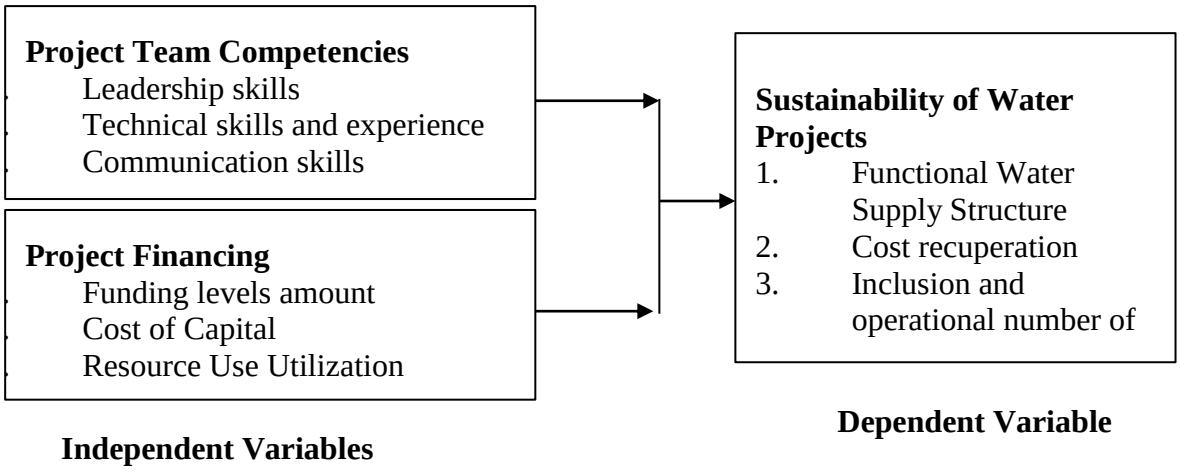

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Figure 1: Conceptual Framework

Project Team Competencies

Zimmerer and Yasin (2008) found that 76% of fruitful projects are affected by constructive leadership and 67% disappointments of tasks are expected to be negative because of poor leadership. Project pioneers must lead the general members under them to finishing the characterized objective inside a stipulated time. The venture colleagues likewise chose ought to be completely equipped to attempt their normal jobs and where vital, extra trainings are to be given preceding the undertaking usage process.

A few creators, in any case, do close a focal job of the undertaking director concerning maintainability (for example Turner, 2010). Maltzman and Shirley (2013) even discussion around a significant job of the venture chief and furthermore Goedknegt and Silvius (2012) reason that the undertaking director has a ton of effect on the utilization of manageability standards in or to the task. What these examinations share for all intents and purpose is that they feature the open door that the job of the task chief offers. The undertaking director has a focal position in the venture and that gives the chance to impact numerous parts of the task. This impact isn't restricted to the way toward executing the venture be that as it may, by the 'intensity of motivation', stretches out to the deliverable and goals of the task. The intensity of plan that the undertaking supervisor has, furnishes the person in question with the chance to talk about supportability perspectives, concerns or issues with the venture support, inside the task group or with different partners.

According to Proctor, 2014, effective communication between employees, supervisors and management improves attitudes, happiness thus affecting job performance. Success of projects is about the way communication is planned with a good selection of communication tools and techniques. It is important for project managers to consider the most preferred and convenient tools and techniques to use (Mnkanalla, 2014). In this case tools refer to applications and devices used in collection and distribution of information while techniques refer to the methods used to enable communication. It is thus a competency that enhances sustainability of water projects.

Project Financing

Guaranteeing project consummation within approved spending structures some portion of the Project Financing (PMBOK, 2018) give the jobs of fund a chance to be taken care of concerning the decided goals of the project. We can infer that a task is fruitful dependent on how proficiently the destinations are accomplished and this can be resolved dependent on expense and time and asset appraisals are factors that project supervisors must guarantee that they are precise if projects life cycle is to be powerful (Schultz &Slevin, 2009). Financial plausibility during undertaking arranging is basic to guaranteeing venture sustenance without proceeded with outer help. Projects ought to along these lines incorporate long haul benefits during arranging. The advantage model arrangement should make a projection of the activities and upkeep costs, repetitive normal wages just as improvement costs for capital ventures (Mwangi, 2014). Resource efficiency is the maximising of the supply of money, materials, staff, and other assets that can be drawn on by a person or organization in order to function effectively, with minimum wasted (natural) resource expenses (Gwadoya, 2011). It means using the Earth's limited resources in a sustainable manner while minimising environmental impact. With proper allocation and utilization, there was efficiency and effectiveness in the implementation.

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Sustainability of Water Projects

We can utilize reliability of water supply, cost recuperation, inclusion and operational number of years to quantify the sustainability of water projects. Barnes and Brown (2014) notes that initial poor planning processes are a major cause of high failure rate of water projects. Other variables of water sustainability are impacted by variables like financial and administrative structures. Project sustainability is the degree to which the projects functions benefiting the users (Habtamu, 2012).

Gebrehiwot (2015) saw sustainability on monetary terms for instance as far as cost recuperation and independence monetarily and depends on both pre implementation and post implementation factors. Pre implementation comprises of factors like demand, technology selected, community training and involvement. At post implementation stage it considers the satisfaction that the community derives, financial management in terms of cost recovery and project management. Sustainability of water undertakings was estimated by the persistent supply of water and when the source isn't drained yet in great condition to guarantee satisfactory and dependable water supply (Mwangi, 2014). Sustainability of water supply activities is affected by natural quality, money related administration and institutional limit. In creating nations there ought to control standards to which these activities ought to be executed to meet the client needs to be specific water ought to be overseen as a financial decent just as a social decent, ladies should assume a key job in the executives of water and an all-encompassing moved toward utilized. Sustainability of water projects is a strategy where maintaining future water resources included increasing supply, managing use of fresh water to sustain economic growth (Ding, 2017).

Empirical Literature Review

Project Team Competencies

Correspondingly, Thairu, (2014) did an examination on the elements impacting the achievement of NGO extends in Nairobi County. The information is inspected from a populace of two hundred and one NGOs. An example of 50% was examined. The specialist discovered that undertaking group impacted the venture execution. This examination anyway was restricted to just Nairobi County which may not be a genuine portrayal of Murang'a County. Njeru, (2016) additionally settled the equivalent on her examination on the variables affecting venture execution in the water extends in Kiambu County. The examination connected elucidating study plan and focused on staff who were straightforwardly associated with usage were talked with utilizing surveys. The examination noted that most of the respondents were in understanding that elements identified with poor task group the board influenced the undertaking usage accomplishment to a major degree in water extends in Kiambu County.

According to Redick, Reyna, Schaffer and Toomey (2014) project leadership provide an important role in an organization to meet strategic goals. Their study sought to develop an effective leadership model in a project. In their study it was found that successful project leadership puts an organization at a competitive position in the market, adds business value and sustains overall organizational growth. In another study conducted by Mwanajuma and Ngugi (2014) on factors that affect the completion of water projects in Kenya it was found out that completion was significantly influenced by organizational structure. In a study conducted in China through structured questionnaire and interviews showed significant correlation on project outcomes and competency of Project Contractors Ling and Mau, (2014). Project management competencies are important for evaluating accomplishments of a firm, strategic development as well as investment decisions (Shahu, 2012).

Project Financing

Anyango (2016) examined the elements deciding undertaking usage of wellbeing ventures in Gedo district, Somalia. The examination tried to build up how monetary help impact venture implementation.

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The concentrate found a positive critical relationship between money related help and task usage. Better money related help in accordance with the association's objectives and goals which came about to powerful implementation of ventures.

As indicated by Kogi (2013), when subsidizing is not sufficient or it needs through and through it adversely affect execution of the undertaking as the tasks can't keep, prompting broadened contract periods and raised contract total. The examination built up those financing offices activities of the venture impact viability of usage. Kogi (2013) noticed that for a legitimate execution and finishing expected ventures in time there is have to provide required assets for the undertakings at the stipulated time. The investigation additionally noted that the fundamental issues in undertaking financing were either postponed or supported in an off-base time just as late payment of assets and variance of the present spending plan hence affecting the first spending plan. Otieno (2017) considered the drivers of compelling usage of between office extends in Kenya: instance of Kenya waterfront advancement venture. The examination found that undertaking financing made the best huge commitment, among the two autonomous factors explored. The investigation reasoned that the executing organizations ought to embrace best practices in budgetary arranging and the board and venture authority from the offices to concentrate on undertaking group and compromise for an acknowledgment of the expected in general task improvement targets.

In another study conducted by Choge and Mutur (2014) established a great relationship between Contractors experience and adherence to cost estimates in construction industry. Poor distribution of labour affect cost baseline while sufficient technical skills influenced cost estimates.

RESEARCH METHODOLOGY

The study used descriptive research design which comprises of the elucidation of a population in relation to significant study variables with the core focus being the establishment of the relationship between the variables. The design helped in explaining the relationship between the determinants of sustainability of water projects at any given time without changes to the conditions. The advantages of this study design are that it is simple and understandable as stated by Kothari (2017). The population for this research entailed all projects undertaken by Muranga County through Murang'a Water and Sanitation Company limited (MUWASCO) the respondents being the MUWASCO head of each project undertaken. The water projects launched by MUWASCO

The study applied a census approach of the water projects undertaken at Murang'a County. This whole population adopted as the sample for the study since the population is well defined, small and within the proximity of the researcher. Structured questionnaires made of both open-ended and closed-ended questions were used to collect primary data. Questionnaires were dropped and picked later to allow respondents enough time to respond to the questionnaires.

A pre-test was conducted to test for validity and reliability of the research instrument and irrelevant information and ambiguity was modified. A sample size of 10% of the sampled population is considered adequate for descriptive study (Mugenda & Mugenda, 2014). The reliability of the research instrument was calculated using Cronbachs correlation coefficient. A correlation coefficient greater or equal to 0.7 is acceptable (Kothari, 2017).

Data collected can either be analysed quantitatively or qualitatively or both. Data from completed questionnaires was checked for errors, edited for completeness, coded and entered into a SPSS program ready for analysis of determinants of sustainability of water projects in Muranga County. The study used multiple linear regression to test if the strength of the relationship between the independent variables and the dependent variable are statistically significant.

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DATA ANALYSIS

Out of the 75 respondents 65 respondents responded returned fully filled questionnaires for analysis. This constitute to 86.6% of the response rate. Mugenda and Mugenda (2012) indicated that a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and above is excellent. Therefore, the response rate of 86% was excellent for the study.

Descriptive Analysis

Project Team Competences

The respondents were asked to indicate the determinants of sustainability of water projects in Muranga County in Kenya. A scale of 1 to 5 where; 1= SD - Strongly Disagree 2=D - Disagree, 3=N - Neutral, 4=A - Agree and 5= SA - Strongly Agree. Mean and standard deviation were calculated for ease of comparison and generalization of findings. From the finding the respondents established that political leadership good necessities to ensuring sustainability of water projects with a mean score of 3.99 and standard deviation of 0.97, the respondents agreed that technical skills of the project team are important in enhancing sustainability of water projects was supported by mean of 3.88 and standard deviation of 1.14. The study further agreed that formalization of the communication frequency within the team is essential for success of project with a mean score of 4.13 and standard deviation of 1.15. The respondents further agreed that Project Managers should grant employee autonomy to outline the goal of the project with a mean score of 3.84 and standard deviation 0.93. Results indicated that majority of the respondents agreed on the statement that project leadership skills influence sustainability of water projects with a mean of 3.95 and standard deviation 1.03. Results indicated that majority of the respondents agreed on the statement that Project team commitment is important to ensure water projects are sustainable with a mean of 4.32 and standard deviation of 0.96. Results indicated that majority of the respondents agreed on the statement that User-friendly communication tools and techniques are critical in water projects with a mean of 3.99 and standard deviation of 0.73. Results indicated that majority of the respondents agreed on the statement that decision making process should involve project team members with a mean of 4.01 and standard deviation of 0.99. Concisely, the study revealed that Project leadership should focus on project team developing relevant skills on project management with a mean of 3.65 and standard deviation of 1.23. The finding of this study are in line with those of Ibrahim & Daniel (2019) found that constructive leadership affects 76% of fruitful projects and 67% disappointments of tasks are expected to be negative because of poor leadership.

Table 1: Project Team Competencies

Statement	Mean	StD
Project leadership skills influence sustainability of water projects.	3.95	1.03
Technical skills of the project team are important in enhancing sustainability of water projects	3.88	1.14
Project team commitment is important to ensure water projects are sustainable	4.32	0.96
Political leadership goodwill are necessities to ensuring sustainability of water projects	3.99	0.97
Project Managers should grant employee autonomy to outline the goal of the project	3.84	0.93
Formalization of the communication frequency within the team is essential for success of project	4.13	1.15
User friendly communication tools and techniques are critical in water projects	3.99	0.73
Decision making process should involve project team members	4.01	0.99
Project leadership should focus on project team developing relevant skills on project management	3.65	1.23

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Project Financing

The respondents were asked to indicate the influence of project financing on sustainability of water project. From table 4.5 majorities of the respondents agreed that the amount of resource allocated to water projects play crucial role in ensuring project sustainability with a mean score of 3.82 and standard deviation of 1.08. The funding indicated that the respondents agreed that efficiency resource use is crucial in ensuring project sustainability supported by mean of 3.87 and standard deviation of 1.00. The respondents further agreed that Quality control costs play an important role in project financing and sustainability of water projects with a mean score of 4.13 and standard deviation of 1.01. The study found that there are effective internal controls on cost to reduce cost overruns while ensuring quality this was supported by mean of 3.96 and standard deviation 0.92. The respondents also agreed that steps are taken to mitigate or manage risks in order to prevent cost over-runs with a mean score of 3.88 and standard deviation 1.15. Results indicated that majority of the respondents agreed on the statement that Cost control during project implementation play important role in ensuring project sustainability as shown by a mean of 3.77 and standard deviation of 0.85.

Results also indicated that majority of the respondents agreed on the statement that adequate record keeping on material costs play an important role in project financing as shown by mean value of 4.01 and standard deviation of 0.85. Results also indicated that majority of the respondents agreed on the statement that the county government allocates enough resources for the maintenance of water projects as shown by a mean of 3.92 and standard deviation of 1.10. Lastly, the respondents also agreed that minimizing cost of connection and full recovery of cost is important to ensuring project sustainability as shown by a mean of 3.64 and standard deviation of 1.02. The findings in this study are in line those of Mwangi (2014) that financial resources play a crucial role in enhancing the sustainability of projects in an organization.

Table 2: Project Financing

Statement	Mean	StD
The amount of resource allocated to water projects play crucial role in ensuring project sustainability	3.82	1.08
Minimizing cost of connection and full recovery of cost is important to ensuring project sustainability	3.64	1.02
Cost control during project implementation play important role in ensuring project sustainability	3.77	0.85
Efficiency resource use is crucial in ensuring project sustainability	3.87	1.00
Adequate record keeping on material costs play an important role in project financing	4.01	0.85
The county government allocates enough resources for the maintenance of water projects.	3.92	1.10
Quality control costs play an important role in project financing and sustainability of water projects	4.13	1.01
There are effective internal controls on cost to reduce cost overruns while ensuring quality	3.96	0.92
Steps are taken to mitigate or manage risks in order to prevent cost over-runs	3.88	1.15

Sustainability of Water Projects

The study sought the extent to in which water projects in Muranga County are sustainable. From the finding of the study, the respondents stated that Muranga water projects supply of water is not reliable and functional throughout the year with 19.48% of the respondents strongly agreeing, 57.14% of the respondents agreeing and only 2.60% of the respondents disagreed. The study provided that water

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projects in Muranga County have not achieved expected functional number of years with majority of the respondents strongly agreeing 42.86%, 35.06% of the respondents agreed while 9.09 % of respondents were neutral with the statements. The study indicated that the water projects are not completed on set schedule in Muranga County with 25.97% of the respondents strongly agreeing, 57.14% of the respondents agreeing and only 1.30% of the respondents disagreed with the statement.

The study established that there is no continued spare parts supply for repairs of any emergency damage with 50.65% of the respondents strongly agreeing, 50.65% of the respondents been neutral and only 2.60% strongly disagreed with the system. Results indicated that majority of the respondents 85.71 agreed on the statement that Muranga water projects are not accepted by the users. Results also indicated that majority of the respondents 85.72% agreed on the statement that Muranga water projects revenues are not able to recover costs of water projects implementation and installation. Results also indicated that majority of the respondents 75.33% agreed on the statement that water projects in Muranga county have not improved water coverage. Results also indicated that majority of the respondents 79.22% agreed on the statement that Muranga water projects are not done within the set allocated budget. Results also indicated that majority of the respondents 75.33% agreed on the statement that Water projects in Muranga county have not improved water coverage. Lastly, the respondent strongly agreed that Projects do not meet specifications. The study results agrees with the study by Shahu, (2017) who asserts that Project management competencies are important for evaluating accomplishments of a firm, strategic development as well as investment decisions.

Table 3: Sustainability of Water Projects

	1	2	3	4	5
Muranga water projects supply of water is not reliable and functional throughout the year	6.49%	2.60%	14.29%	57.14%	19.48%
Muranga water projects are not accepted by the users	2.60%	5.19%	6.49%	58.44%	27.27%
Muranga water projects revenues are not able to recover costs of water projects implementation and installation	1.30%	2.60%	10.39%	64.94%	20.78%
Water projects in Muranga county have not improved water coverage	3.90%	3.90%	16.88%	41.56%	33.77%
Water projects in Muranga County have not achieved expected functional number of years	7.79%	5.19%	9.09%	35.06%	42.86%
Water projects are not Completed on set schedule in Muranga County	1.30%	5.19%	10.39%	57.14%	25.97%
Muranga water projects are not done within the set allocated budget	3.90%	2.60%	14.29%	35.06%	44.16%
Projects do not meet specifications	5.19%	2.60%	5.19%	46.75%	40.26%
There is no continued spare parts supply for repairs of any emergency damage	2.60%	2.60%	7.79%	36.36%	50.65%

The study sought to determine the sustainability of water projects in Muranga County. This was presented on a graph showing the Number of functional water projects in Muranga County from the year 2014 to 2018. From the graph, it is evident that the number of functional water supply projects not been consistent from 2014 to 2018.

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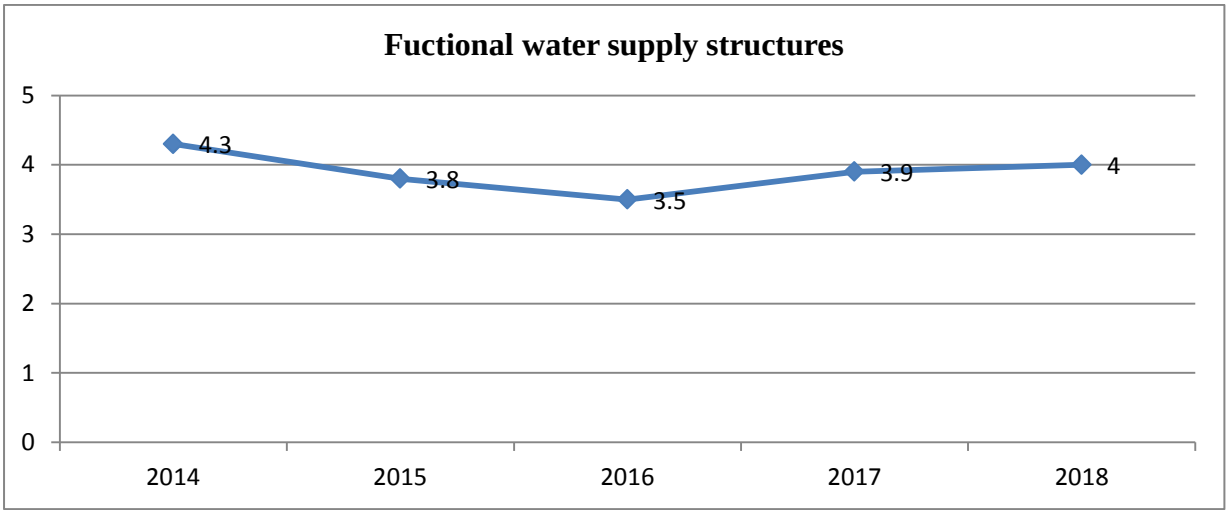

Figure 1: Functional water projects

The study sought to determine the cost projections of water projects in Muranga County. This was presented on a graph showing the cost projects water projects in Muranga County from the year 2014 to 2018. From the graph, it is evident that the cost projections of water supply projects have not been consistent from 2014 to 2018.

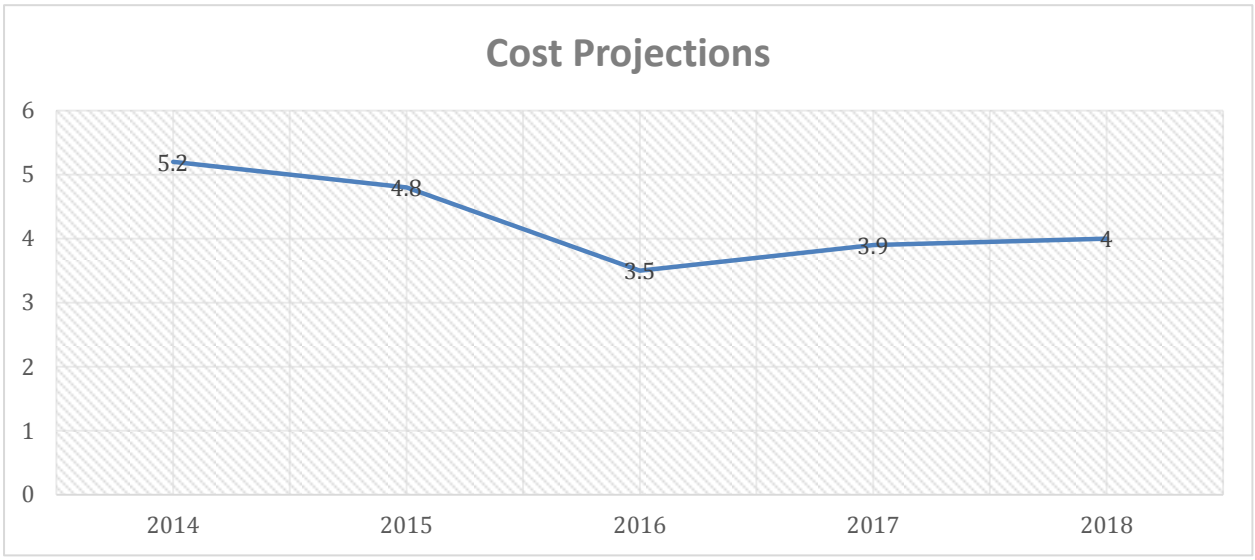

Figure 2: Cost Projections

The study sought to determine the number of years the projects have been fully operational in Muranga County. This was presented on a graph showing the number years the projects have been fully operational in Muranga County from the year 2014 to 2018. From the graph, it is evident that the number of fully utilized water projects has been increasing consistently from 2014 to 2018.

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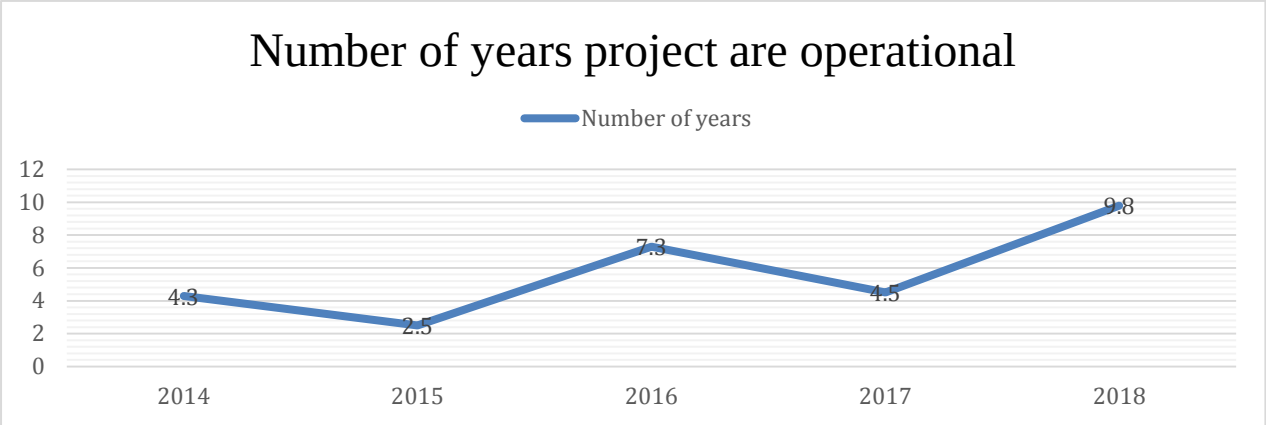

Figure 3: Inclusion and Operational number of years.

Inferential Analysis

Correlation analysis

The study undertook correlation matrix analysis to examine the determinants of sustainability of water projects in Muranga County. Table 4 presents the correlation matrix analysis on determinants of sustainability of water projects in Muranga County. The correlation factor ranged from -1≤ 0 ≥1. The acceptance confidence level was 95% or significance level of 0.05. The study conducted a Pearson Moment Correlation analysis which is represented by; project team competencies, project financing, Monitoring and Evaluation and Project Planning and Design and Sustainability of Water Projects. Table 4 indicate that project team competencies and project monitoring and evaluation has the strongest positive influence on sustainability of water projects at Muranga County as attributed by the correlation coefficient of 0.836 and a p-value of 0.00 and correlation coefficient of 0.816 and a p-value of 0.00 respectively. In addition, project financing and project planning and design are positively correlated to sustainability of water projects in Muranga County with Pearson correlation values of 0.782, 0.755 and p-values of 0.000 respectively.

This correlation matrix implies that the independent variables; project team competencies, project financing, monitoring and evaluation and project planning and design has influence on the on sustainability of water projects in Muranga County.

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Table 4: Correlations Matrix

		Sustainability	Project team competencies	Project financing	Monitoring and Evaluation	Project Planning and design
Sustainability	Pearson Correlation	1	.836**	.782**	.816**	.755**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	65	65	65	65	65
Project team competencies	Pearson Correlation	.836**	1	.921**	.972**	.910**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	65	65	65	65	65
Project financing	Pearson Correlation	.782**	.921**	1	.918**	.876**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	65	65	65	65	65
Monitoring and Evaluation	Pearson Correlation	.816**	.972**	.918**	1	.915**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	65	65	65	65	65
Project Planning and design	Pearson Correlation	.755**	.910**	.876**	.915**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	65	65	65	65	65

**. Correlation is significant at the 0.05 level (2-tailed).

Regression Analysis

The study conducted regression analysis to determine the determinants of sustainability of water projects in Muranga County. The study results are shown in the subsequent sections. The Multiple regression analysis ($y = B_0 + B_1X_1 + B_2X_2 \ldots\ldots\ldots B_nX_{n+} \varepsilon$) was run with sustainability of water projects as the dependent factor and determinants as the predictor variable. Table 5 shows that the coefficient of determination R^2 is 0.779. This means that the combined influence of the predictor variables (project team competencies, project financing, monitoring and evaluation and project planning and design) explains 77.9% of the sustainability of water projects.

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.882	.777	.766	.462

a. Dependent Variable: Sustainability of water projects

b. Predictors: (Constant), Project team competencies, Project financing, Monitoring and Evaluation, Project planning, and design.

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ANOVA

Result in Table 6 indicated that the Total variance 69.532 was the difference into the variance which can be explained by the independent variables (Model) and the variance which was not explained by the independent variables (Error). The study established that there existed a significant goodness of fit of the model $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$. Based on the findings in Table 4.11 the results indicate the F_{Cal} =52.875> F_{Cri} = 2.525 at confidence level 95% and sig is 0.000<0.05.This implies that there was a goodness of fit of the model fitted for this study: $Y= 1.331+ 0.748X_1+0.164X_2+ 0.369X_3+ 0.539X_4+ \varepsilon$.

Table 6: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	54.145	4	13.536	52.875	.000[b]
	Residual	15.387	60	.256		
	Total	**69.532**	**64**			

a. Dependent Variable: Sustainability of Water projects
b. Predictors: (Constant), Project team competencies, Project financing, Monitoring and Evaluation, Project planning, and design.

Beta Coefficients

From regression results in Table 7, the 1.331 represented the constant that predicted value of sustainability of water projects when all other variables were constant at zero (0). The implication is that when determinants predictors effect is constant, sustainability of water projects in Muranga County be at 1.331.

The study found that project team competencies has the highest significance positive influence in sustainability of water projects in Muranga County as indicated by β_1=0.748, p=0.000<0.05, t=3.702. The implication is that a unit increase in project team competencies would lead to a significant increase in sustainability of water projects in Muranga County by β_1=0.748.

From coefficient results the study found that project financing, has a significance positive influence on sustainability of water projects in Muranga County as indicated by β_2= 0.164, p=0.002<0.05, t=1.341.The implication was that a unit increase in project financing would result into increase in sustainability of water projects in Muranga County by β_2= 0.164

From the regression coefficient findings, the study revealed that monitoring and evaluation would have a significant positive influence sustainability of water projects in Muranga County as indicated by β_3=0.369, p = 0.003<0.05, t=1.567. The implication is that an increase in monitoring and evaluation would lead to an increase in sustainability of water projects in Muranga County. The findings concurred with Pearson (2010); Project monitoring is the customary assortment, examination, and utilization of information about proceeding with advancements and project mediation.

The regression findings further indicated that there existed a significant positive relationship influence of project planning and design and sustainability of water projects in Muranga County as indicated by β_4=0.539, p=0.000>0.05, t= 2.080. This implied that an increase in project planning and design would lead to an increase in sustainability of water projects in Muranga County. The findings agreed with Swiatecki, (2015) that project planning is that process of identifying the methods, resources and activities necessary to accomplish the project objectives by drawing on the expertise of the organization.

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Table 7: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients Beta	T	Sig.
		B	**Std. Error**			
1	(Constant)	1.331	.275		4.845	.000
	Project team competencies	.748	.202	.927	3.702	.000
	Project Financing	.164	.122	.200	1.341	.002
	Monitoring and Evaluation	.369	.235	.395	1.567	.003
	Project Planning and design	.539	.206	.725	2.616	.000

a. Dependent Variable: Sustainability of water projects
b. Predictors: (Constant), Project team competencies, Project financing, Monitoring and Evaluation, Project planning, and design.

Conclusion

Project Team Competencies.

The study concludes that project team competencies elements such as Leadership skills, Technical skills and experience and Communication skills have significant influence on sustainability of water projects in Muranga County. The regression coefficients of the study show that project team competencies has a significant influence on sustainability of water projects. This implies that increasing levels of project team competencies indicators by a unit would increase the levels of sustainability of water projects.

Project Financing

The study concludes there is a positive and significant influence between project financing and sustainability of water projects in Muranga County. This implies that an increase in project financing improves the sustainability of water projects in Muranga County. The regression coefficients of the study show that it has a significant influence on sustainability of water projects in Muranga County. This implies that increasing levels of project financing by a unit would increase the levels of sustainability of water projects in Muranga County.

Recommendations

The study recommends that technical capabilities of the managers and supervisors of the projects should be assessed clearly to be ascertained whether they are in position to deliver good results. Interpersonal proficiency among the manager is very vital in driving the success of the projects. Concisely, the study recommends that extensive knowledge and skills in regards to water projects is paramount when dealing the sustainability of water projects, as such the managers should undergo adequate training for them to effectively run the projects.

The study recommends that that mobilization policy should be developed to mobilize funds from other developmental partners of the projects. There should be collaboration with other agencies in co funding of the water projects. The study also recommends that there must be a technical knowhow and infrastructure for successful implementation of the water projects in Muranga County.

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Areas for Further Study

The study is a milestone for further research in the field of sustainability of water projects in Africa and particularly in Kenya. The findings demonstrated the important aspects of sustainability of water projects to include; project team competencies, project financing, monitoring and evaluation and project planning and design. The current study obtained an R^2 of 77.9% and should therefore be expanded further in future in order to include other aspects of water sustainability that may as well have a positive impact. Existing literature indicates that as a future avenue of research, there is need to undertake similar research in other institutions and counties in Kenya and other countries in order to establish whether the explored aspects herein can be generalized to affect sustainability of water in other counties.

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