PROJECT PLANNING AND SUSTAINABILITY OF WATER PROJECTS IN SAMBURU COUNTY, KENYA

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DECLARATION

I declare that this thesis is my own original report and that it has not been submitted for any previous degree.

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This research project has been presented with my approval as the appointed research Supervisor.

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DEDICATION

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ABBREVIATIONS AND ACRONYMS

ANOVA	Analysis of Variance
ASALs	Arid and Semi-Arid Lands
CDF	Constituency Development Fund
GOK	Government of Kenya
ICT	Information Communication and Technology
NACOSTI	National Commission for Science Technology and Innovation
NGO	Non-Governmental Organization
NWSS	National Water Services Strategy
SEM	Structural Equation Modeling
TOC	Theory of Change
WSS	Water Supply System

ABSTRACT

Most developers are concerned about the sustainability of water projects, particularly in water stressed areas. According to research, most water projects in Samburu County developed fail to reach sustainability immediately after the project closure period or after three years. As a result, this research focuses on project planning to ensure the long-term water projects sustainability. This research was based on an overall objective of the influence of project planning on the long-term water projects sustainability in Samburu County, Kenya. The key variables in the research included assessing the impact of stakeholders' analysis, the impact of project schedule, and the impact of project cost. The study adopted the four-capital model theory, as the anchor theory in this study, as well as the theory of change (TOC). Descriptive research approach was employed in the study in order to accurately describe the population in question and the targeted group included water project management committee members, project beneficiaries, and opinion leaders from Samburu County's three completed water projects. A sample size of 99 participants who were not involved in the pilot study were distributed with questionnaire to give their response research, and purposive sampling was utilized in selecting the participants. All quantitative data obtained via structured instruments and questionnaires was cleaned, sorted, edited, and keyed into SPSS for further analysis, and descriptive analysis was performed, including the calculation of frequency, percentages, means, and standard deviations. According to the study's findings, the r values ranged from 0.7 to 0.8, indicating that project planning influences water projects sustainability. Project scheduling received the highest r values, indicating that it had the greatest impact on the water projects sustainability; this was followed by stakeholder analysis and project cost. The results also showed that all variables in project planning are significant since their computed critical values are indicated to be below 0.05 with 95% confidence, indicating that all project planning components had a substantial effect on the sustainability of water projects. According to the findings, stakeholder analysis also involves stakeholder mapping based on stakeholder influence, interest, and involvement, all of which have a significant impact on project success. The project schedule element comprised regular planned updates or reviews of the project schedule that led to water project sustainability, proper technology choices, increased communication, and time allocation for each activity.

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Project planning is instrumental in ensuring long-term sustainace of water projects by instilling strategies that once implemented they can cause change that is sustainable for the current and future generations. However, most project managers and developers over look project planning phase during project implementation resulting to unsustainable water projects or incomplete water projects development (Wolf et al., 2019; Bernaur & Bohmelt 2020). This has become a major problem especially in arid and semi-arid areas where most donors and government agencies are putting up so many unregulated water projects which either turns out dry or incomplete (UNESCO., 2023).

According to research conducted it is estimated that approximately more than 700 million (world Bank., 2023) cannot access quality and adequate water at all times. In Africa, the situation is more worrying since it is estimated that over 300 million people cannot afford to have water to cater for simple basic needs such as drinking water (World Bank, 2021). These calls for thorough planning by donors and relevant stakeholders to ensure sustainable water projects for both surface water and ground water projects constructed (Peterson, 2017) to improve water security.

Research shows that majority of community water project fail to attain sustainability (USAID., 2021) due to poor planning or lack of planning. For instance, report released by USAID (USAID., 2021) highlight that most water projects in Africa are unsustainable and approximately 70% of water projects fail to cater for the need of the current and future generation. More so, research conducted by the World Bank (2020) shows that those projects that are termed as sustainable 35% of those projects fail to meet all the requirements of measuring sustainability of water projects more so in developing countries. This is despite efforts of encouraging community ownership by increasing participation of the community members (Hutchings, Franceys, Smits & Mekala, 2017).

In Kenya, (Mulei, B. M., Gachengo, L. 2021), statistics indicate that 25-30 % of water projects managed by the community tend to be non-operational after three years from the project completion date. These shows that once a project ends, money is no longer given therefore the

focus should be on creating sustainable community projects that can run by themselves long after the project is completed - ensuring there is enough skillset, human resource and capital. These calls for stakeholders, donors and Non-Governmental Organizations (NGOs) to work closely with relevant institutions (Radujković, et al 2017) such as the social services in forming Community Based Organizations (CBOs) and empowering them on sustainable ways to maintain the water projects. The CBOs should also be encouraged be actively involved in construction of the water related projects through labor provision and participating in decision making especially in sourcing for construction materials.

In Ghana for instance, the government established National Sanitation Authority to ensure that water sustainability is achieved through empowering the community to drill and fit boreholes with pumps that are manually operated, however the pump constantly broke down forcing the community to use outdated sources of water (Carter, 2019). In the recent past Kenya has also made strides through establishment of community water projects which are projected to be 680 currently that enable at least 750,000 households to access water (Rao., 2023). Further, the Kenyan government has put a significant amount of funds into water supply especially in arid and semi-arid areas with extra funds sourced from NGOs (Lillian et Al., 2019). This has led to an increase in water projects but most of the projects end up collapsing – this means that water supply still remains a challenge (Rao., 2023).

In Samburu County, it is estimated that in the last 5 years an average of over 20,000 boreholes have been sunk by both the county government and the NGOs (UNESCO, 2023) within Samburu. However, reports indicate that 79% of these boreholes (Alaci et al., 2023), are currently not functioning. This is as a result of poor stakeholder analysis, lack of community involvement, use of wrong technology in borehole siting drying up of boreholes, vandalization of water infrastructure, unregulated drilling of boreholes, embezzlement of funds and inadequate funding to finish the project.

Further, research (UNESCO, 2019) shows that most functioning water projects in Samburu county have poor water quality due to poor or no sanitation facilities, lack of capacity development of the water users on water sanitation and hygiene (WASH) and catchment degradation. Thus, most people continue to suffer due to reduced water quantity and quality. Hence, this study seeks to

employ four model capital theory as an anchoring theory to achieve sustainability of water projects by incorporating all essential components during project planning such as human capital, social, ecological and economic. Therefore, this research considers project planning as an element that can be used in sustaining water projects.

1.1.1 Sustainability of Water Projects

Sustainability has sometimes been referred as the project capability to cater for the community's social, economic and environmental needs at that particular time and being also to adequate enough to meet the necessity of the incoming generation (Gimenez, Sierra, Rodon, 2022). Sustainability integration within a project is the consideration of the three (3Ps) People, Planet and Profit to ensure sustainability. Therefore, sustenance of projects especially related to water can be defined as the capability of the water project to sustain its services without having negative impacts even after special assistance in terms of finances and technical support phase out (Komujuni, Basheka, & Oluka, 2023). So, there is need to involve the project beneficiary in the planning, implementation, completion and commissioning phase to increase project ownership (Kwena., 2022).

The performance of water projects after their closure time can be used to examine the sustainability of water projects. This signifies that if a water project remains operational for more than five years after its completion (Braver., 2020). This is as a result of most established water related projects becoming in operational after three years (Braver., 2020) or soon after project completion. Donors must ensure that water projects are sustainable and that project recipients have constant reliable access to water.

Consequently, the sustainability of projects especially related to water can be determined by consistent availability to water points and water sources. In that the project beneficiaries have constant access to clean, enough water and their physical and economic needs are addressed. This will aid in the growth of the education, health, and urban sectors (Juwana et al. 2016). Water project sustainability has been extensively investigated over the years, with the findings that community participation and involvement from the start of the project have a compounding impact on project sustainability (Kleemeier, Elizabeth 2000).

In general, the sustainability of water projects can be determined by community members' continuing project improvement through their dedication to project operation and maintenance (Aqua Tech 2019). When people of the community own a water project and have received proper training in its operation and upkeep. They will ensure that the community is able to undertake minor repairs to the water project and that monies are generated from the project to fix or replace any problematic equipment. In other words, the operation of a water project after special support has ended, reliable access to water, and continuous improvement of the water project are all indicators of sustainability.

1.1.2 Project Planning

Project planning is the most critical and crucial part in ensuring sustainability of a project (Beratan, 2020). Project planning is like a compass that gives the direction of a project. Lack of project planning leads to project failures and delays. It is stated that a doubtful project plan can lead to project failure. (Fischer, F. 2022) Other factors may include poor siting, lack of communication between stakeholders and lack of community participation. Therefore, project planning is like a compass of a project and if the compass is wrong everything else in the project is wrong. Research shows that effective planning is crucial among project team members as it leads to success of any project (Sambasivan et al., 2021).

Planning in a project activity is the only stage of a project that has a direct impact on implementation of a project, resulting in earlier project completion or reduced project delay. Project delays are a regular issue for project managers. In Saudi Arabia, for example, estimates show that 70% of big projects are delayed and do not reach their deadlines (Hwang et al.,2023) due to poor financial planning and a lack of stakeholder analysis throughout the planning phase, resulting in incomplete project development.

This means that project planning not only means setting deadlines of the project but also involves stakeholder’s analysis, identifying funding options for a project, and developing a comprehensive project schedule that not only highlights the timeframe of a project but also the resources to be involved in the project (Mojtahedi & Oo, 2020). Stakeholder analysis, especially for community water projects is essential in order to identify all key stakeholders both primary and secondary and

ranking them according to their level of influence, interest and participation (Li, Ng & Skitmore, 2020). So as to be able to incorporate the relevant stakeholder with interest in water project management and influential stakeholders such as the opinion leaders to be able to gain the political good will during project implementation.

Project planning is also key in developing comprehensive project schedule which not only contains the list of activities to be conducted and the timeframe but also the resources that will be utilised in ensuring water projects sustainability. For example, determining the appropriate technology to be employed in project implementation (Macharia., 2020). According to Mustafa et al. (2018), the correct technology can influence project achievement. In the context of community projects especially those related to water, the use of computer or digital platforms in disseminating information is critical for connecting with many stakeholders. Furthermore, it is critical to examine appropriate machines in borehole siting to avoid the sinking dry boreholes. Furthermore, studies reveal that it is critical to consider the pumping technology to be employed in order to maintain an efficient and stable supply of water (Anjum, 2018). This study further considers project schedule through the information communication systems, availability and use of spare parts and water technologies like pumping technologies (Yang et al., 2020).

Project planning also considers project cost, the total amount of money needed to cover and complete the project (Rao, 2023). Studies show that without adequate funding (Gachuka et al.,2022) a project cannot be sustainable meaning the project beneficiaries may not benefit from the project. Project costs should account for implementation, operating, and variable costs. The implementation cost refers to expenditures sustained during the initial stages of a project such as planning, design, and construction, whereas the project operational cost refers to overheads sustained during the running and maintaining of the project, and the variation cost is the variance between the budget estimates and the actual budget project risk. This research looks into the project planning as a gap identified in implementation of water projects resulting into development of unsustainable water projects.

1.1.3 Water Projects in Samburu County, Kenya.

In the last 5 years it is estimated that an average of 20,000 water projects has been set up within Samburu County (UNESCO., 2023). However, reports indicate that 79% of this water projects

(Alaci et al., 2023), are currently not functioning. This is as a result of drying up of boreholes, vandalization of water infrastructure, embezzlement of funds, unregulated drilling of boreholes, lack of community involvement, use of wrong technology in borehole siting and inadequate funding to finish the project. Furthermore, research (UNESCO.,2019) suggests that most operational water projects in the county have worsened water quality due to inadequate or non-existent sanitation facilities, a lack of community capacity building on water, sanitation, and hygiene (WASH), and watershed degradation.

This has resulted to a huge challenge in terms of water security in the county considering that Samburu County is categorized as an arid and semi-arid area which receives an annual rainfall of below 500mm (Kenya Climatology, 2021). Further, research shows that Samburu county is one of the counties that has been greatly affected by extreme drought and floods (NDMA., 2021) resulting in prolonged drought and extreme flash floods during rainy seasons causing massive destruction of property and loss of life. Most parts of Samburu have also been established to have a stony-rocky soil which is prone to run off (Samburu Central Spatial Plan, 2021-2030). The poor rainfall and poor soils makes it difficult for the soils to hold water posing a huge threat to water security (Titomet, 2017). Therefore, there is need to establish sustainable water projects within the county, and this research aims to use the theory for change to change the mindset of donors and NGOs within the county by equipping them with knowledge on the right tools to use when conducting planning of a project.

Thus, this study identifies and intends to examine three (3) operational water projects within Samburu County, one from each sub-county, that have had a significant impact on the community in terms of continuous flow of water, reliable access to available water, and ongoing maintenance of water projects so as to measure the water projects' sustainability. Further, this research will look at project planning as the missing link in ensuring the water projects sustainability in Samburu County.

1.2 Research problem

Samburu County has an estimate of 20,000 water projects developed in the past 5 years (Alaci et al., 2023) within the three sub-counties; Samburu North, Samburu Central and Samburu East.

However, research indicates that 79% of these water projects in Samburu County are not functioning (Alaci et al., 2023). Lack of sustainable water projects in Samburu County (NWSS study for forecasts from 2016 to 2025) is explained in part by a lack of stakeholder analysis, insufficient funding, and the use of outmoded technologies. For instance, it has been established that most developers in the county use wrong or out dated technology such as the Vertical Electrical Sensitivity (VES) which is prone to wrong siting of ground water resulting to sinking of dry boreholes or boreholes which has highly mineralized water thus unfit for human consumption. Instead of using modern technology such as Electrical Resistivity Imaging/ tomography which has been known of transmitting accurate data in terms of taking photos of the aquifer and transmitting data on the water level and its quality. Another reason is the rush by most donors to construct new water projects without putting into consideration rehabilitation of the non-functional water projects (Ministry of Water and Irrigation, 2019). This has led to springing up of so many water projects within the county which are unsustainable. Additionally, (NWSS report for projections of 2016 to 2026) research indicates that lack of stakeholders' analysis during the planning cycle of the project has resulted to the community not owning the water project leading to vandalization of water projects by community members immediately after completion or rejection of the water projects by the community leading to incomplete works.

Currently, the goal of the Government of Kenya on the ongoing water sector reforms, is for water projects to achieve sustainability through proper management of the water projects. However, based on predictions from 2016 to 2026, the National Water Services Strategy (NWSS report) states that Kenya has significant obstacles in delivering clean, safe water to its citizens. It is estimated that 60% of community members living in rural areas have no access to a reliable water facility. Since there is insufficient baseline survey data to provide precise percentages, these numbers are merely estimates. According to Mwangangi (2016), Samburu County and neighboring counties continue to encounter difficulties in enlisting communities in long-term water projects, with those in the ASAL having the lowest success rates. Due to poor development of the project schedule during the project planning phase, resulting to unsustainable water projects.

According to Komujuni, Basheka, and Oluka (2022), a study was conducted on the impact of building capacities of community members on improving the health care facilities in Uganda's Mayuge district and it was discovered that the projects' ability to remain viable was greatly

influenced by the participation of disadvantaged groups, community leaders, and a focus on the aspects of capacity development that the community owned. From the literature reviewed in the research project the main focus was on involving the community and capacity building the community. It was however noted that (UNESCO, 2023), building capacity of the community is not the only aspect that guarantees sustainability of the water project but also stakeholder mapping to identify key stakeholders within the area to be empowered, development of comprehensive project schedule and identifying project costs. Thus this research highlights project planning as a gap in addressing water projects sustainability in Samburu County and sought to answer the question on: what is the influence of project planning in water projects sustainability.

1.3 Research Objectives

This research aims at achieving the objectives stated below:

i. To determine the impact of stakeholders' analysis on sustainability water projects in Samburu County, Kenya.

ii. To determine the influence of project schedule on sustainability of water projects in Samburu County, Kenya.

iii. To examine the influence of project cost on sustainability of water projects in Samburu County, Kenya.

1.4 Value of the study

The study's findings will help community engagement specialists who develop project funding concepts by providing them with information and abilities in recognizing communities' requirements and evaluating the financial support that a community requires to realize its project goals. As a result, project duplication is avoided.

The communities will also benefit in understanding the value of engaging in project activities so as to continue enjoying the benefits of the water facilities.

The county government of Samburu and the national government will also benefit from the study, by gaining knowledge and insight on the importance of project planning, factors to consider during planning and coordinating with other stakeholders during planning.

The NGOs and other donors will learn on the significance of involving the beneficiaries or community in the process of water project establishment to ensure sustainability and also the need of determining the right technology for siting water projects especially boreholes. This will ensure that donors do not only fund projects but allocate adequate funds, focus on plans and strategies that enhance sustainability of water projects.

Finally, this study will benefit students and scholars by expanding their knowledge of project design and sustainability of water project. This study can also be utilized as a source of empirical literature, citation material, and to guide future researchers on topic topics to pursue.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section discusses theories existing in project planning, additionally the literature evaluations and conceptual framework. The chapter also examines the empirical and theoretical literature on water project sustainability, as well as a conceptual framework that depicts the relevant objectives in this research study and underlines how they interrelate to make conclusions.

2.2 Theoretical Foundation of the study

This thesis was based on two theories one is the four capital model theory which is an anchor theory in this research and theory of change which is meant to change the mindset of developers and promote water security.

2.2.1 Four Capital Model Theory

The four capital model theory is the anchor theory in this research, which aims to achieve sustainability of water projects by incorporating all essential components during project planning such as human capital, social, ecological and economic during project planning phase. Social capital supports the first objective on stakeholder analysis as it refers to analysis of all primary and secondary stakeholders both in the public and private sector networks supporting social cohesion with shared level of interest, influence and participation to ensure sustainability of water projects. Natural capital refers to the second objective on project schedule which encompasses incorporating all resources that are required to ensure sustainability of a project and have positive impact to the environment. For instance, use of modern technology in borehole siting to avoid sinking of dry borehole leading to environment degradation and use of solar panels for pumping water during supply to avoid environmental pollution especially when using diesel or petrol generators (Ekins et al., 2020). Cruz et al., (2019).

Economic capital supports the third objective of project costs as it refers to all the resources in terms of monetary needed to cover the implementation, operational and variation cost of a project in order to complete water projects (Ekins, Dresner & Dahlstrom, 2020). The economic aspect

stresses the importance of sustainability of a project when using adequate resources (Cruz, Gaspar & de Brito, 2019). Human capital further should be incorporated in the entire project planning process to ensure that the well-being and productivity potential of all stakeholders has been analyzed and not only the well-bring of people but also adequate resources allocated that will sustain the project even when it is completed and communication technology to be used to ensure and sustain a productive workforce. Consideration and integration of these four capitals in water project planning, implementation, and management will contribute to long-term sustainability by assuring the availability and equitable distribution of water resources while reducing negative environmental impacts. Whereas the initiative attempted to address the public's current demands without jeopardizing the future. According to the report, in order to attain sustainability, the project should consider social, economic, ecological, and human capital. The notion is based on an essay by Ekins, Dresner, and Dahlström (2020) on sustainable development, which stated that the project's potential to be sustainable is dependent on satisfying the stakeholders' requirements.

2.2.2 The theory of change

These research also seek to instill strategies that once implemented they can cause change that is sustainable for the current and future generations (Stein & Valters, 2022). Moreover, the theory is in line with the sentiments of where any action is employed there will be automatically a reaction to the action as stated by Isaac Newton in his third law of motion (Jackson, 2023), and this can apply to this study once stakeholder analysis is done where all stakeholders are mapped within the intended project area according to their level of interest, influence and impact in participation in the project planning phase then this will result to sustainability. Stakeholders' level of interest refers to stakeholders who have an interest in water sector and once involved they will assist to change the mindset and enhance sustainable water practices, stakeholders with high level of influence refers to opinion leaders within the society who can cause change by embracing the project hence resulting to the community following their deeds and stakeholders level of participation refers to stakeholders who's participation in the project will have an impact such as the community at the bottom of the pyramid who are the main beneficiaries of the project.

Nevertheless, in the 1990s, Weiss (Weiss.,1998) suggested that the theory of change provides a comprehensive picture or roadmap of a project schedule indicating resources to be involved,

communication methods to be used and the project timelines (Janzen, Ochocka & Stobbe, 2016). Thus, this theory supports the second variable on developing comprehensive project schedule which not only contains the list of activities to be conducted and the timeframe but also the resources to be used to ensure water projects viability. For instance, selecting the right technology during planning phase to avoid siting of dry boreholes and highly mineralized water. This theory encourages the shift from using Vertical Electrical Sensitivity (VES) which is prone to wrong siting of ground water resulting to sinking of dry boreholes or boreholes which has highly mineralized water therefore unfit for human consumption to us of Electrical Resistivity Imaging/ tomography which has been known of transmitting accurate data in terms of taking photos of the aquifer and transmitting data on the water level and its quality.

The theory also encourages shift from using outdated water systems to use of modern and advanced technology in the water sector. It also facilitates the use of technological applications to allow project managers and water users coordinate activities. Water technologies have allowed proper use of water resources leading to high case of project sustainability.

Moreover, this theory supports objective three on Project costs, by encouraging developers to do comprehensive budgeting during the planning phase which entails looking at the implementation costs, operational costs and variation costs. Most developers assume that water projects ends immediately after construction of the water projects but fail to realize that they need to also factor for the operational costs of the water projects after project closure. This will enhance sustainability of water projects and put an end to development of incomplete water projects or non-operational water projects before five years from the project closure period.

However, the negative side of this theory is that it has an hypothesis that when a certain input is incorporated into a project it will automatically channel into a positive output. This can sometimes happen but not all the time (Golf Mulgan., 2020). For instance, groundwater has been seen as the new kid in the block in increasing water accessibility but majority of the developers have not thought through of how these water projects can be made sustainable without sinking so many boreholes or venturing into so many water projects.

Another problem with the theory of change is that it limits the potential of learning. For instance, different projects tend to have different factors that will determine the sustainability of the project.

It is encouraged that all project managers or developers to always generate additional information about what will make the project work and why (Golf Mulgan., 2020). For instance, most developers adopt borehole sinking as an alternative method for increasing water in various regions but fail to think through that groundwater is unsustainable and there are various methods that can be used to increase water security.

2.3 Empirical Literature

According to Virjee and Gaskin (2020) sustainability is defined as, the necessity that is available for those who are available within a certain area and will also cater for the needs of the future generations. Water projects sustainability can be measured through the long term performance, reachability to water source and upkeep of water project. However, majority of water projects in developing countries do not attain the criteria of being sustainable (Afgan, et al., 2023). Research shows that there is need to come up with standard regulations for water projects on how they should be constructed to meet the user needs even after closure of a project (Afgan, et. Al., 2023).

Further, research conducted by Huggins show that their still exist a gap in defining sustainability of water projects especially in dry areas or areas that experiences extreme weather patterns therefore there should be regulations in place both at the county and national government that will act as instrument in guiding developers in implementing sustainable water projects (Huggins, 2020). To maximize the odds of achieving water security, government agencies must collaborate closely with relevant stakeholders to design measures that ensure these elements are in play. Numerous scholars have attempted to bridge the gap and define project sustainability, but none of the definitions have been successful.

Research was conducted on how community water projects impact the success of various sectors such as finance, employee's management, and modern technology. During the primary data collecting the researcher employed descriptive research and stratified random sampling in selecting viable water projects. The research revealed that finance, employee's management, and modern technology have a positive influence in ensuring there is improved performance and water projects sustainability.

In Nyeri, a study was done on determining the positive impact that community engagement have in implementation of a project and its performance on projects related to water and sanitation. The

study included 94 people who answered the questions and were not previously involved in the pilot study, and the individuals who were chosen included the following water project managers, government officials, and community leaders. The respondents were picked using a stratified random sampling design. The research findings highlighted that involvement of community members during the implementation of water projects has a notable impact in improving any project or designing the project to meet the stakeholders needs since when the community members within the area are not factored-in in most projects decision the project might be rejected by the community leading to failure of the project.

A study was done on investigating the impact stakeholders' participation has on environmental evaluation of logistics master plan in the northern economic corridor of Kenya (Awino., 2019). The information collected was then assessed and the conclusions in the study showed that stakeholder mapping and community engagement in the process of data collection especially when putting up projects that have an impact to the environment enable the researcher to get both positive and negative views concerning the project and what the people need. For instance, in putting up construction projects it is important to consider the environmental surrounding to know how much impact the construction will have for example in terms of noise if it will affect the residence and in terms of soil erosion or dust going into the environment causing pollution.

Furthermore, a research was conducted on the impact of local community stakeholders on large water projects (Di Maddaloni and Davis., 2017). The research was carried out on water facilities projects in Canada, with a strong emphasis on community involvement. According to the findings, community ownership of the project allows the community to have control over their own resources. The study also found that conducting stakeholder interviews during the project's genesis phase improves project performance. However, the study failed to demonstrate the methodological technique employed in conducting the research, indicating a methodological gap.

A multinational software company that deployed geographically distant teams one based in the UK and the other in India constructed sophisticated software systems for its clients conducted research on managing schedule length (Ahmedshareef., 2015). The projects employed component-based model and collected date using mixed method approach. The research conclusions showed that most of the project delays were caused by implementation of ideas which were not incorporated in the plan during the planning phase. It emerged that most of the delays came from

external parties who were not part of the planning team bringing in new ideas during implementation, conflict as a result of strained resources and competition from different projects (Ahmedshareef., 2015).

A study was conducted in an attempt to link a vital components of a project with the creation of a timetable (Harikrishnakumar., 2017). Case study research was used to validate the proposed technique. The method used in data collection involved qualitative data collection method and the results obtained from the respondents was then analyzed using descriptive research to determine the impact of a project schedule (Harikrishnakumar., 2017). The research findings indicated that development of a project schedule saves on time and reduces project delay and it also helps to meet the need of the end users objective.

A study comparing project costs in site management between Finland and Vietnam was carried out by Nguyen (2021). The study's findings suggested that both direct and indirect factors may have an impact on a project's cost. Human resources, design, material costs, and risk are some of the most important variables that could have an overall impact on the project's cost. During a building project, salaries for laborers, designers, and supervisors can add up to a significant sum of money. It is important to take this into account to avoid a human resource problem later on in the project. If the owner and the contractor cannot agree on a design change during their initial meeting, it is another aspect that might cause a project's cost to vary (Nguyen., 2021).

Additionally, in Elgeyo Marakwet a research was conducted on how effective management of cost affected the projects that involved building (Onyango., 2021). The research employed the following theories technological acceptance model, agency cost, theory of constraints, and project management. The figures were then collected by use of feedback form which contained close ended questions. The records were then scrutinized using descriptive research and inferential analysis. The outcomes indicated that the dependent variables were statistically important at various confidence levels. The study discovered a statistically substantial link between the two variables, indicating that cost management influences construction project.

2.4 Summary of literature and Research Gaps

Table 2. 1

Summary of the Studies and Knowledge Gaps

Variable	Author & Year	Title	Findings of the Study	Research Gaps	Focus of the Study
Sustainability of water projects	Rutto (2017)	Community Water Supply Projects in Kipkelion East Constituency, Kenya: Performance and Sustainability	The study's findings revealed that staff training, managerial impact, technological, financial, and social-cultural impact all have an impact on the performance and sustainability of community water initiatives.	The research displayed a methodological gap by use of stratified random sampling to select water projects	This research will bridge the methodological gap by using purposive sampling in selecting water projects

Sustainability of water projects	Kamau, D. G. and Mungai, J. N. (2019)	Water and sanitation project implementation and sustainability in Nyeri County, Kenya	The findings of the research informed that key stakeholder Participation and involvement significantly influences the Sustainability of Water and Sanitation Projects.	The study was guided by McKinsey 7s model, Porter's value chain mode, Mintberg's organizational model and Theory of change theories, therefore, creating theoretical gaps.	To mitigate the theoretical gap the study will employ theory of change as an anchor theory for the study
Stakeholder Analysis	Awino (2019)	Analyzing stakeholder participation in the strategic environmental evaluation of Kenya's northern economic corridor logistics master plan	According to the study's findings, stakeholder analysis revealed the participants' interests, with 62% showing an interest in the logistics sector, such as highways.	The study uses structural equation modeling for data analysis while the current study would employ descriptive statistics and inferential statistics, thus presenting a methodological gap	The study will adopt both descriptive statistics and inferential statistics to help understand the findings of the study, and show the relationship

				in the approach of analysis.	
Stakeholder Analysis	Di Maddaloni and Davis (2017)	Local community stakeholders' influence on large-scale water projects	The study also indicted that stakeholder analysis at the project inception phase increases the performance of the project	The study failed to show the methodological approach used in conducting the research, thus evidently presenting a methodological gap.	The study will use questionnaires for collecting Data and will do detailed analysis of data.
Project Schedule	Harikrishnakumar (2017)	Consider Multiple Critical Path Scenarios In Project Network: A Practical Approach To Project Scheduling	The study concluded that use of Multiple critical path scheduling approach in scheduling jobs can facilitate obtaining near optimal solutions.	The study employed an experiment case study thus evidently presenting a methodological gap.	To mitigate the methodological gap this study will employ descriptive research

Project Schedule	Ahmedshareef., (2015)	Controlling Schedule Duration During Software Project Execution; A case study of United Kingdom	A multinational software company that deployed geographically distant teams one based in the UK and the other in India constructed sophisticated software systems for its clients conducted research on managing schedule length	The study's flaw is that it was done in United Kingdom, therefore creating contextual gaps	To mitigate the contextual gap the study will be conducted in Samburu County, Kenya
Project Cost	Onyango (2021)	Cost management and project implementation in Elgeyo Marakwet County, Kenya.	The study found out that the independent variable; cost management has a direct and indirect influence on the construction	The study was grounded on technology acceptance model theory, agency cost theory, theory of constraints and project	To mitigate the theoretical gap the study will employ theory of change as an anchor theory for the study

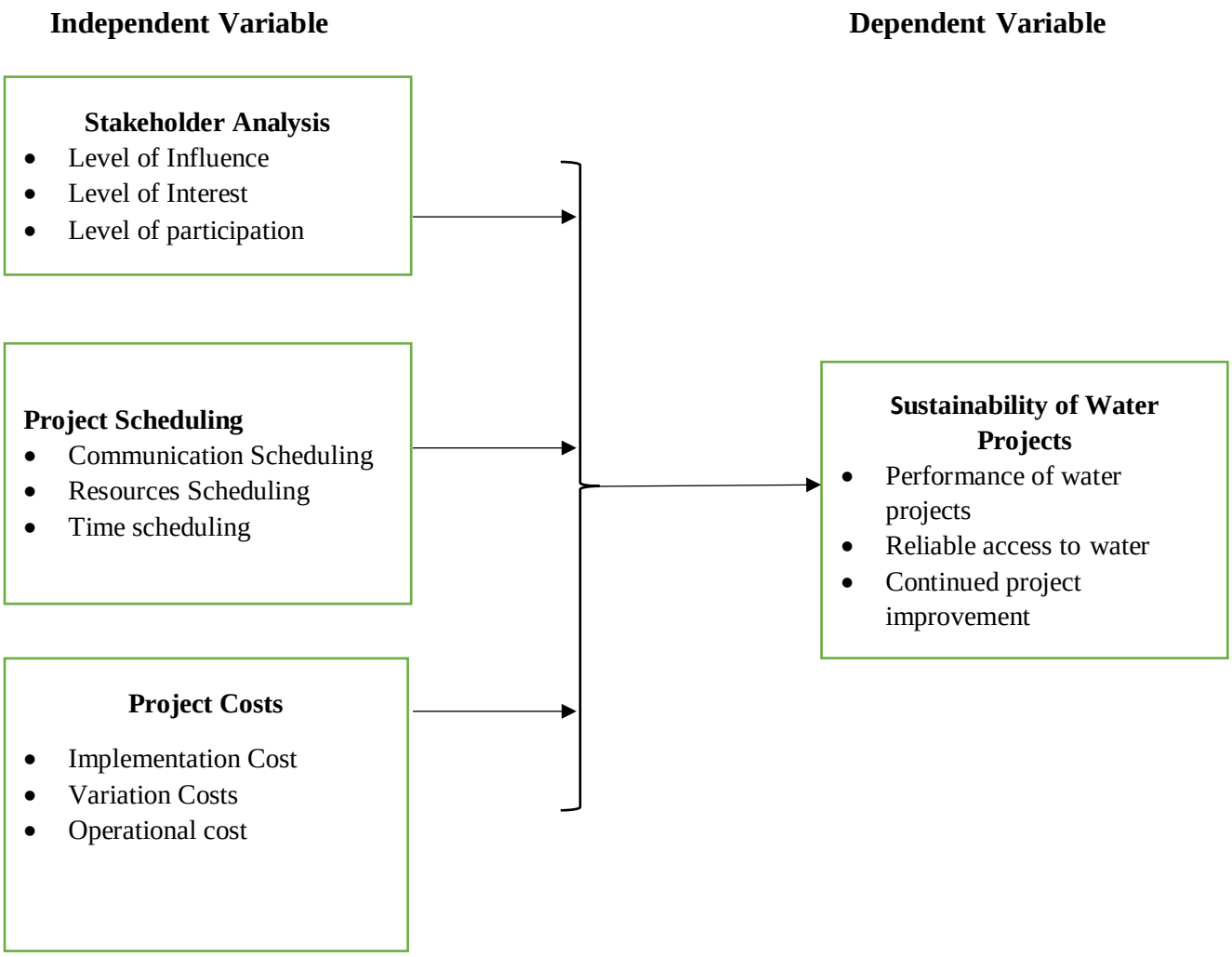
			projects management.	management theory. therefore, creating theoretical gaps.	
Project Cost	Nguyen (2021)	Project Cost Study In Site Management- Finland Vs Vietnam	The study's findings suggested that both direct and indirect factors may have an impact on a project's cost and therefore it is important to take into account all human resources to avoid problem later on in the project.	The study's flaw is that the study did a comparison between Finland Vs Vietnam therefore creating contextual gaps.	To mitigate the contextual gap the study will be conducted in Samburu County, Kenya

2.5 Conceptual Framework

It is an illustration that depicts the association between the variables under consideration. The conceptual framework depicts the relevant objectives in this research study and demonstrates how they interrelate to draw conclusions. The study's independent variables include stakeholder participation, technology selection, and project funding. Sustainability of water projects which is the study's dependent variable, will be assessed in terms of continuous water flow, reliable access to clean and safe water, performance of water projects, and ongoing repairs and improvements to the water projects.

Figure 2.1 1

Conceptual Framework



CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section sets out how the study was conducted. The chapter discussed the research design, intended study population, sampling technique, research analysis, and lastly ethical considerations.

3.2 Research Design

This research employed descriptive research design due to the large group of people it targeted (Lugo., 2018) and so as to gives permission to the researcher to gather information on the variables without any alteration.

3.3 Target Population

The research targeted three major completed water projects namely, Opiroi Catholic water project, Longewan water project and Lolkunyuani water project, in the three (3) completed major water projects within Samburu Central, Samburu North and Samburu East Sub-Counties in Samburu County which have been completed and have been operational for the past five years. The information that was collected was on project planning and water projects sustainability. The respondents comprised of water project management committee members, opinion leaders (The area chief, village elders), and community beneficiaries (women) of the water project. The women who were targeted as project beneficiary within the area were chosen using purposive sampling as they are believed to have sufficient information about the water project within the area, planning process and sustainability measures. The study targeted groups was as revealed in the table 3.1.

Table 3. 1

Target Population Distribution

S/No.	**Water Project**	**Target Population**			
		Project Management Committee	Project Beneficiaries (women)	Opinion Leaders (The area chief, village elders)	
1.	Opiroi Catholic water project	15	25	4	
2.	Longewan water project	15	25	4	
3.	Lolkunyuani water project	15	25	4	
	Total	45	75	12	**Total** 132

Source: USAID-2020

3.4 Sample Design

This process involved picking a representation from a large group of the population to be included in the response group (Bryman 2016). This study employed sampling when doing research to get manageable size of the population to make it easy to collect data. The targeted group was stratified as per groupings of the respondent's Project Management Committee, Opinion leaders & project beneficiaries (women). This study involved a sample size of 99 respondents who did not participated in the pilot study. The researcher utilized a purposive sampling approach to select the participants (Fischer., 2020) that were most likely to yield useful information and to ensure that the selected sample is unbiased and it is the representation of the entire population in question.

Table 3. 2

Sample Size Distribution

S/No.	**Water Project**	**Sample Size Population**			
		Project Management Committee	Project Beneficiaries (women)	Opinion Leaders (The area chief, village elders)	
1.	Opiroi Catholic water project	10	20	3	
2.	Longewan water project	10	20	3	
3.	Lolkunyuani water project	10	20	3	
	Total	30	60	9	**Total** 99

Source: USAID-2020

3.5 Data Collection

This research used structured closed-ended questionnaire which contained Likert scale and closed-ended questions with prior potential answers that the respondent can select. Lamm and Lamm (2019) define primary data as information collected for the first time from its original source. The form which contained the questions was split into 3 parts: one for demographic data, two on the dependent research elements - water sustainability - and three on the independent variables – project planning aspects.

3.5.1 Pilot Study

The research instrument went through pilot testing to gauge its capability and usefulness in collecting valid and reliable data from the targeted respondents. According to Taherdoost (2022) pilot study that employs 10% of participants were deemed fit and appropriate before embarking on the final data collection. The participants in the pilot study were not permitted to take part in the main study to preserve credibility of the findings.

3.5.2 Validity of the instruments

It is the amount of accuracy a method analyses what it is intended to analyse. Taherdoost (2016) defines validity as the measure to which obtained data results following data analysis are an accurate depiction of the phenomenon under study. According to Litosseliti (2018), requesting expert advice and judgment can improve the validity of a study instrument.

3.5.3 Reliability of the instruments

Instrument's reliability is focused on giving same and consistent results each and every time that instrument is administered onto the same object (Chad & Idris, 2017). The researcher used internal consistency technique which evaluates the extent that the test items in the construct produced similar results every single time that they are put to use. This study also employed the use of Cronbach Alpha whose alpha value ranges from 0 to 1, such that when the reliability keeps increasing as the Alpha values also increase. Cronbach Alpha coefficient that ranges of 0.7 and above deemed the instrument sufficient in collecting reliable data.

Table 3. 3

Reliability of Instrument

Variable	**Number of Items**	**Cronbach Alph**	**Comment**
Sustainability of water projects	5	.881	Reliable
Stakeholder Analysis	5	.881	Reliable
Project Schedule	5	.881	Reliable
Project Cost	5	.881	Reliable
Overall Score	**20**	**0.881**	**Reliable**

Source: Research data (2023)

The pilot test results indicate that all the Cronbach Alpha test results were above 0.7 which means that the instrument is reliable thus ideal in carrying out this research study.

3.5.4 Data Collection Procedure

When collecting data, the researcher got permission to conduct research first by obtaining data collection permit from NACOSTI as well as an introductory letter from the university. Three research assistants were employed–one for each of the completed water projects within Samburu County. The Research Assistant were trained on the data collection procedures, data recording,

communicating and acceptable 40 research ethics. Each research assistant was given questionnaires and reported daily to the researcher to go through the answers provided during the process. The research exercise was carried out within a span of one week, before embarking on data coding and analysis.

3.6 Data Analysis

The quantitative data that was collected through structured instrument and the questionnaires was cleaned, sorted, edited and entered in SPSS (v.25) for further analysis. Each questionnaire was numbered and the responses were given a numerical code that helped in understanding the responses.

Descriptive analysis was then used to analyze means, frequencies, and std. deviation. The researcher also performed correlations and regressed the variables on each other to demonstrate the link and magnitude of the variables.

The study followed this Simple Regression Model:

$$Y= \beta 0+ \beta 1X1+\beta 2X2+\beta 3X3 + \varepsilon$$

Where Y= Sustainability of Water Projects

B0 = Constant

β1, β2, β3 and β4 are Coefficients of project planning

E = error term

X1= Stakeholder analysis

X2= Technology Choice

X3= Project Funding's

The study conducted diagnostics tests to ensure that the assumption made by the regression model is not violated. The specific tests that was conducted included multi-collinearity

Assumption test that obtained the VIF values; Normality test through using the Shapiro-Wilk test and obtain p-values, Linearity test were performed to investigate and ensure that the data was normally distributed, Homoscedasticity Assumption test was conducted to validate the appropriateness of the linear regression analysis and Autocorrelation that checked for serial correlation in the data series using Durbin Watson statistic.

3.7 Ethical Considerations

The first step that was used before data collection was to sought permission from the water projects management team, the officers in Samburu County Government and the local administrative officers. A field permit was obtained from NACOSTI that gives credibility to research work. The research ensured that participation in the research was on willing basis and no one was coerced into participating, by ensuring all willing participants sign a consent form. The study upheld openness, transparency and honesty in reporting research objectives, methods and results. The study was careful not to mix views or policies of the findings. All material references to be used in the research was acknowledged accordingly to avoid instances of plagiarism and all information collected was kept confidential. The findings from the data collection process was then presented without manipulation in favor or interest of the outcomes.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction

This section of the paper shows the results from the research, data analyzed and discusses the findings from the research. The results are based on SPSS analysis made on project planning and water projects sustainability, and it was done in terms of analyzing inferential statistics and descriptive statistics through correlation and regression analysis. Tables were used to display the results.

4.2 Response Rate

The set of questions that were distributed was 99, however, only 90 of them were answered and given back, making the response rate of 90.9%. In addition, Lugo (2018) stipulates that a response of 70% or more is suitable for use in research, hence 90.9% is suitable for use in the study and so findings can be generalized to cover the full population.

4.3 General Information

The researcher obtained generic information about the participants' gender, age, project position, and academic qualification from them.

4.3.1 Gender

Table 4.1 displays the gender results acquired during data collection:

Table 4.1

Gender

Gender	Number	Percentage
Male	37	33.3%
Female	53	66.7%%
Total	**90**	**100%**

According to the results of table 4.1, 53 of the 90 partakers in the research were female while 37 were male. It came out clear that the number of women who participated in the study was higher than the number of men since the study concentrated on women as project beneficiaries because the Samburu believe that water belongs to women.

4.3.2 Respondents Ages

Table 4.2 display data obtained from the participants in terms of their age:

Table 4.2

Age

Age Bracket	Number	Percentage
20-30 Years	20	40%
30-40 Years	36	27.7%
40-50 Years	25	22.2%
50 + Years	9	10%

The study revealed that, 40% of the study participants were among the participants who were aged between of 30 and 40, followed by 27.7% who were aged 40 and 50, 22.2% who were between the age of 20 and 30, and 10% who were above 50 of age. The bulk of responders were between the ages of 30 and 40, indicating that the majority of the population at that age has completed their studies and is able to actively participate in projects. The age range indicates that the information for the source would be variable.

4.3.3 Academic Qualification

The table 4.3 highlights the level of education of the participants as shown below:

Table 4.3

Academic Qualification

Academic Qualification	Number	Percentage (%)
Primary level	20	22.2%
Secondary level	25	27.8%
Certificate holder	24	26.7%
Diploma holder	14	15.6%
Degree holder	6	6.7%
Masters holder	1	1.1%
PhD holder	0	0%

The majority of participants (27.8%) had completed secondary school, followed by certificate holders (26.7%), while 22.2% had completed primary school. According to the statistics, 15.6% of respondents held diplomas, 6.7% held degrees, and only 1.1% held Masters degrees. Because most community members in the county lack knowledge of higher education, the majority of responders have obtained at least a secondary degree of education. Furthermore, because many of the respondents had limited academic qualifications, the researcher had to take the time to read and interpret the instrument so that they could reply and enable for the collection of excellent data for the study.

4.3.4 Position held

Participants in the study were given the task to identify which title they held in the water projects and they gave their responses as highlighted in table 4.4.

Table 4.4

Position held

Position Held	Percentages
Project committee member	33.3%
Project beneficiary	56.7%
Opinion Leader (The Area Chiefs, Village Elders)	10%

The results for position held by the respondents show that 56.7% of them were project beneficiary committee members in the water projects, 33.3% of them were water projects committee members, 10% were opinion leaders within the area. The differences in the position that the respondents held gives them a different view on planning for the water projects and sustainability which provides the study with different perspectives.

4.4 Tests for Statistical Assumptions

Following the completion of linear regression assumption testing, multiple regressions was then calculated. Followed by Normality, linearity, multi-collinearity, homoscedasticity, and autocorrelation tests were performed.

4.4.1Normality Assumption Test

Table 4. 5

Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Stakeholder Analysis	0.192	90	0.000	0.893	90	0.000
Project Schedule	0.113	90	0.007	0.965	90	0.015
Project Cost	0.168	90	0.000	0.909	90	0.000
Sustainability Of Water Project	0.201	90	0.000	0.825	90	0.000

a. Lilliefors Significance Correction

The normality at the 5% level of significance was tested using Shapiro-Wilk test. In all cases, the estimated significant value was smaller than the P-critical value of 0.05, indicating a normal distribution or flow of the data.

4.4.2 Linearity Assumption Test

Table 4.6

Linearity Test

			Sum of Squares	df	Mean Square	F	Sig.
Sustainability Of Water Projects * Stakeholder Analysis	Between Groups	(Combined)	34.165	15	2.278	22.305	0.000
		Linearity	**27.739**	**1**	**27.739**	**271.652**	**0.000**
		Deviation from Linearity	6.426	14	0.459	4.495	0.000
	Within Groups		7.556	74	0.102		
	Total		41.721	89			

To investigate and guarantee that the data was normally distributed, linearity tests were done. Means comparison tests were performed, and the results revealed that them was normality in data distribution, as validated by the linearity test. The estimated linearity value is smaller than the p-critical value of 0.05, confirming normality.

4.4.3 Multi collinearity Assumption Test

Table 4. 7

Multi collinearity Test

Coefficients[a]					
		95.0% Confidence Interval for B			
				Collinearity Statistics	
Model		Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	-0.342	0.725		
	Stakeholder Analysis	0.119	0.535	0.288	**3.477**
	Project Schedule	0.281	0.590	0.379	**2.636**
	Project Cost	0.069	0.441	0.399	**2.504**

a. Dependent Variable: **Sustainability of Water Projects**

To confirm the multi collinearity test, the tolerance levels and the variance inflation factor (VIF) were utilized, as shown in the table below. Any value above 10 in VIF implies multi-collinearity, which is the industry standard. However, the analytical findings derived from the data set show low VIF values for all variables, as shown in table 4.8. The VIF factor for stakeholder analysis was 3.477, the project timeline was 2.636, and the project cost was 2.504.

4.4.4 Homoscedasticity Assumption

Table 4.8

Homoscedasticity Test

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
Sustainability Of Water Projects	Based on Mean	7.385	8	10	.002
	Based on Median	7.385	8	10	.002
	Based on Median and with adjusted df	7.385	8	2.000	.125
	Based on trimmed mean	7.385	8	10	.002

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: **Sustainability Of Water Projects**

b. Design: Intercept + **Stakeholder Analysis + Project Schedule + Project Cost + Stakeholder Analysis * Project Schedule * Project Cost**

Levenes test of equality of error variance was used to test homoscedasticity assumption. The p-value determined across all the variables was less than critical p_0.05 prompting a failure to reject the null hypothesis as indicated in the table 4.9.

4.4.5Autocorrelation Assumption Test

Table 4. 9

Autocorrelation Test

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.518[a]	0.268	0.242	0.94814	0.268	10.494	3	86	0.000	1.906

a. Predictors: (Constant), **Project Cost, Project Schedule, Stakeholder Analysis**

b. Dependent Variable: **Sustainability of Water Projects**

Acceptable autocorrelation levels should lie between 1.5 and 2.5. Durbin-Watson test was used to establish the autocorrelation assumption test. Stakeholder Analysis results showed 1.906 as the Durbin –Watson value indicating no autocorrelation.

4.5 Descriptive Analysis

Descriptive statistical analysis was performed to show, summarize and describe meaningful information and patterns in the data by analyzing the mean which measures central tendency while spread was measured by the variance, minimum and maximum values as well as the standard deviation.

Table 4. 10

Descriptive Statistics

		Stakeholder Analysis	**Project Schedule**	**Sustainability Of Water Projects**	**Projects Cost**
N	Valid	90	90	90	90
	Missing	0	0	0	0
Mean		4.11	3.85	4.34	4.42
Median		4.33	4.00	4.50	4.67
Mode		5	5	5	5
Std. Deviation		0.614	0.719	0.685	0.583
Skewness		-2.120	-1.564	-2.445	-1.947
Std. Error of Skewness		0.254	0.254	0.254	0.254
Kurtosis		4.956	2.956	5.918	4.386
Std. Error of Kurtosis		0.503	0.503	0.503	0.503
Minimum		2	1	2	2
Maximum		5	5	5	5

Table 4.5 revealed that stakeholder analysis had a mean of 4.11 with a std. deviation of 0.614, project schedule recorded a mean of 3.85 with a std. deviation of 0.719, water project sustainability had a mean of 4.34 with a std. deviation of 0.685, and project cost had a mean of 4.42 with a

standard deviation of 0.583. The data was skewed in all cases, which was addressed using log transformation.

4.6 Inferential Analysis

In this section the analysis involved the correlation and regression analysis

4.6.1Correlational Analysis

Table 4. 11

Correlation Analysis

Correlations

		STAKEHOLDER ANALYSIS	PROJECT SCHEDULE	PROJECT COST	SUSTAINABILITY OF WATER PROJECTS
Stakeholder Analysis	Pearson Correlation	1	.724**	.669**	.727**
	Sig. (2-tailed)		0.000	0.000	0.000
	N	90	90	90	90
Project Schedule	Pearson Correlation	.724**	1	.503**	.773**
	Sig. (2-tailed)	0.000		0.000	0.000
	N	90	90	90	90
Project Cost	Pearson Correlation	.669**	.503**	1	.633**
	Sig. (2-tailed)	0.000	0.000		0.000
	N	90	90	90	90
Sustainability Of Project	Pearson Correlation	.727**	.773**	.633**	1

Sig. (2-tailed)	0.000	0.000	0.000	
N	90	90	90	90

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

The strength and direction of association between variables was determined through the use of Pearson correlation analysis. A strong positive correlation of Project Schedule 0.773, Project Cost 0.633, and Stakeholder Analysis 0.727 was exhibited between sustainability of water project and stakeholder analysis, project schedule and project costs respectively. The results are as indicated in the table below. The findings adopted the Huber (2014) classification and analysis of linear relations that studies exhibit. The categories are such that ranges of 0.1-0.29 are interpreted as weak relations; moderate relations lie between 0.3 and .49 as strong relations are for r- values ranging from 0.5 to 0.9. Using this categorization then project schedule had the strongest linkage to water project sustainability. The second variable is stakeholder analysis and the third is project cost as based on the obtained r values.

4.6.2 Results for Multiple Regression Analysis

This test was then carried out to determine the impact of project planning on the long-term viability of water projects in Samburu County. The purpose of the analysis was to compare the impact of the independent variables, stakeholder analysis, project timeline, and project cost, on the dependent variable, water project sustainability.

4.7 Model Summary

Table 4. 12

Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.884[a]	**.782**	**.775**	.325	.782	102.986	3	86	.000

a. Predictors: (Constant), **Project Cost, Project Schedule, Stakeholder Analysis**

The coefficient of correlation is 0.884, indicating a positive association between the variables and their significance. The corrected R was 0.775, showing that any changes in Samburu Central, Samburu North, and Samburu East sustainable water projects in Samburu County may be traced back to project planning aspects (independent variable). As a result, the R2 and R coefficients show a strong association between the dependent and independent variables. The R2 value was discovered to be 77.5%, indicating that the sustainability of the water project varies as a result of changes in the independent components. Other factors are believed to be the source of the 24.5% change in the dependent variable in addition to those in the model.

4.8 Regression Model

Table 4. 13

Regression Model

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	32.636	3	10.879	102.986	.000[b]
	Residual	9.085	86	.106		
	Total	41.721	89			

a. Dependent Variable: **Sustainability Of Water Projects**

b. Predictors: (Constant), **Project Cost, Project Schedule, Stakeholder Analysis**

Table 4.13 displays the ANOVA results with the significance level set at 0.05. The computed F is 102.986, which is more than the F critical value, indicating that the model fits well and can be used in the study. The test findings revealed that the p-value was 0.000, which is lesser than the p-critical of 0.05, showing that at least one aspect of project planning has a substantial effect on the sustainability of water projects in Samburu County.

4.9 Regression model coefficients

Regression coefficients was undertaken in order to interpret the regression equation results and application. The analysis output is as shown in the table 4.14.

Table 4. 14

Regression Model Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	.192	.268		.715	.477	-.342	.725
	Stakeholder Analysis	.327	.105	.293	3.124	.002	.119	.535
	Project Schedule	.436	.078	.458	5.603	.000	.281	.590
	Project Cost	.255	.094	.217	2.725	.008	.069	.441

a. Dependent Variable: **Sustainability of water Project**

The results of Table 4.14 show that if all project planning variables are held constant, the sustainability of water projects in Samburu County is 0.192. Stakeholder analysis (p-0.002), project duration (p-0.000), and project cost (p-0.008) all had statistically significant effects on the long-term viability of the water project (p-0.008). All of the independent variables were significant at 95% confidence since their computed critical values were less than the p-critical value of 0.05. The regression equation as a result of the analysis would be:

$Y= 0.192+ 0.327X1+0.436X2+0.255X3 + \varepsilon$

Where Y= Sustainability of Water Projects

$\beta 0$= Constant

$\beta 1$, $\beta 2$, $\beta 3$ and $\beta 4$ are Coefficients of project planning

E = error term

X1= Stakeholder analysis

X2= Technology Choice

X3= Project Funding's

If all of the independent variables in the model are equal to zero, the change in the water project's sustainability will be 0.192.A unit change in stakeholder analysis results in a 0.327 unit change in project sustainability; a unit change in project timeline results in a 0.436 unit change in project sustainability; and a unit change in cost results in a 0.255 unit change in water project sustainability.

4.10 Discussing the Research Findings

The study looked at how project planning influences the longevity of water projects in Samburu County, Kenya. The independent factors of the study were stakeholder analysis, project timing, and project cost, while the dependent variable was water project sustainability.

Correlation studies revealed a very high positive association between stakeholder analysis and water project sustainability. These findings were consistent with Mojtahedi and Oo's (2020) assertion that investing in stakeholder analysis is critical in water resource management and infrastructures by conducting stakeholder mapping to identify stakeholder level of interest and influence in a project (Mojtahedi & Oo, 2020). Further, an outstanding correlation result was noted between project schedule and sustainability of the water project. These research findings were related to the study conducted by Mustafa and Yaakub (2018) who noted that project schedule had an vital role to play in the performance of any project additionally, Anjum (2018) noted that incorporating project schedule with effective components such as communication, adequate resources and verified timelines will automatically improve the performance of a projects. Finally, project cost also indicated a strong correlation relationship with water projects sustainability. The findings displayed similarity to the research conducted by Rao (2023) that revealed that project cost such as putting together implementation costs, budgeted costs and variation costs automatically leads to sustainability of projects. Dinnie and Holstead (2018) further states that financial policies development is important in ensuring sustainability of projects.

Regression modeling results showed that the adjusted R^2 as 77.5% depicting that the independent variables are causing 77.5% disturbance in the dependent variable though the rest 25.5% disturbance emanates from other factors beyond the model. In general, the investigated findings indicate that project planning has a considerable impact on the sustainability of water projects. These findings are comparable to those of Awino (2019), who found that stakeholder analysis revealed the participants' interests, with 62% showing an interest in the logistics sector, such as highways. Furthermore, Kamau and Mungai (2019) found that key stakeholder mapping is important in achieving sustainability of projects especially those related to water. Furthermore, Rutto (2017) finds that training of employees, good leadership, use of right technology, adequate funds, and good working and social environment have a positive Impact leading to success and longevity of community water projects. Further the findings are similar to Macharia (2020) that highlighted project schedule adoption is highly effective when good communication technology is employed by all relevant stakeholders. Similarly, Siborurema, et al. (2020) noted that project cost is a fundamental concern for any project and can be used designing of a project design and budgeting.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Summary of the findings of the research were then discussed in this section of the research paper. The chapter gives sections including the summary of findings, the drawn conclusions and the recommendations and suggestions for both practice and policy. The chapter ends with a section where suggestion for future research areas is given.

5.2 Summary of Findings

This research aim was to determine the influence of project planning on the water projects sustainability in Samburu County, Kenya. The three criteria considered in project planning were stakeholders' assessments, project timetable, and project expenses. The researcher used a descriptive research approach and focused on three water projects in Samburu County's Samburu North, Samburu East, and Samburu Central Sub-Counties. The three water projects were the Opiroi Catholic water project, the Longewan water project, and the Lolkunianyi water project, with information gathered from water project management committees, project beneficiaries (women), and opinion leaders.

5.2.1 Stakeholder Analysis and Sustainability of water projects

By considering the results of the p-values and the r value, the researcher discovered that stakeholder analysis positively and considerably improved the sustainability of water projects. Stakeholder analysis included elements of understanding the influence of different stakeholders is important for effective stakeholder management in water projects, all stakeholder being informed about the progress and outcome of the water project leads to project success, stakeholders' mapping has helped in analyzing various stakeholders according to their interest, influence and potential impact for water projects sustainability, the level of stakeholders involvement in water projects is a crucial factor that influences project outcomes and the level of stakeholders' interest in water project greatly impact the projects overall success of sustaining water projects in Samburu North, Samburu Central and Samburu East Sub-Counties within Samburu County.

5.2.2 Project Schedule and Sustainability of Water Projects

The project schedule was discovered to have notable impact on ensuring the water projects sustainability. This is based on the regression analysis results in the form of p-values and the correlation analysis, which reveal positive associations between the variable and the sustainability of the water project. The project schedule included elements such as regular planned updates or reviews to the project schedule, which led to the sustainability of water projects, appropriate technology selection has become a primary concern of our project committee members, communicating the project schedule to all members and stakeholders', utilizing innovative technologies that result in long-lasting projects, and designating timelines for each task in the project schedule, which led to high susceptibility.

5.2.3 Project Cost and Sustainability of Water Projects

Project cost established that this variable also leads to sustainability of water projects. The variable covers aspects of including costs management affect project implementation, operational cost are used for maintenance of water project, the budgeted cost for the water project is partly contributed by the community members, poor cost management affect project implementation quality and an adequate budget allocation improves viability efforts of project related to water hence higher cases of sustenance of the water projects. The elements of project cost were strongly correlated to water projects Sustainability in Samburu County based on the correlation analysis.

5.3Conclusion

Water project sustainability includes characteristics such as project performance, consistent access to water, and ongoing water project improvement. The water projects in Samburu North, Samburu Central, and Samburu East within Samburu County used project planning aspects such as stakeholder analysis, project schedule, and project cost to accomplish this.

The study concluded that project planning aspects such as stakeholder analysis resulted in higher levels of sustainability for the water project. Respondents agreed that understanding the influence of various stakeholders is important for effective stakeholder management in water projects, that keeping all stakeholders informed about the progress and outcome of the water project leads to project success, that stakeholders' mapping has aided in analyzing various stakeholders based on

their interest, influence, and potential impact for the water projects sustainability, and that the level of stakeholders' involvement. This means that stakeholder mapping and analysis are required to increase project sustainability.

According to the analysis, the project timetable improved the water projects sustainability. Participants in this study stated that our project committee members' key worry has become the regular planned updates or reviews of the project schedule, which leads to the sustainability of water projects and the right selection of technology. The study also concluded that project costs, including cost management, operating expenses, and the budgeted cost for the water project, increased the water project's sustainability. This suggests that project scheduling improves the likelihood of project sustainability, and hence project managers should strive to conduct extensive project scheduling throughout project planning. The findings highlight the need of utilizing committee members with diverse management abilities for project success and maintenance.

5.4Recommendations for Policy and Practice

The report recommends that water projects to use project planning aspects to ensure the project's operations and performance. Water projects should use project scheduling since it has the most influence on project sustainability. It should include characteristics such as regular planned updates or reviews, appropriate technology selection, proper communication, usage of novel technologies, and set timetables, all of which contribute to the water project's high sustainability.

The research also suggests that water projects employ elements of stakeholder analysis by analyzing various stakeholders based on their level of interest, influence, and potential impact for water projects sustainability, the degree of stakeholders' involvement in water projects, and the level of stakeholders' interest in water projects, all of which have an impact on the overall success of sustaining water projects. This means that stakeholder mapping and analysis are required to increase project sustainability.

5.5 Suggestions for Further Study

Because the research only examined three water projects in Samburu County, more research on water projects in the county is required. There is also a need to perform research on additional aspects of project planning outside the three variables covered in this study: stakeholder analysis, project cost, and project scheduling. Furthermore, other researchers are urged to investigate this research utilizing various methods of data gathering and data analysis to obtain comprehensive information on project planning and sustainability of water projects. Finally, future researchers are encouraged to conduct additional research on project planning and water projects sustainability in water stressed areas, as well as how to best employ project planning to promote sustainable water initiatives.

5.6 Limitation of the Study

This study was limited to Samburu county and involved only three projects within Samburu County therefore there is need to do more research on water projects within Samburu County and also on other parts of Kenya that are water stressed. The research also experienced financial constraint due to increased costs in field data collection, however, the researcher employed research assistant who were tasked with data collection within their locality to save on cost for transport.

5.7 Contribution to the Body of Knowledge

This study seeks to contribute to the existing body of knowledge by adding more incite to developers and project managers in the field of project planning on the key elements of planning. Further, the study seeks to contribute knowledge to students who are pursing project planning and management on how they can put into practice the knowledge gained by providing tangible solutions that would lead to sustainability of water projects. Additional, knowledge will also be added to community engagement experts who prepare concepts and proposals for funding to factor in project planning budget when developing concepts. The community will also get to know their role in planning during project implementation.

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APPENDICES

APPENDIX I: INTRODUCTION LETTER

Immaculate Ingasia Omuya
P.O BOX 939-20300
KITALE

To whom it may concern,

RE: DATA COLLECTION FOR STUDY IN RELATION TO A RESEARCH PROJECT ON PROJECT PLANNING AND SUSTAINABILITY OF WATER PROJECTS IN SAMBURU COUNTY, KENYA

I am Immaculate Ingasia Omuya of National Identity Card No. 31667272. I am undertaking my research project as a requirement for the award of Master of arts in Project Planning and Management. My area of study is on Project Planning and Sustainability of Water Projects in Samburu County, Kenya.

The purpose of writing therefore is to request for your assistance in collecting data for this research project. The information obtained from the respondents will be kept confidential and used only for the purpose of this study. Responders and other sources of information's names will be kept private.

Looking forward for your kind support. Thank you .

Yours Sincerely

Immaculate Ingasia Omuya

Appendix II: Questionnaire for Project Management Committee, Project Beneficiaries and Opinion Leaders

PART A: General Information

Introduction

The purpose of this study is to investigate the role of project planning on the sustainability of water projects in Samburu County, Kenya. Your honest and correct answers to the following questions are critical for receiving significant insights into this study. Please keep in mind:

- Do not indicate your name
- Kindly fill all the blank spaces.

PART B: Demographic Information

1. Gender of the respondent?

Male ()

Female ()

Others ()

2. Age of the respondent?

18 to 28 years ()

29 to 39years ()

40 to 50 years ()

Above 50 years ()

3. Indicate your highest education qualification.
   Primary level []
   Secondary level []
   Certificate holder []

Diploma holder []

Degree holder []

PhD holder []

4. What title do you hold in this project?

   Project Manager []

   Committee member []

   Community leader []

   Project beneficiary []

5. Which type of water project is available in your locality?

   Wells (no hand pumps) []

   Boreholes (with hand pumps) []

   Water pipes (extended from water tanks) []

   Dams []

PART C: SUSTAINABILITY OF WATER PROJECTS

6. The following statements relate to the extent of sustainability of water projects in Samburu County. Give your perception of the current status of the water projects in your locality.

Ranges: 1 –strongly disagree, 2 –disagree, 3 –neutral, 4 –agree and 5-strongly agree

Sustainability of Water Projects	**1**	**2**	**3**	**4**	**5**
The water from the water source does not deplete					
There is reliable access of water by all locals					
Ongoing upkeep and maintenance of the project makes it last long					
Continuous improvement of water projects improves their sustainability					
The water projects has been functioning well even after project closure					

PART D: PROJECT PLANNING

SECTION A: Stakeholders' Analysis

7. Indicate the ratings that you give each statement on stakeholder analysis in your water project. Using the Likert scale.

Ranges: 1 –strongly disagree, 2 –disagree, 3 –neutral, 4 –agree and 5-strongly agree

Stakeholders' Analysis	**1**	**2**	**3**	**4**	**5**
Understanding the influence of different stakeholders is important for effective stakeholder management in water projects					
All stakeholder were informed about the progress and outcome of the water project					
Stakeholders' mapping has helped in analyzing various stakeholders according to their interest, influence and potential have an impact on water projects sustainability					
The level of stakeholders participation in water projects is a crucial factor that influences project outcomes					
The level of stakeholders' interest in water project greatly impact the projects overall success					

SECTION B: Project Schedule

8. On the project schedule statements, rate how much you agree or disagree with your water project. The Likert scale is used for rating:

Ranges: 1 –strongly disagree, 2 –disagree, 3 –neutral, 4 –agree and 5-strongly agree

Project Schedule	**1**	**2**	**3**	**4**	**5**
Planned updates or reviews to the project schedule throughout the project duration leads to sustainability of water projects					

Selecting appropriate technology has become a primary concern of our project committee members					
The project schedule has been communicated to all members and stakeholders'					
The water projects employ the use of innovative technologies that result in long lasting projects					
There are designated timelines for each task in the project schedule					

SECTION C: Project Cost

9. Give each assertion a rating based on stakeholder participation in your water project. The Likert scale is used.

Ranges: 1 –strongly disagree, 2 –disagree, 3 –neutral, 4 –agree and 5-strongly agree

Project Cost	**1**	**2**	**3**	**4**	**4**
Costs management affect project implementation					
Operational cost are used for maintenance of water project					
The community members contribute to the budgeted cost of the water project.					
Poor cost management affect project implementation quality					
An adequate budget allocation improves the sustainability efforts of the water project					

Appendix III: Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **108732**

Date of Issue: **10/November/2023**

RESEARCH LICENSE

This is to Certify that Miss.. Immaculate Ingasia Omuya of University of Nairobi, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in on the topic: PROJECT PLANNING AND SUSTAINABILITY OF WATER PROJECTS IN SAMBURU COUNTY KENYA for the period ending : 10/November/2024.

License No: **NACOSTI/P/23/31330**

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2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way;
    i. Endanger national security
    ii. Adversely affect the lives of Kenyans
    iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
    iv. Result in exploitation of intellectual property rights of communities in Kenya
    v. Adversely affect the environment
    vi. Adversely affect the rights of communities
    vii. Endanger public safety and national cohesion
    viii. Plagiarize someone else's work
3. The License is valid for the proposed research, location and specified period.
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12. Research, findings and information regarding research systems shall be stored or disseminated, utilized or applied in such a manner as may be prescribed by the Commission from time to time.
13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

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