ASSESSING FACTORS AFFECTING THE SUSTAINABILITY OF WATER PROJECTS IN RURAL AREAS IN TANZANIA: A CASE OF PANGANI DISTRICT

JUMBE S. KUCHIMBA

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PROJECT MANAGEMENT (MPM)

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CERTIFICATION

The undersigned certifies that he/she has read and here by recommends for acceptance by The Open University of Tanzania a dissertation entitled; **"Assessing Factors Affecting the Sustainability of Water Projects in Rural Areas in Tanzania: A Case of Pangani District"** in partial fulfillment of the requirements for the award of degree of Masters of Project Management.

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Dr. Juma Matonya

(Supervisor)

….....…

Date

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Dr. Lilian Macha

(Supervisor)

……..……

Date

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DECLARATION

I, **Jumbe S. Kuchimba,** declare that, the work presented in this dissertation is original. It has never been presented to any other University or Institution. References have been supplied where other people's work has been used. In this regard, I declare that this is my unique work. It is hereby submitted in partial fulfilment for the Degree of Master of Project Management (MPM).

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Signature

31/07/2023
……
Date

DEDICATION

This piece of work is dedicated to my beloved family for the undying support and immense sacrifices they have made to make sure that I completed this entire course. Much loyalty to this research should be to my lovely wife and my children hope they will be encouraged to learn and acquire education for their future success.

ACKNOWLEDGEMENT

First of all I would like to give thanks to the ALMIGHTY GOD for keeping me alive and giving me the strength and power plus good health during my whole time of doing this research. I would like to express my sincerely appreciations to my family who have supported me from the start to the end of my research.

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ABSTRACT

The study intended to assess the factor affecting the sustainability of water projects in rural areas in Tanzania, taking Pangani District as a case study. In order to achieve this objective, the study used mixed research approach which incorporated the elements of both quantitative and qualitative data collection techniques. The sampling techniques used in this study were simple random sampling and purposive sampling. A total number of 417 respondents participated in this study; 20 respondents participated in qualitative data gathering using interviews, other 397 participated in quantitative data gathering using questionnaires. Qualitative data were analysed using thematic analysis while quantitative data were analysed using descriptive statistics and multiple regression analysis with the aid of Statistical Package for Social Science (SPSS V.23.0). Multiple regression analysis results indicated that community participation, management skills and technology have positive and significant influence on sustainability of water projects. In the same way, qualitative findings obtained through interviews also indicated that the community is involved in meetings and in decision making as well as through money, labour and materials provisions. Qualitative results also indicated that leaders have skills in resource management, skills in community mobilization and have expertise in their job. Furthermore, qualitative findings revealed that choice of pumping technology was appropriate, infrastructures are well maintained and spare parts are available, but technology adoption was slow. It was concluded that community participation, management skills and technology are the important factors towards achievement of sustainability in water projects. This study recommends that project implementers should ensure community participation, enhancing their skills in project management and using quality technology in order to enhance lifespan of water infrastructures.

Keywords: *Management skills, Technology, Water Project, Sustainability.*

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LIST OF ABBREVIATIONS

CBWSOs	Community Based Water and Sanitation Organizations
DCDO	District Community Development Officer
DPs	Development Partners
INSP	International Network on Strategic Philanthropy
MDGs	Millennium Development Goals
NRWSSP	National Rural Water Supply and Sanitation Program
RUWASA	Rural Water Supply and Sanitations Agency
SPSS	Statistical Package for Social Science
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations International Children' Emergency Fund
URT	United Republic of Tanzania
WHO	World Health Organization
WSDP	Water Sector Development Program

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter describes the background of the study, statement of the problem, objectives of the study and research questions. The remaining sections include scope of the study, significance of the study and organization of study.

1.2 Background of the Study

Wise utilization of water resources is becoming very important as world faces water crises which could hold back human development (Masombe and Omwenga, 2020). Rural areas in developing countries across the world remain severely underprivileged, with eight out of ten people not having access to safe water supply (Bikuba and Kayunze, 2019). As per WHO and UNICEF report of 2010, about 884 million people worldwide, out of which 37% living in sub-Saharan Africa, still utilize drinking water from unsafe supply spots. The proportion of the African population who had access to safe drinking water accounted for only 60% by 2010, which is about 11% increase compared to the situation in 1990 (WHO and UNICEF, 2010).

Due to this global challenge in accessing safe water supply, a number of water projects have been established to meet the sustainable millennium goals. The Ministry of Water and Irrigation of Kenya show that 57% of the past investments in rural water supplies in Kenya are unproductive. Infrastructure implemented for safe water supply in rural communities after some months or years cease to function due to low project sustainability. This makes 17 million Kenyans, 43% of the population;

do not have access to safe drinking water (Olela, 2018).

In spite of the efforts in place in establishing numerous water projects in African countries, there are still some doubts about sustainability of such water projects initiated. For instance, Kinyata and Abiodun, (2020) studied the causes of the failure of many African development projects including water projects which were funded in 1980s and 1990s by Donors and implemented without involving local communities or beneficiaries of the projects. The study revealed that ignorance of bottom up approaches is a major barrier that led to failure of the projects implemented at that particular time approach. In addition, Olela (2018) stressed that the choice of technology for water abstraction and availability of technical staffs managing the projects have shown some positive effect on sustainability of water projects in Kenya.

It is approximated that 4 million people in Tanzania who live in rural areas lack access to an improved water source, and 29 million do not have access to improved sanitation (URT, 2022). This means the water problem in rural settings is still a challenge to the government and the whole society at large. There is increase investment in rural water supply development in the last decade by both Government and development partners although has not resulted in the desired levels of anticipated service. Many rural water projects completed have either stopped operating or are not operating optimally in spite the major efforts (Odie, 2012).

Therefore, it is well known that rural population living districts like Pangani District have no reliable access to water and sanitation in spite of availability of water

projects in rural areas. This situation raised a lot of concerns about the sustainability of water projects especially in Tanzanian rural context. Therefore, there was a need to conduct a study which assesses factors affecting sustainability of water projects in Pangani district as a rural area in Tanzania.

The theory of change guided this study. This theory is an expression of the important strategies that are critical for bringing outcomes and improvement guided by service delivery strategy (INSP, 2005). The theory represents the need of the expected project beneficiaries and what strategies facilitated them to encounter those needs. The theory is relevant to this study because it explains that any project can achieve its intended end results if the interests of the community who are the prime beneficiaries have been considered and project implementers apply the best strategies that could determine positive end results.

As far as this study is concerned, community can be satisfied if they have been involved and project implementers have the required management skills and apply relevant technology in order to attain end results which in this study, sustainability of water project are the end result. Since that the theory of the study addressed the community participation, management skills and technology, the study considered these variables over other variables such as geographical factors, socio-cultural factors, socio-economic factors, water tariffs, and specialized trainings which have been investigated in other studies such as Muriuki and Luketero (2019), Olela (2018), Tafara, (2013) etc.

Management skills, community participation and technology management are the factors which have been linked with sustainability of water projects (Muriuki and

Luketero, 2019), Leaders who are in charge of supervising and managing the water projects should possess different skills in order to ensure the project goals are achieved as well as sustainability of the projects. These management skills include skills in resource management, budget estimation as well as skills in community mobilization (Masombe and Omwenga, 2020).

Technology management can be successful if the resources are always available, operators should have appropriate technical skills and expertise and the community should adopt the technology (Olela, 2018). The community can participate in the water projects through different means such as labour, money and offering project materials (Kinyata and Abiodun, 2020). It is up for this study to confirm whether variables including community participation, management skills and technology management have positive influence on sustainability of water projects.

There are 20 community based water projects implemented in Pangani District, with approximately 48,521 number of project beneficiaries (Pangani District, 2022). Since that Pangani is a District, all authority of managing the water project is vested to Rural Water Supply and Sanitations Agency (RUWASA). The community has been empowered to participate in management of water projects through the community based water and sanitation organizations (CBWSOs) which are in charge of collection of water tariffs, maintenance of project infrastructures and the overall supervision of the projects on behalf of RUWASA, Pangani District (Pangani District, 2022). In spite of the availability of 20 water projects which serve 48,521 community members in Pangani District, the issue of sustainability of water projects is unknown as there is no empirical study conducted in the district addressing the

issue at hand. Hence, this study assessed the factor affecting the sustainability of water projects in Pangani District.

1.3 Statement of the Problem

Access to sustainable water supply is inadequate in developing countries compared to developed nations (Olela, 2018). As a result, donors and government in developing countries highly prioritize on investing in water projects in order to increase success to water sources (Masombe and Omwenga, 2020). Large number of population in Tanzania live in rural areas as it has been estimated that urban population constitute of 22.1 million people equivalent to 37 percent while rural population accounts for 37.6 million people equivalent to 63 percent (UN data, 2022). In response to such gap, the government has made efforts to ensure that rural areas are developed and that people can access essential services such as electricity, health, water, and transport infrastructure (URT, 2022).

As a response towards lack of access to water supply, in 2006, the national rural water supply and sanitation program (NRWSSP) was adopted for the period between 2006 and 2025 (Bikuba and Kayunze, 2019). It is a long-term plan for the rural water supply and sanitation development to meet the millennium development goal (MDG) targets and beyond (Muro and Namusonge, 2015). Consequently, the water sector in the economy came up with a water sector development program (WSDP); the WSDP is supported by several Development Partners (DPs), including the World Bank Group. The target was to ensure that 90% of people access safe and clean water by 2025 (Chumbula and Massawe, 2018).

In spite of the efforts done by the government, it has been approximated that 4 million people in Tanzania who live in rural areas lack access to an improved water source, and 29 million do not have access to improved sanitation (URT, 2022). This means that access to clean water is still a challenge in Tanzania and in most cases women and girls are highly disturbed as they spend a significant amount of time traveling long distances to fetch water (Muro and Namusonge, 2015). There is a number of water projects implemented in rural areas but there is no evidence on the factors affecting sustainability of water projects in the country (Bikuba and Kayunze, 2019).

There are some studies conducted outside of Tanzania including that of Kinyata and Abiodun, (2020), Muriuki and Luketero (2019), Olela (2018) and linked community participation, management skills and technology with sustainability of water projects, however it was important to seek evidence about this in the context of rural Tanzania. Because of this gap, it was inevitable to gather empirical evidence to assess factors affecting sustainability of water project with specific focus on three factors including community participation, management skills and technology.

The government and development partners spent a lot of money in water projects, however there is limited access to water and sanitation services in rural areas like Pangani district (Chumbula and Massawe, 2018). If the question of factors affecting sustainability of water projects has not been answered, the investment of the government and other development partners can be in jeopardy as well as insufficient supply of water in the community. This motivated the conduction of this study in rural area like Pangani district without any delays.

1.4 Objectives of the Study

1.4.1 General Objective

The general objective was to assess the factor affecting the sustainability of water projects in Pangani District.

1.4.2 Specific Objectives

The following specific objectives addressed the subject matter:

i. To assess the effect of community participation on sustainability of water projects in Pangani district
ii. To assess the influence of management skills on sustainability of water projects in Pangani district
iii. To assess the influence of technology employed on sustainability of water projects in Pangani district

1.5 Research Questions

i. To assess the effect of community participation on sustainability of water projects in Pangani district
ii. To assess the influence of management skills on sustainability of water projects in Pangani district
iii. To assess the influence of technology employed on sustainability of water projects in Pangani district

1.6 Scope of the Study

This study focused on five randomly selected water projects implemented in Pangani District. This study also based on three independent variables including community

participation, management skills and technology and one dependent variable which is sustainability of water projects.

1.7 Significance of the Study

The rationale of conducting this study was to provide empirical evidence concerning the factors affecting sustainability of water projects in order to make improvements in terms of practice. This study is beneficial to different stakeholders including academicians and researchers, policy makers and people in the community who are regarded as project beneficiaries.

(i) To academicians and researchers

This study generated useful data concerning the factors affecting sustainability of water projects to academicians and future researchers. Such data both shown the magnitude of the problem and explanations on how factors such as community participation, management skills and technology impact sustainability of water projects.

(ii) To policy makers

Data provided in this study concerning the factors affecting sustainability of water projects can be used as reference or baseline data to formulate policies which could enhance sustainability of water projects especially those implemented in rural areas. In particular, the study can guide policy makers with evidence to make appropriate policies on community participation, management capabilities and choice of technology deployed in water projects that could enhance sustainability of water projects.

(iii)To the community

Sustainability of water projects is more beneficial to the community as it ensure consistent availability of clean water for domestic as well as economic uses. This study contributes in improving water management practices which in turn can benefit the community as they are regarded as main beneficiaries of such water projects. Not only that, but also, the study creates awareness of the community on the importance of project ownership through their full participation in water projects from the design to implementation stage.

1.8 Organization of the Study

This research report covers six chapters including introduction, literature review and research methodology, research findings, discussion of the findings and summary, conclusion and recommendations. Introduction chapter cover background to the study, statement of the problem, research objective, and scope of the study, significance of the study and organization of the study. The next section of this work includes chapter two which presents the literature review that covers theoretical and empirical parts of literature review. Chapter three contains research methodology that shows the methods deployed in order to accomplish the study purpose. This includes research philosophy, research approach, research design and study area and population. Other research methodology' sections include sampling procedures and sample size, data collection methods, data analysis methods, validity and reliability as well as ethical consideration. Chapter four and five include research findings and discussions respectively. Chapter six finalizes the study by providing the summary of the findings, conclusion and recommendations reached based on the study objectives.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter covers the definitions of key terms, theoretical and the empirical literature review. One the theoretical part, the study discusses the theory which guides the study. In the empirical literature review, the study covers previous studies related to this topic in accordance with the study's specific objectives.

2.2 Definition of Key Terms

2.2.1 Community participation

This indicates the men, women, girls and boys perceive that they actively participate in all aspects of water infrastructural development, with specific emphasis on provision of free labour, locally available materials, decision making, project implementation, planning, evaluation and monitoring (Olela, 2018). Another definition of community participation is; the involvement of people in the community in projects to solve their own problems (Muriuki and Luketero, 2019). Muriuki and Luketero, (2019) clarified that people should not be forced to participate in projects which affect their lives but should be given the opportunity where possible.

This study was guided by the first definition of community participation which was provided by Olela, (2018).

2.2.2 Management skills

Management skills refers to using expertise in coordinating the efforts of people to accomplish desired goals and objectives using available resources efficiently and

effectively. It comprises planning, organizing, staffing, leading or directing, and controlling an organization (a group of one or more people or entities) or effort for the purpose of accomplishing a goal (Tafara, 2013). Management skills can also be defined as certain attributes or abilities that a leader should possess in order to fulfil specific tasks in an organization or the community (Persoon, 2016).

This study was guided by the first definition of management skills which was provided by Tafara, (2013).

2.2.3 Technology

Technology refers to tools and machines that define the methods of ground water abstraction, source of power facilitating the abstraction that is accepted and able to be adopted and operated by the community (Olela, 2018). Technology also refers to the application of scientific knowledge for practical purposes like abstraction of water from the ground (Chumbula and Massawe, 2018).

This study was guided by the first definition of technology which was provided by Olela, (2018).

2.2.4 Water Project

A project is an undertaking that has an objective of meeting human needs and aspiration and has specific budget and timeframe (Tafara, 2013). A project also refers to a temporary endeavour undertaken to create a unique product, service or result within defined constraints. In this case, the unique service in this study was water supply services (Masombe and Omwenga, 2020).

This study was guided by the first definition of water project which was provided by Tafara, (2013).

2.2.5 Sustainability

The continuing ability of a project to meet the needs of its community and embraces the concept of doing this beyond the time of donor agency involvement (Persoon, 2016). Sustainability also refers to the meeting of long-term needs without compromising the ability of future generations to meet their own needs (Muriuki and Luketero, 2019). This study was guided by the first definition of sustainability which was provided by (Persoon, 2016).

2.3 Theory Related to the Study

2.3.1 Theory of Change

In the middle of the 1990s, the discipline of program theory and program evaluation developed a new method for analyzing the theories guiding initiatives and programs aimed at bringing about social and political change. This theory was early developed by Peter Druckers. According to this theory, the theory of change functions as a planning, participation, adaptive management, and evaluation methodology used by businesses, philanthropy, not-for-profit organizations, international development agencies, academic institutions, and government agencies to advance social change. The theory of change establishes long-term objectives before mapping backward to determine necessary prerequisites (Brest, 2010).

INSP (2005) defined a theory of change as an expression of the important strategies that are critical for bringing outcomes and improvement guided by service delivery

strategy. Theory of change represents the need of the expected project beneficiaries and what strategies facilitated them to encounter those needs. The strategy establishes a framework for bearing connections between an organization‘s mission, project strategies and actual results, while creating relations among the project implementers, the strategies that are implemented and project end results. This theory show fundamentals of project sustainability as the theory has defined actions, necessary strategies for long term project outcomes as well as desired project outcomes.

The benefit of this theory is that it offers a chance to ensure that project staff, the community, and other key stakeholders all share a common understanding of the expected outcomes that are expected to occur and their contribution to that change. This theory of change is applied in the execution of the community-based project. By developing a theory of change, the project may have a clear and tested hypothesis about how change happens, which not only makes the findings more believable because they were projected to happen in a certain way, but also makes the project accountable for them. The drawbacks of this theory include the potential for oversimplification or over completion, the fact that funders may not always appreciate its value, and the potential for challenging results that contradict the initial assumptions of the research.

The study adopted the theory of change in spite of the weaknesses of the theory because it helped the study to understand what the project variables and factors determine the change of the projects sustainability at the research area. By knowing this critical information, it enabled the study to measure the community projects

results and compare them against the original intent, in order to detect the relative change.

The theory of change has been used to guide different previous studies. For instance, Mrangu, (2018) used this study to measure the community projects results and compare them against the original intent, in order to detect the relative change. Therefore this study by Mrangu, (2018) put into consideration the theory of change as the study assessed the sustainability of various projects in Bagamoyo district in Pwani Region in Tanzania, mainly by looking on the expected results and the change it has influenced. De Silva et al (2014) has used theory of change to design and evaluate development programs and recognizing its capacity to provide a framework for monitoring, evaluation and learning throughout a program. Sub-section 2.2.1 below elaborates the relevance of theory of change to the study.

2.2.3 Relevance of the Theory to the Study

These studies consider the theory of change because it explains important matters concerning the determinants of sustainability of community based projects like water projects. This theory explains that any project can achieve its intended end results if the interests of the community who are the prime beneficiaries have been considered and project implementers apply the best strategies that could determine positive end results. This shows the importance of community participation, management skills and technology which are the study variables highlighted in the theory of change in determining the sustainability of water projects. Therefore, this study put into consideration this theory to determine the factors affecting sustainability of water projects in Pangani District, Tanzania.

2.4 Empirical Literature Review

This part reviews previous studies which depicted the relationship between community participation and sustainability of water projects, management skills and sustainability of water projects and technology and sustainability of water projects.

2.4.1 Community Participation and Sustainability of Water Projects

Kinyata and Abiodun, (2020) studied the causes of the failure of many African development projects which were funded in 1980s and 1990s by Donors and implemented without involving local communities or beneficiaries of the projects. This study used documentary review of reports related to the projects funded by donors between 1980s and 1990s in Uganda as an African country. In this case, only secondary data were used in this study in order to achieve study objectives. According to the study, one of the main obstacles that contributed to the failure of the initiatives that were being undertaken at the time was people's ignorance of bottom-up approaches. This study demonstrated how numerous projects from donor nations to developing nations, including Uganda, failed. African countries received nothing from these programs, and what's more, some of these nations are still paying back loans that had no beneficial effects on the community.

Persoon (2016) conducted a study on factors influencing community based programs including water projects in Nepal. In this study, a systematic literature review was combined with expert interviews as part of a mixed-methods strategy. The purpose of the literature review was to find out which sustainability-related criteria have already been discovered. The frequency of elements stated in research was also evaluated in order to build an overview. The interviews were based on the systematic

review. It was possible to learn more in-depth information about the elements of sustainability by speaking with specialists from community-based organizations. These professionals have experience with this problem and are knowledgeable about the variables and mechanisms affecting sustainability.

This study revealed that involvement and participation of the local community as a main factor for program sustainability. The study concluded that this process of involvement should begin at an early stage, preferably during the program's planning phase. To accomplish this, the community must genuinely recognize the need for the program, recognize the value of the program's results, and be ready to provide local resources for the program. If these resources can't be used financially, they should be used in another way. From the start, the local population should feel accountable for the initiative. To accomplish this, the implementers must pay attention to and comprehend the community, its needs, the surrounding environment, and the theory of change at the local level.

The study by Tafara, (2013) investigated the influence of stakeholders' involvement on sustainability of community based water projects in Kenya. In this study, descriptive survey was used. The household heads made up the study's population. Through household surveys and the purposeful identification of the subject matter or key informants across pertinent local institutions, the respondents were found. Both probability and non-probability sampling strategies were used in the investigation. Through the use of a questionnaire, this study gathered quantitative data from the respondents. Statistical software was used to produce descriptive statistics for the data analysis (SPSS V.17.0 and Excel).

The implementation of the water projects required the collaboration of the stakeholders. Stakeholders contributed money and other resources, helped with the design, and were involved in management of the water project. The involvement of the stakeholders significantly improved the viability of the rural community-based water projects. According to the study, stakeholders' involvement encouraged locals to take responsibility for their own community resources, enhanced regional security by reducing disputes over water sources, encouraged locals to conserve natural resources, including water, as well as helped the community benefit from the water project by gaining significant knowledge and technical skills.

It has also strengthened community identity and pride, helped to sustain cultural standards, and encouraged social networks among local residents. It has brought together people from many ethnicities, tribes, and clans in the area. Partnerships between the local community and the government or non-governmental groups have improved as a result of the water project. In order to improve the sustainability of the county's water projects, the report advises increasing the level of stakeholder participation in project design and execution.

The study by Hassan (2017) found that the community participation influence sustainability of community based project in Kenya - Garissa County . The study used descriptive research design, had a target population of 1045 respondents and sample size of 204 respondents. This study used stratified sampling technique, and primary data were collected using administered questionnaire and interview methods. Data were analysed through descriptive statistics such as mean, standard deviation and variance with the aid of Statistical Package of Social Science (SPSS

version 20.0).

The study made clear that cooperation between the organization and the community is essential for any community development. It was also discovered that community-based projects are typically done in communities that are dealing with other serious issues including poverty, social ills, and unemployment. Due to the presence of such socioeconomic problems and geophysical qualities, community members have few options for pursuing their development needs other than ensuring their existence, which causes them to lag behind in the projects started and carried out in their community. Because the needs of the community are not considered and their involvement in community-based projects is minimal, this has an impact on the sustainability of such projects.

Rashied and Begum, (2016) conducted a study on Community Participation in Development Projects in a Low Income Community in Bangladesh. In a low-income community, this study sought to better understand the nature of community involvement in development projects. In-depth interviews were used to gather primary data for the study, which was then analyzed utilizing content analysis in order to meet this goal. Employing the purposive sample technique, respondents were gathered. This study found that low income communities have low levels of community involvement in community development initiatives. According to the report, locals from the host community are typically not involved and, if they are, they are always instructed what to do and there is no true cooperation. As a result, many initiatives fail or are simply unsustainable because they are not community-focused. The study also showed that has a detrimental and negligible impact on

community development initiatives in low-income communities.

Bikuba and Kayunze, (2019) entitled “Enhancing community participation to improve sustainability of irrigation projects in Geita District, Tanzania”. The purpose of this study was to evaluate the type of community involvement in irrigation projects in three villages (Nzera, Lwenge, and Nyamalulu) in order to determine whether such involvement was likely to contribute to the projects' long-term sustainability. A cross-sectional research methodology was used, and a sample of 120 respondents was chosen using a combination of basic random and purposive sampling methods. Through questionnaire surveys, key informant interviews, and focus group discussions, quantitative and qualitative data were gathered. While content analysis was used to analyze qualitative data, descriptive statistics and inferential analysis were performed on quantitative data using the Statistical Package for Social Sciences (SPSS). Because the community was not included in the project's early stages of project design, the study's findings showed that there is little community participation in community development projects. As a result, community development initiatives undertaken without community involvement are unsuccessful.

Muriuki and Luketero (2019), investigated factors influencing sustainability of community-based county projects in Kenya. This study used a descriptive research design, which employed questionnaires that were shaped by the study's goals and provided the answers to the study's questions. The community-based project managers, field staff, and donor agencies (USAID, Red Cross, Compassion International, World Vision) are the study's target populations. This study used a

sample size of 343 respondents using a stratified sampling methodology. With the use of SPSS, descriptive analysis was used in the study.

According to study findings, community involvement is essential when starting initiatives. Additionally, this study discovered that funding, capacity building, and project implementers are determinants of project sustainability. The report suggested routine monitoring and evaluation to make sure initiatives meet community requirements and suggested involving many stakeholders for the good of the community. Thus, it was hypothezed that, community participation has positive and significant effect on sustainability of water projects.

2.4.2 M**anagement Skills and Sustainability of Water Projects**

Tafara, (2013) spotlighted the relationship between management skills and sustainability of community based water projects in Kenya. In this study, descriptive survey was used. The household heads made up the study's population. Through household surveys and the purposeful identification of the subject matter or key informants across pertinent local institutions, the respondents were found. Both probability and non-probability sampling strategies were used in the investigation. Through the use of a questionnaire, this study gathered quantitative data from the respondents. Statistical software was used to produce descriptive statistics for the data analysis (SPSS V.23.0 and Excel).

According to the report, people in charge of the water project dealt with complaints in a timely and effective manner. The individuals chosen to oversee the water project performed well. The study also revealed that there was adequate technical know-how

to manage the project, adequate human resource for project sustainability, community satisfaction with the overall management of the water project, satisfactory risk management, increased project management has increased the alignment of development projects with host communities priorities, project managers have adequate and experience (task familiarity) in management.

Given the complexity of community-based initiatives and the need for multidimensional management capabilities, the study determined that the managers' leadership abilities were adequate and that technical architecture guidance was provided for the project. In this regard, the study found that technical expertise, resource management, technical architecture advice, business knowledge, leadership, project schedule and budget estimation, risk identification and management, and experience were the management traits that had an impact on the sustainability of the rural community-based water projects (task familiarity).

Persoon (2016) conducted a study on factors influencing community based programs including water projects in Nepal. In this study, a systematic literature review was combined with expert interviews as part of a mixed-methods strategy. The purpose of the literature review was to find out which sustainability-related criteria have already been discovered. The frequency of elements stated in research was also evaluated in order to build an overview. The interviews were based on the systematic review. It was possible to learn more in-depth information about the elements of sustainability by speaking with specialists from community-based organizations. These professionals have experience with this problem and are knowledgeable about the variables and mechanisms affecting sustainability.

This study revealed that effective community leadership was seen as an important and crucial factor for program sustainability and should be involved from the design phase. It was stressed that finding the right leader can take time. Sometimes the community has a designated leader, while other times it is simply one person who feels accountable and defends the initiative. It was frequently stated that having a leader who is well-known in the neighborhood increases effectiveness. The listed duties of the leader included encouraging and raising support, inviting others to participate and join the program, planning meetings, and assisting with attendance at the program.

Masombe and Omwenga (2020) conducted a study on the Factors Hindering Sustainability of Water Projects in Makueni County: A Case Study of Kwing'ithya Kiw'u Project. In this study, a descriptive survey design was used. Residents of the two wards, key informants, including the self-help group that collaborated with the NGO, and local sub-chiefs of the seven sub-locations within the two wards made comprised the research population. To contact the respondents, a household survey was performed. Purposive identification of the subject matter or key informants across pertinent local institutions was then carried out.

The study employed both probability-based and non-probability sampling strategies. In this study, questionnaires were given to participants to help obtain quantitative data from them. In order to help the researcher describe the data, descriptive statistical techniques (SPSS V.17.0 and Excel) were used to examine the data. This study found that leaders' lack of technical understanding has a detrimental effect on

the sustainability of water projects.

Muro and Namusonge, (2015) conducted a study on government factors affecting community participation in public development projects in Meru District in Arusha in Tanzania. The case study method of research was used in this study. Village and ward leaders, government representatives, such as extension staff, and civil society organizations were among the groups targeted. Community members, village chairpersons, village executive officers, ward executive officers, extension workers, non-governmental organizations, and district authorities made up the sample frame for this study.

Interviews conducted using questionnaires, observations, focus groups, and document reviews were the data collection techniques used. With the aid of statistical tools like the Statistical Package for Social Science (SPSS) and interpretations of the data based on statistical generalization, the analysis and summary of the results were completed. The results of this study showed that community mobilization programs in community development projects are impacted by governance issues such as accountability, transparency, misuse of funds, and corruption.

This is due to the fact that while the community can be persuaded to participate using a variety of resources, including cash, materials, and labor, a lack of accountability, a lack of transparency, the misappropriation of funds, and corruption may deter the community from taking part in community development projects. The sustainability of community development projects, such as water projects, is also

impacted by poor community participation. This is reason why there insignificant impact of management skills on sustainability of water projects.

In the Kenyan constituency of Machos Town, Kairu and Ngugi (2014) performed research on the elements influencing the efficiency of constituency development fund projects. Inferential statistics, a descriptive study design, and stratified proportionate random sampling methods were employed. A sample of 100 responders was chosen from the 330 CDF stakeholders that made up the target population. Structured and unstructured questionnaires, interview schedules, and record-observation techniques were used to obtain the data. Technical officers and the recipients of the projects were given questionnaires. To determine the validity and reliability of the instruments, a pilot research was carried out. In the analysis, the researcher combined primary and secondary data. The results were utilized to determine how well the independent variables affected the dependent variable. Analyses using descriptive data and multiple regression were employed. The findings showed that the most important factor affecting how successfully the project was implemented was the education level of the project management committee members. Therefore, this study hypothezed that, management skills has positive and significant effect on sustainability of water projects.

2.4.3 Technology Employed and Sustainability of Water Projects

Olela (2018) examines the impact of technology selection on water supply projects in terms of technology type, participation in technology selection, frequency of failure, length of repairs and maintenance, accessibility to skilled technicians, and accessibility to financial resources for operations and maintenance. This study was

conducted in Kenya. The study used descriptive design, with a target population of 32,226 and a sample size of 384 who were selected using simple random sampling method. Qualitative data were collected using interview and focus group discussion and analysed using thematic analysis while quantitative data were collected using questionnaire and analysed through descriptive statistics and inferential analysis with the aid of SPSS.

According to the study, solar power technology is the second most common method of water abstraction in Garbatula sub-County, after generators. Ninety-four percent of water supply project beneficiaries do not participate in the technology selection process, with the justification that the project's technology was chosen by the country's government and development agency. The majority of the community, or 76.4% of the respondents, were found to be ignorant of the factors to be taken into account while choosing technology. According to reports, leaky or damaged pipes are the main reason for breakdowns, followed by mechanical problems with generators. It was discovered that the dearth of spare parts stores and the inexperienced local experts made repairs take longer. The statement that the beneficiaries would look outside the neighborhood, wards, or sub-county for skilled, trained technicians backed this.

Chumbula and Massawe, (2018) conducted a study on the role of local institutions in the creation of an enabling environment for water project sustainability in Iringa District, Tanzania. This study was carried out in the Iringa district using a cross-sectional study approach. Village chairpersons and project managers were included in the research population along with district planning officers, district water

engineers, and district community development officers (DCDOs). While data collection methods included interviews and focus groups, a purposeful sampling method was utilized to choose study participants. The variables affecting the projects' sustainability were identified using a binary logistic regression model. The findings of this study revealed that local institutions' management of water projects through provision of technical assistance is very critical as it enhance the life span of the projects.

Masombe and Omwenga (2020) conducted a study on the Factors Hindering Sustainability of Water Projects in Makueni County: A Case Study of Kwing'ithya Kiw'u Project. This study used a descriptive survey approach. The study's participants were the people who lived in the two wards, key informants, particularly the self-help group that collaborated with the NGO, and local sub-chiefs of the seven sub-locations that made up the two wards. To contact the respondents, a home survey was performed, and key informants or subject matter experts were purposefully identified throughout pertinent local institutions.

The study employed both probability-based and non-probability sampling strategies. In this study, questionnaires were given to participants to help obtain quantitative data from them. In order to help the researcher describe the data, descriptive statistical techniques (SPSS V.23.0 and Excel) were used to examine the data. The findings of this study indicated that the level of adoption of technology was very low as a result it had negative and insignificant impact on sustainability of water projects.

Tafara (2013) evaluated the effect of technology on the sustainability of water projects in Kenya. In this study, descriptive survey was used. The household heads

made up the study's population. Through household surveys and the purposeful identification of the subject matter or key informants across pertinent local institutions, the respondents were found. Both probability and non-probability sampling strategies were used in the investigation. Through the use of a questionnaire, this study gathered quantitative data from the respondents. Statistical software was used to produce descriptive statistics for the data analysis (SPSS V.23.0 and Excel).

This study discovered that technology was a critical factor affecting the sustainability of the community-based water project through reduction of operations costs, improvement of the project's efficiency, and extension of the project's lifespan. Insufficient technical know-how and human resources are also noted in the study to administer the project and ensure its sustainability. The level of technological adoption in the management of water projects was extremely low, which negatively impacted their long-term viability. Technology has a significant impact on the community-based water project's sustainability by lowering operating costs, enhancing project effectiveness, and lengthening project lifespan. The water project barely used the technology at all. The project management should raise budgetary allocations in an effort to adopt contemporary technology. Therefore, this study hypothezed that, technology employed has positive and significant effect on sustainability of water projects.

2.4.4 Research Gap

Numerous studies such as Kinyata and Abiodun, (2020), Persoon (2016), Tafara, (2013), Hassan (2017), Muriuki and GLuketero (2019), Rik and Rutten (2016),

Kairu and Ngugi (2014) and Olela (2018) have been conducted concerning factors affecting sustainability of water projects, however there were numerous reasons for taking this explanatory study under consideration.

Firstly, this study sought to strengthen the available knowledge concerning the issue under investigation and further add new empirical evidence on the ways to make available water projects more sustainable and more community owned. This study achieved this by using explanatory research design which have not been used in previous studies concerning the factors affecting sustainability of water projects.

Secondly, previous studies did not incorporate variables including community participation, management skills and technology in the same study, hence this study included all these variables in the same study in order to see which factor is stronger than the other in ensuring sustainability of water projects. Thirdly, most of these studies have been conducted outside the country, hence this study sought to fill this gap by conducting this study in the context of Tanzania rural settings where there is persistent water problems.

Furthermore, most of studies conducted on the factors affecting sustainability of water projects have not adopted a mixed study approach, as a result the previous studies had some limitations of using qualitative approach alone, or using quantitative approach alone. Through usage of mixed study approach in this study was beneficial because the methods complimented one other, the strength of one method mitigated the weaknesses of another method. For instance, qualitative data enabled the study establish new knowledge using open ended questions while

quantitative approach enabled the study establish the extent of the problem.

2.5 Conceptual Framework

This part shows the conceptual relationship of the study variables specifically independent and dependent variables. The study envisaged that community participation, management skills and technology which are regarded as the study's independent variables affect sustainability of water projects which is the study's dependent variable. Figure, 2.1 demonstrate the study's conceptual framework.

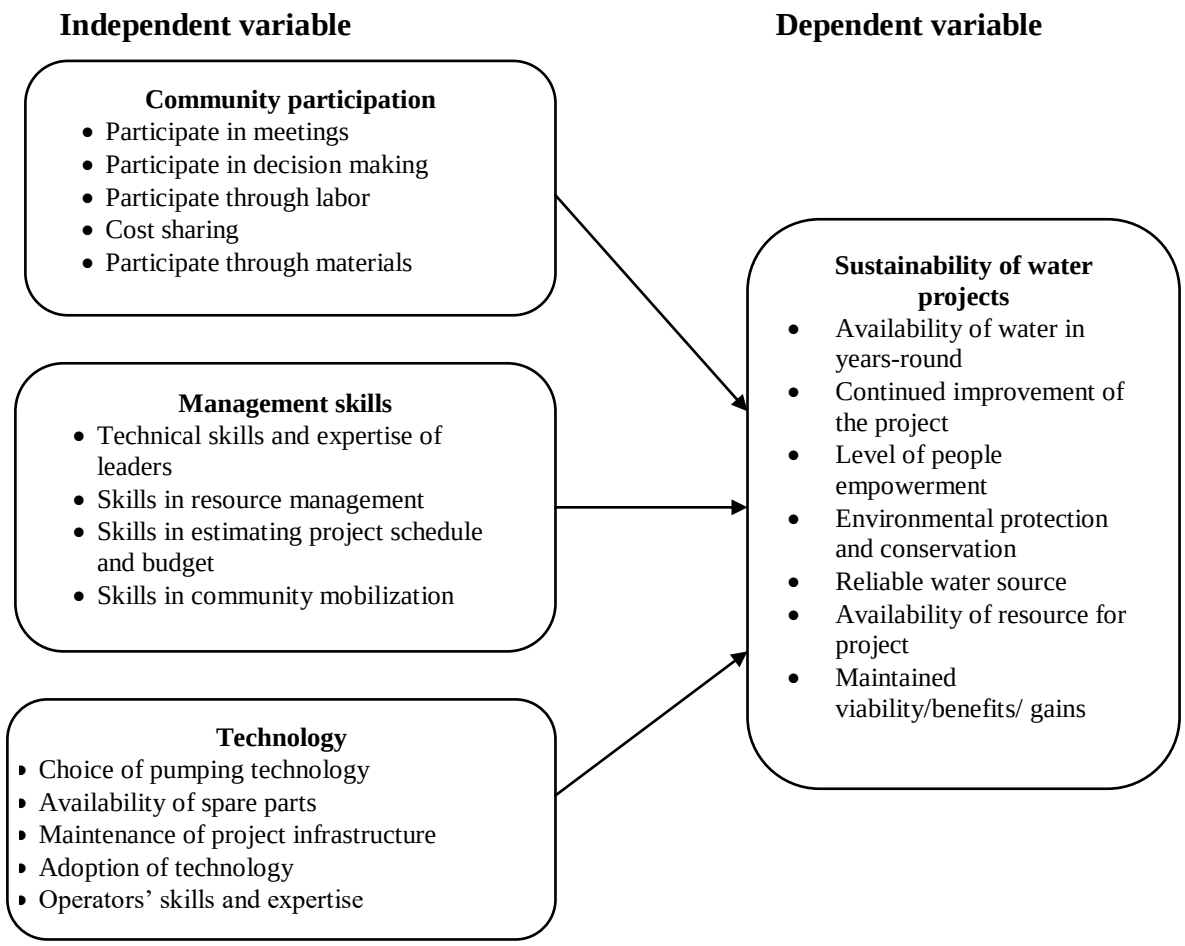

Figure 2.1: Conceptual Framework

Source: Researcher's own construct (2022)

2.5.1 Community participation and sustainability of water projects

This study envisage that community participation have positive and significant influence on sustainability of water projects. The community have a room to participate in water projects through different means. One of the means that the community participate in water projects is cost sharing. Other means are community participation through labour and materials. The community should be allowed to participate in meetings and in making important decisions concerning the water projects. Hence, this study has reached to the following hypothesis:

H_1: Community participation has positive and significant influence on sustainability of water projects.

2.5.2 Management skills and sustainability of water project

This study hypothesis that management skills have positive and significant influence on sustainability of water projects. The leaders in charge of supervising water projects implemented in Pangani district should possess important leadership skills. This includes leadership skills in resource management, community mobilization and skills in estimating budget and project schedule. Therefore, this study has reached to the following hypothesis:

H2: management skills have positive and significant influence on sustainability of water projects.

2.5.3 Technology and Sustainability of Water Projects

The study made the hypothesis that technology has positive and significant influence on sustainability of water projects. The technology management variables include choice of pumping technology, availability of spare parts, maintenance of project

infrastructure, adoption of technology and operators' skills and expertise. This study has reached to the following hypothesis:

H3: technology has positive and significant influence on sustainability of water projects

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

This part covers various sections including research philosophy, research approach, research design, study area, study population, sampling procedures and sample size, variables and measurements, instruments of data collection, data analysis methods, reliability and validity and ethical consideration.

3.2 Research Philosophy

Saunders et al (2015) define research philosophy as a system of beliefs and assumptions on knowledge development. Research philosophies are important because they influence the researcher's choice of what data to collect, how to collect and analyse the data, the meanings to make the data and the extent of the generalizability of research findings. This study used both Positivists and interpretivism research philosophies in order to allow mixed study approach.

Positivism is the phenomenon, which can produce knowledge since it is associated with empirical testing. Positivist, like scientific research, is concerned with gaining knowledge by enquiry. The interpretivist philosophy emphasizes the importance of studying phenomena in their natural settings and the fact that scientists cannot avoid having an impact on the phenomena they research. According to interpretivists, reality can only be fully grasped by the subjective interpretation of and intervention in it. No single research technique is inherently superior to any other methodology, and many writers have called for a blend of research methodologies to increase the

caliber of research.

All philosophies are valuable if used appropriately, hence, this study incorporated the elements of both the positivist and interpretivist philosophies. Positivist is related to quantitative research while interpretivist is related to qualitative research, hence, using elements of both positivist and interpretivist philosophies allowed this study to utilize mixed methods approach.

3.3 Research Approach

This study used mixed approach concurrently in carrying out this research. This approach assisted the researcher to minimize the weaknesses of using qualitative approaches alone or using quantitative approaches alone. For instance, including quantitative elements helped the study to determine the level and magnitude of the problem under study as well as investigating the relationship between study variables, which cannot be achieved by using qualitative approach alone. Also, with incorporating qualitative elements, the study controlled the environment in the field and adds new outcomes through open ended sort of questions, which cannot be achieved if the study used quantitative approach alone. Hence, mixed study approach was suitable as research approaches complemented each other.

3.4 Research Design

This research used explanatory and exploratory for both quantitative and qualitative data respectively. In this study, the researcher initially conducted quantitative research, analysed the results and then produced results were later explained them in more detail with qualitative research.

3.5 The Study Area

The study was conducted in Tanzania mainland, particularly at Pangani District in Tanga region. Therefore, the study preferred a Pangani District in Tanga Region because it is accessible, also there is a number of water-based project conducted within a district, so it was easier for a researcher to acquire the correct information concerning the subject matter from the vitality exposure. In particular, the study target 20 water projects conducted at Pangani so as to investigate the factors affecting the sustainability of water projects at Pangani District. In the district there is RUWASA office which is the authority in charge of managing the water project available in Pangani district. The office was consulted before carrying out a study in order to allow the researcher to conduct a study there and to allow its staffs to participate in the study.

3.6 Study Population

According to Kothari (2016), a population is defined as the number of individuals included in the investigation. In this study, community members who regarded as project beneficiaries, RUWASA officials in Pangani District, ward executive officers and water committee members were regarded as study population. 48,521 Community members were targeted for quantitative data collection whereas 16 RUWASA officials, 13 ward executive officers and 180 water committee members were targeted for qualitative data collection. This was done in order to have the views or opinions from both project implementers and beneficiaries.

Table 3.1: Targeted Water Projects at Pangani Districts

N/A	Project	Number of people (Coverage Target)	Water stations	Number of water tap	Beneficiaries of the projects
1	KIGURUSIMBA	1,208	6	12	KIGURUSIMBA
2	MASAIKA	1,114	20	34	MASAIKA
3	MIVUMONI	3,074	27	47	MIVUMONI
4	MSARAZA	3607	16	45	MSARAZA
5	BOZA & KIMANG'A	4,777	137	181	KIBO
6	BWENI	1,519	58	68	BWENI
7	MZAMBARAUNI	358	4	8	MZAMBARAUNI
8	MWERA & USHONGO	5,146	180	210	MWERA & USHONGO
9	MEKA & MSEKO	1455	13	13	MEKA & MSEKO
10	UBANGAA	1048	11	22	UBANGAA
11	TUNGAMAA	1,882	17	28	TUNGAMAA
12	LANGONI	1,285	4	5	LANGONI
13	MIKINGUNI & STAHABU	3,090	11	30	MIKINGUNI
14	MTANGO	2,382	11	22	MTANGO & MTONGA
15	KWAKIBUYU	4,437	42	76	KWAKIBUYU
16	KIPUMBUNI	2,065	103	110	KIPUMBUNI
17	SANGE & MAKORORA	1,891	5	6	SANGE & MAKORORA
18	MIKOCHENI	1,486	23	38	MIKOCHENI
19	MBULIZAGA	1,675	13	23	MBULIZAGA
20	MKALAMO	5,022	9	30	MKALAMO

Source: Pangani District, (2022)**.**

3.7 Sampling Design

3.7.1 Simple Random Sampling

This study employed simple random technique to select randomly 5 water projects implemented in Pangani District. The names of 20 water projects implemented in Pangani District were written in pieces of paper and shuffled, then the researcher randomly picked 5 pieces of papers with the names of water projects which were included in this study. This method was useful as it was fair and provided an equal chance for the water projects to be part of this study. After random selection of 5 water projects, the researcher consulted 5 village leaders of the villages where these projects operate in order to identify household heads in their villages. The researcher

further wrote the names of those household heads in pieces of paper and then shuffle, the researcher picked 397 names of household heads as community members who participated in quantitative data collection.

3.7.2 Purposive Sampling

Purposive sampling is non-probability sampling that is selected based on the characteristics of population and the objective of the study (Creswell, 2014). Purposive sampling was used to select government officials from RUWASA, ward executive officers and water committee members who participated in qualitative data collection. According to Creswell (2017), purposive sampling is appropriate for qualitative study, since this is a mixed study, purposive sampling was useful because the respondents who were selected using purposive sampling participated in qualitative data gathering.

3.7.3 Sample Size

A number of 417 respondents were drawn (it includes 397 community members obtained by the formula who participate in quantitative data gathering and 20 government officials which were purposively obtained to participate in qualitative data gathering). The 20 respondents who were purposively selected to participate in qualitative data gathering included government officials from RUWASA (5), ward executive officers (5 respondents, one in each ward among 5 wards with the randomly selected projects for the study) and water committee members (10 which include 2 respondents in each ward among 5 wards with the randomly selected projects for the study). Furthermore, 397 community members were drawn for quantitative data gathering with the aid of Slovin's formula and the workings are as

shown below.

n = N / (1+N (e) 2)

Whereas: n = sample size; N = Population of the study; e = Error term

Particulars: N = 48,521 (Number of population benefited from water projects in Pangani District); e = 5% error term; n =?

Thus,

n = 48,521/ (1+ 48,521 (0.05)2

n =48,521/1+ 48,521(0.0025)

n = 48,521/1+ 121.3

n = 48,521/122.3

n = 396.7

n=397

3.8 Variables and Measurement

This part presents the variables involved in this study and their respective measurements. Independent variables include community participation, management skills and technology while the study's dependent variable is sustainability of water projects. Table 3.2 presents the variables and measurements of the variables included in questionnaires for quantitative data gathering. On the side of qualitative research, the variables including community participation, management skills, technology employed and sustainability of water projects were measured using nominal scale. The non-numeric interviewees' response from the open ended questions included in interviews was coded and measured using nominal scale.

Community participation was measured through five indicators including participation in meetings, in decision making, cost sharing, participating through labour and participating through materials provision. Indicators of management skills included technical skills, skills in resource management, community mobilization skills and skills in estimating project schedule and budgeting. About technology, the study spotlighted the choice of pumping technology, availability of spare parts, maintenance of project infrastructure, adoption of technology and operators' skills and expertise. On the side of sustainability of water projects the study considered several indicators including availability of water in years-round, continued improvement of water projects, level of people empowerment, environmental protection and conservation, reliable water source, availability of project resources and maintenance of viability/benefits/gains.

Table 3.2: Variables and Measurements

S/N	Variable to be measured	Number of scale items	Measurement scale	Source
1	Sustainability of water projects	7 items	5 point Likert scale	Tafara, (2013)
2	Community participation	5 items	5 point Likert scale	Muriuki and Luketero (2019)
3	Management skills	4 items	5 point Likert scale	Persoon (2016)
4	Technology	5 items	5 point Likert scale	Olela (2018)
	Total	21		

Source: Research data, (2022).

3.9 Instruments of Data Collection

3.9.1 Semi-Structured Interview

The method was used for RUWASA officials in Pangani District, ward executive officers and committee members to collect qualitative data concerning factors affecting sustainability of water projects. In general, semi-structured interview is the

technique for the exploration of the perceptions and opinions of the interviewees. The rationale of choosing semi-structured interview is that the method enabled respondents to express their views in details as well as providing chances for discussions about the problem under study.

3.9.2 Questionnaire

A questionnaire is a set of questions, each of which has a number of possible responses from which responders can choose (Lee, 2020). According to Snyder (2019), there are two sorts of surveys: structured or closed-ended questionnaires and unstructured or open-ended questions. In this study, structured or closed-ended questionnaires were used to collect quantitative data regarding factors affecting sustainability of water projects from community members who are regarded as project beneficiaries. In this study, 397 questionnaires were distributed to respondents in order to respond to the questions asked. This is the suitable method for the study because it is less costly and enables the researcher to collect data in a short period of time.

3.10 Data Analysis

3.10.1 Quantitative Data Analysis

Quantitative data obtained through questionnaire were analysed through descriptive statistics and multiple regression analysis with the aid of Statistical Package for Social Science (SPSS version 23.0). As specified earlier, this is an explanatory study, hence the first phase of quantitative data analysis provided direction of results which were explained further with qualitative data. Descriptive statistics shown frequencies and percentages of demographic variables such as age, sex etc and other

study variables including the level of community participation, management skills, technology and sustainability of projects. Multiple regression analysis enabled the study to show the direction of relationship between the study's independent variables including community participation, management skills and technology and the study's dependent variable which is sustainability of water projects.

Multiple regression analysis equation

$Y= \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + e$

Where: Y= Sustainability of water projects

β1, β2, β3 and β4 are constants or unknown parameters

X1= Community participation

X2= Management skills

X3= Technology

e = Error term

3.10.2 Qualitative Data Analysis

Qualitative data collected through semi-structured interview were analysed using thematic analysis. Through this technique the researcher gained familiarity with data obtained through interviews. After being familiar with data collected through interview, the researcher assigned preliminary codes to the collected data in order to describe the content. Then, the patterns or themes in the codes were searched across the different interviews, reviewed, defined, named and then produce a report.

3.11 Reliability and Validity

In research, reliability and validity are designed to measure the extent to which a measuring procedure produces consistent results after repeated administration of the

scale (Bonett and Wright, 2014).

3.11.1 Reliability and Validity of Quantitative Data

3.11.1.1 Reliability

Reliability refers to the degree to which a result remains consistent over time. Cronbach's Alpha was developed to determine data consistency. It is critical to assess the dependability of the items in order to ensure that all of the study variables are measuring the same underlying hypothesis. The interpretation of Cronbach's Alpha is; a > 9 (excellent); a > 8 (Good); a > 7 (Acceptable); a > 6 (Questionable); a > 5 (Poor) and a < 5 (Unacceptable) (Bonett and Wright, 2014). Therefore, this study applied this interpretation to determine reliability of research. CronBack Alpha was used to measure the reliability of quantitative data collected through questionnaire.

3.11.1.2 Validity

The validity of the data is present in all cases to determine whether the research accomplished what was intended. To ensure the validity of the data, the researcher conducted a pilot study to test the data collection tools prior to the actual data collection. Prior to data collection in this study, questionnaires were distributed to 10% of respondents in order to test if they understood the questions in the same way. The researcher was able to ensure that respondents understands the questions correctly and in the same way.

3.11.2 Reliability and Validity of Quantitative Data

The methods which are used to measure reliability and validity in qualitative study are; credibility transferability, dependability, conformability and reflexivity.

3.11.2.1 Credibility

The degree of assurance that the research's findings are accurate. Credibility determines if the research findings are a valid interpretation of the participants' original perspectives and represent plausible information derived from the participants' original data. Different methods can be used to guarantee credibility in qualitative research. These strategies include prolonged engagement, persistent observation, triangulation, and member check (Korstjens and Moser, 2018). By being involved for a long time, the researcher was able to examine misconceptions, develop a rapport with the participants, and spend enough time getting to know the location and context. This method allowed the study to obtain trustworthy and accurate data from the field.

The study determined the traits and components that were most pertinent to the issue being investigated through careful observation. To ensure the reliability and validity of the research, the researcher used three different data gathering methods, including an interview and a questionnaire. Members of the groups from which the data were initially collected were given some feedback by the researcher regarding the data, analytical categories, interpretation, and conclusions through member check. In the context of this study, the member groups from whom qualitative data were originally obtained were RUWASA officials, ward executive officers and committee mebers. This strengthened the data, especially because researcher and respondents looked at the data with different eyes.

3.11.2.2 Transferability

This is the degree to which the results of qualitative research can be transferred to

other context or settings with other respondents (Korstjens and Moser, 2018). Transferability was used to measure reliability of qualitative data collected through interviews. The study facilitated the transferability judgement through thick description. In this study, the study cross-checked the results by selecting government officials in Muheza district in order to study whether they had similar or different views concerning the factors influencing sustainability of water projects. The study confirmed that the respondents had similar views as the sampled government officials of Pangani district who were involved in interviews. In this case, the qualitative results are trustworthy.

3.11.2.3 Dependability

This is the consistency of results across time. Dependability entails participants' judgment of the study's conclusions, interpretation, and suggestions in order for all of them to be backed by the information they were given by study participants (Korstjens and Moser, 2018). This was accomplished through the use of an audit trail, wherein the researcher openly disclosed the actions followed from the conception of a research project to the development and dissemination of the findings. The records of the research path were kept throughout the study.

3.11.2.4 Confirmability

This indicates the likelihood that additional researchers will find the research study's findings to be reliable. Confirmability is concerned with proving that the data and interpretations of the findings are obviously drawn from the data and not the inquirer's imagination (Korstjens and Moser, 2018). Through audit trail, confirmability is implemented in the same way as dependability. The processes

taken from the beginning of a research endeavor to the development and reporting of the findings were transparently documented by the researcher.

3.11.2.5 Reflexivity

This approach involves critical self-reflection regarding the researcher's own biases, interests, and prejudices as well as the relationship with the respondent and how that relationship influences the participant's responses to the research questions (Korstjens and Moser, 2018). Using this approach, the researcher explored how their own conceptual lens, explicit and implicit assumptions, preconceptions, and values affected their research choices throughout all stages of qualitative studies.

3.12 Ethical Considerations

According to Creswell (2017), ethical consideration is a basic principle in ethical issues which includes treatment of participants or respondents as well as observing respect and justice. The researcher requested a permission letter from Open University of Tanzania in order to get the permission from RUWASA in Pangani District in order to authorize the researcher to collect data in the selected area. Respondents remained anonymous; participants' responses were reported using pseudonyms rather than their actual names.

Participation in this research was voluntary with informed consent. The participants were informed about the purpose of this study that it was only for academics requirements and not in any other way that would cause harm to respondents. Also other people's works and all the citations that were used in this study were acknowledged using the APA referencing style.

CHAPTER FOUR

FINDINGS OF THE STUDY

4.1 Overview

This part presents the findings in respect to the study objectives. The findings are in terms of descriptive statistics and inferential statistics, in which qualitative data obtained through interviews, are used to explain the quantitative data analyzed using descriptive and inferential analysis.

4.2 Response Rate

An aggregate of 397 questionnaires were distributed to sampled community members in Pangani District. The researcher succeeded in collecting 304 completed and useable questionnaire, thus achieving a response rate of 76.6% which far above 60% which recommended by research methodology scholars including Morton, et al., (2012).

4.3 Reliability Test

Reliability of data was measured using Cronbach's Alpha Scale, whereby the items included were sustainability of water projects, community participation, management skills and technology. It was important to measure the reliability of these items so as to be assured that these variables measure the same underlying purpose. The interpretation of Cronbach's Alpha Scale is; $a \geq 0.9$ means excellent, $0.9 > a \geq 0.8$ means good, $0.8 > a \geq 7$ means acceptable, $0.7 > a \geq 0.6$ means questionable, $0.6 > a \geq 0.5$ means poor, and $0.5 > a$ means unacceptable (Tavakol and Dennick, 2011).

Table 4.1: Reliability Statistics

Variables	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Sustainability of water projects	0.814	0.884	7
Community participation	0.864	0.887	5
Management skills	0.821	0.864	4
Technology	0.873	0. 880	5

Source: Research data, (2023).

Table 4.1 presents the reliability results, of which it was indicated that sustainability of water projects has the Cronbach's alpha value of 0.81, community participation has the Cronbach's alpha value of 0.86, management skills has the Cronbach's alpha value of 0.82, while technology has the Cronbach alpha value of 0.87. This means the Cronbach's Alpha Scale results in all variables including sustainability of water projects, community participation, management skills and technology were above 0.80 which is good according to the interpretation of Tavakol and Dennick, (2011).

4.4 Demographic Profile

This study included community members in Pangani district who participated in quantitative data collection whereas government officials from RUWASA, ward executive officers and water committee members participated in qualitative data collection.

4.4.1 Demographic profile-Community Members

This study included five variables to demonstrate demographic profile of the sampled community members. These variables included sex, age, education level, occupation and monthly income in which the findings are as presented in Table 4.2.

Table 4.2 indicates that 163 (53.6%) of the sampled community members were male respondents while 141 (46.4%) of them were female respondents. This shows that

male and female respondents were included in the study, however, the number of male respondents slightly exceeds the number of female respondents, hence this implies that the study considered gender balance.

About 102 (33.6%) of respondents were aged between 40 and 50 years old followed by those aged between 29 and 39 years 84 (27.6%).The rest of respondents aged 51 years and above 67 (22%), followed by those aged between 18 and 28 years (16.8%). This shows that the study had response from both youth and adults. Since that youth and adults have different ways of seeing things, they have different opinions and different ways of reacting to the questions. Hence, it implies that the study succeeded in collection of opinions from both youth and adults. It was also revealed that 117 (38.5%) which is the highest percentage of respondents have primary level of education, followed by those with secondary level of education 104 (34.2%). The rest of respondents had no formal education 42 (13.8%), followed by those with college/ university level of education 41 (13.5%). People with different level of education tend to have different opinions and different ways of reacting to the questions. This implies that this study succeeded in collecting diverse opinions from respondents with different opinions.

The findings also indicated that 105 (34.5%) of respondents are farmers, followed by those engaged in entrepreneurship 102 (33.6%). The rest of respondents were engaged in livestock keeping 60 (19.7%), followed by the ones who are employed 37 (12.2%). This implies that 267 (87.8%) of respondents were self-employed in farming, entrepreneurship and livestock keeping while only 37 (12.2%) employed. This implies that in Pangani district there are a lot of self-employment opportunities

than formal employment opportunities.

The rate of monthly income earned by majority of respondents 109 (35.9%) was between 100,001 and 200,000Tshs, while the rest earned 200,001-300,000Tshs [72(23.7%)]. The rest of respondents were earning less/equal to 100,000Tshs [64(21.1%)], followed by those earning 300,001-400,000 [38(12.5%)] and those earning 400,001 and above [21(6.9%)]. The study considered income variable because people in the community whom some of them were respondents from this study are required to participate in water projects through money as well as materials which all of them requires money. From the findings, it implies that people in the community have no high capacity to contribute to water project through money. However this does not imply that the community members fail to contribute to the project through money because there is a chance to contribute through low amount of money or participate through labor as well as in meetings and decision making.

Table 4.2: Characteristics of Respondents-Community Members (N=304)

Variable	Category	Frequency	Percentage (%)
Sex	Male	163	53.6
	Female	141	46.4
Age	18-28	51	16.8
	29-39	84	27.6
	40-50	102	33.6
	51 and above	67	22.0
Education level	No formal education	42	13.8
	Primary	117	38.5
	Secondary	104	34.2
	College/University	41	13.5
Occupation	Livestock keeper	60	19.7
	Farmer	105	34.5
	Employed	37	12.2
	Entrepreneur	102	33.6
Monthly income	Less/equal to 100,000	64	21.1
	100,001-200,000	109	35.9
	200,001-300,000	72	23.7
	300,001-400,000	38	12.5
	400,001 and above	21	6.9

Source: Researcher, (2022).

4.4.2 Demographic Profile-Project Officials

This study included five RUWASA officials, five ward executive officers and ten committee members who participated in qualitative data gathering apart from community members who participated in quantitative data gathering. Table 4.3 indicates that male respondents were 12 (60%) while female respondents were 8(40%). This implies that the study considered gender balance as the study collected opinions of both male and female respondents; however the number of male respondents exceeded the number of female respondents.

About age of interviewees, 8(40%) were aged between 29 and 39 which is the highest percentage, followed by those aged 40-50 years 6(30%). It was also indicated that 4(20%) of interviewees were aged 51 years and above while 2(10%) were aged between 18 and 28 years. By these findings it appears that the age range of the respondents included in this study balanced, the researcher collected opinions of both youth as well as adulthood respondents.

In this study, 10(50%) of interviewees were water committee members, while 5(25%) were RUWASA officials and 5(25%) were ward executive officers. Among the interviewees, 10(50%) had work experience above 5 years, 9(45%) had work experience between 2 and 5 years and 1(5%) had experience of 0-1 year (See Table 4.3). These findings imply that the study collected data with opinions from both low experienced and high experienced employees.

Table 4.3: Characteristics of Respondents-Project Officials (N=20)

Variable	Category	Frequency	Percentage (%)
Sex	Male Female	12 8	60 40
Age	18-28 29-39 40-50 51 and above	2 8 6 4	10 40 30 20
Position	RUWASA official Ward executive officer Water committee member	5 5 10	25 25 50
Work experience	0-1year 2-5 years Above 5 years	1 9 10	5 45 50

Source: Researcher, (2022).

4.5 Descriptive Analysis

This part presents descriptive data in terms of frequencies and percentage in order to depict the effect community participation on sustainability of water projects, the influence of management skills on sustainability of water projects and the influence of technology employed on sustainability of water projects in Pangani District. This part also describes respondents' opinions on sustainability of the existing water projects in the selected district.

4.5.1 Respondent's Responses on Community Participation in Water Projects

Five variables were used to gather information about community participation for water projects in Pangani District. These variables include participation in meetings, participation in decision making, participation through labor, cost sharing and participation through materials. Table 4.4 indicates that majority of respondents 199(65.4%) agreed that there is community participation regarding water projects while 79(26%) did not agree with this statement and 26(8.6%) were not sure.

Table 4.4 also indicates that majority 205(67.3%) of research participants agreed with the statement that the community participates in decision making for water projects and 67(22%) did not concur with this statement whereas 32(10.5%) were neutral about this. It also reveals that 240(78.9%) of respondents agreed that they participate in water projects through labour whereas 37(12.2%) disagreed on the statement while 27(8.9%) were not sure. The findings through questionnaire also revealed that 179(58.8%) of respondents participate in water projects through cost sharing whereas 89(29.2%) disagreed on the statement while 36(11.8%) were not sure. It was also revealed that 193(63.5%) of respondents agreed that they participate in water projects through materials whereas 87(28.7%) disagreed on the statement while 24(7.8%) were not sure. These findings are as presented in details in Table 4.4.

Table 4.4: Respondent's Responses on Community Participation in Pangani District (N=304)

Variables	Responses									
	SD		D		N		A		SA	
	F	%	F	%	F	%	F	%	F	%
Participation in meetings	15	4.9	64	21.1	26	8.6	117	38.5	82	26.9
Participation in decision making	22	7.2	45	14.8	32	10.5	131	43.0	74	24.3
Participation through labor	3	1	34	11.2	27	8.9	142	46.7	98	32.2
Cost sharing	17	5.6	72	23.6	36	11.8	98	32.2	81	26.6
Participation through materials	16	5.3	71	23.4	24	7.8	104	34.2	89	29.3

Key: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree and SA = Strongly Agree

4.5.2 Respondent's Responses on Management Skills in Pangani District

The second objective of this study was to examine the influence of management skills on sustainability of water projects in Pangani District. One of the ways to achieve this objective was to describe respondents' perceptions on the influence of technical skills and expertise of leaders, skills in resource management, skills in estimating project schedule and budget and leadership skills in community

mobilization on sustainability of water projects in the selected district.

Table 4.5 indicates that 220(72.3%) of respondents agreed that leaders in charge of water projects' management have technical skills and expertise whereas 44(14.5%) disagreed on the statement while 40(13.2%) were not sure. Table 4.3 also indicates that 232(76.3%) of respondents agreed that leaders have skills in resource management whereas 51(16.8%) disagreed on the statement while 21(6.9%) were not sure. It was also revealed that 244(80%) of respondents agreed that leaders have skills in estimating project schedule and budget whereas 42(13.8%) disagreed on the statement while 18(5.9%) were not sure. Moreover, questionnaire findings indicated that 219(72.1%) of leaders managing water projects have skills in community mobilization whereas 50(16.4%) disagreed on the statement while 35(11.5%) were not sure. The findings are as presented in details in Table 4.5.

Table 4.5: Respondent's Responses on Management Skills in Pangani District (N=304)

Variables	SD		D		N		A		SA	
	F	%	F	%	F	%	F	%	F	%
Technical skills and expertise of leaders	13	4.3	31	10.2	40	13.2	119	39.1	101	33.2
Skills in resource management	11	3.6	40	13.2	21	6.9	105	34.5	127	41.8
Skills in estimating project schedule and budget	13	4.3	29	9.5	18	5.9	146	48.0	98	32.0
Skills in community mobilization	4	1.3	46	15.1	35	11.5	99	32.6	120	39.5

Key: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree and SA = Strongly Agree

4.5.3 Respondents' Response on Technology Employed in Pangani District

Like community participation and management skills, technology employed also have an influence on sustainability of water projects in Pangani District. The findings obtained through questionnaire as presented in Table 4.6 shows that

276(90.8%) of respondents agreed that the water pumping technology used in water projects is useful and convenient to them whereas 18(5.9%) disagreed on the statement while 10(3.3%) were not sure.

Table 4.6 also indicates that 295(97%) of respondents agreed that spare parts are always available to repair the water infrastructures whereas 5(1.5%) disagreed on the statement while 4(1.3%) was not sure. In the same way, 300(98.7%) of respondents agreed that the infrastructure of water projects is well maintained whereas 3(0.9%) disagreed on that while 1(0.3%) was not sure. It was also revealed that 227(74.6%) of respondents agreed that the community adopted the technology used in water projects whereas 30(9.9%) of respondents disagreed on the statement while 47(15.5%) were not sure. Furthermore, Table 4.6 indicates that 295(97%) of respondents agreed that operators have skills and expertise whereas 7(2.3%) disagreed on the statement while 2(0.6%) were not sure.

Table 4.6: Respondents' Response on Technology Employed in Pangani District (N=304)

Variables	SD		D		N		A		SA	
	F	%	F	%	F	%	F	%	F	%
Choice of pumping technology	3	1	15	4.9	10	3.3	142	46.7	134	44.1
Availability of spare parts	2	0.6	3	0.9	4	1.3	139	45.7	156	51.3
Maintenance of project infrastructure	1	0.3	2	0.6	1	0.3	148	48.7	152	50.0
Adoption of technology	14	4.6	16	5.3	47	15.5	104	34.2	123	40.4
Operators' skills and expertise	3	1	4	1.3	2	0.6	155	50.9	140	46.1

Key: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree and SA = Strongly Agree

4.5.4 Sustainability of Water Projects in Pangani District

In this study, sustainability of water projects was the study's dependent variable. Seven variables were considered in describing sustainability of water projects in

Pangani District. These variables include availability of water in year-round, continued improvement of the project, level of people empowerment, environmental protection and conservation, reliable water source, availability of resource for project and maintained viability/benefits/gains. The findings are as presented in Table 4.7.

Table 4.7 shows that 199(65.5%) of the sampled community members agreed that water is available in Pangani District all year-round whereas 51(16.7%) disagreed on the statement while 54(17.8%) were not sure. In contrary, 178(58.6%) of respondents disagreed that there is continued improvement of the projects in the District whereas 61(20%) agreed on the statement while 65(21.4%) were neutral. Questionnaire findings also indicated that 138(45.4%) of respondents agreed that people are empowered through water projects whereas 109(35.9%) disagreed on the statement while 57(18.7%) were not sure. It was also revealed that 206(67.7%) of respondents agreed that there is environment protection and conservation, hence the water projects have not produced environmental harm whereas 30(9.9%) of respondents disagreed on the statement while 68(22.4%) were not sure.

The findings obtained through questionnaire indicated that 232(76.4%) of respondents agreed that there are reliable water sources in the district whereas 31(10.1%) of respondents disagreed on the statement while 41(13.5%) of respondents were neutral. It was indicated that 181(59.6%) of respondents disagreed that there is availability of resource for project whereas 73(24%) of respondents agreed on the statement while 50(16.4%) were neutral. Moreover, questionnaire findings indicated that 164(54%) of respondents agreed that there is maintained viability/benefits/gains in water projects available in Pangani District whereas

111(36.5%) disagreed on the statement while 29(9.5%) of respondents were neutral.

Table 4.7: Sustainability of Water Projects in Pangani District (304)

Variables	SD		D		N		A		SA	
	F	%	F	%	F	%	F	%	F	%
Availability of water in years-round	20	6.5	31	10.2	54	17.8	107	35.2	92	30.3
Continued improvement of the project	82	27	96	31.6	65	21.4	43	14.1	18	5.9
Level of people empowerment	45	14.8	64	21.1	57	18.7	82	27.0	56	18.4
Environmental protection and conservation	13	4.3	17	5.6	68	22.4	105	34.5	101	33.2
Reliable water source	12	3.9	19	6.2	41	13.5	123	40.5	109	35.9
Availability of resource for project	92	30.3	89	29.3	50	16.4	59	19.4	14	4.6
Maintained viability/benefits/ gains	14	4.6	97	31.9	29	9.5	88	29.0	76	25.0

Key: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree and SA = Strongly Agree

4.6 Multiple Regression Analysis

4.6.1 Regression Assumptions

4.6.1.1 Test of Auto-Correlation Assumption

This part presents the test of auto-correlation using the Durbin-Watson value. Durbin-Watson (d) statistic value is supposed to be not less than 1 or greater than 3 and fully not exactly 2. Durbin-Watson values should range between 1.5 and 2.5 (Field, 2009). Table 4.8 presents that the Durbin-Watson value is 1.762, which ranges between the values of $1.5 < d < 2.5$, suggesting that there was no auto-correlation errors in the regression model, and so no highly correlated variables in the general model.

Table 4.8: Test of Auto-Correlation

Model	Durbin-Watson
1	1.762

a. Predictors: (Constant), technology, community participation, management skills
b. Dependent Variable: sustainability of water projects

4.6.1.2 Test of Normality Assumption

This regression assumption must be tested because, in order to make a valid inference from a regression model, the regression residual must follow the normal distribution. Skewness and Kortosis tests were done to ascertain the normality statistics. Field (2009) indicated that the values of skewness and kurtosis lying in between -2 and +2 the data are considered normally distributed and hence satisfactory for interpretation. The test results in Table 4.9 show that the residuals are normal, and the study was able to make a valid inference using this regression model.

Table 4.9: Test of Normality: Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Community participation	304	-.732	.140	1.070	.279
Management skills	304	-.160	.140	-.025	.279
Technology	304	.509	.140	.025	.279
Sustainability of water projects	304	-.151	.140	.030	.279
Valid N (listwise)	304				

Source: Research data, (2023).

4.6.1.3 Multicollinearity Test

This is measured to see if the predictor variables are highly correlated with one another. The VIF value above 10 and tolerance less than 0.1 means that there is significant multicollinearity. The model does not suffer from multicollinearity because the VIF ranges from 1.879 to 2.020. Table 4.8 also indicates that tolerance values in all variables are above 0.1 which implies that the model does not suffer from multi-collinearity. For further inspection see Table 4.10.

Table 4.10: Test of Multicollinearity

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Community participation	.532	1.879
	Management skills	.526	1.901
	Technology	.495	2.020

a. Dependent Variable: sustainability of water projects

4.6.2 Model Summary

This part provides the R values. The R value explains how well the whole model describes the data. In this case the model explained 58.6% of the data. R square explains the extent to which the variability of the dependent variable is explained by the independent variables. In this case 34.4% of the variability in sustainability of water projects was explained by the independent variables namely community participation, management skills and technology employed. In this study, the adjusted R square value was 33.7%. This means that accurately, 33.7% of the total variability of the dependent variable was explained by the independent variables.

Table 4.11: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.586[a]	.344	.337	.49982	.344	52.388	3	300	.000

a. Predictors: (Constant), technology, community participation, management skills
b. Dependent Variable: sustainability of water projects

4.6.3 ANOVA

This part presents the analysis of variance (ANOVA). This section provides statistics about the overall significance of the model being fit. By looking at the significant value also known as the p-value, one is able to know if the independent variables of the study explain the dependent variable. The ANOVA results indicated that the p-value is 0.000 which is less than 0.05. This tells us that the study's independent variables including community participation, management skills and technology

employed reliably explains the dependent variable which was sustainability of water projects, therefore the model is statistically significant.

Table 4.12: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	39.263	3	13.088	52.388	.000[b]
	Residual	74.946	300	.250		
	Total	114.209	303			

a. Dependent Variable: sustainability of water projects
b. Predictors: (Constant), technology, community participation, management skills

4.6.4 Multiple Regression Results on Factors Influencing Sustainability of Water Projects in Pangani District

An inference on the factors influencing sustainability of sustainability of water projects in the council has been drawn using multiple regression analysis which incorporated three independent variables and one dependent variable. The three independent variables were community participation, management skills and technology employed while the study's dependent variable was sustainability of water projects. Before presenting the findings, the study considered that positive Beta value meant that the correspondent independent variable has a positive influence on the dependent variable while the p-value less than 0.05 meant that the kind of association between an independent variable and dependent variable is significant (Pallant, 2011). The findings are as presented in Table 4.13.

Table 4.13: Coefficients for Factors Influencing Sustainability of Water Projects (N=304)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.482	.149		9.981	.000
	Community participation	.169	.053	.205	3.202	.002
	Management skills	.225	.050	.291	4.509	.000
	Technology	.133	.049	.179	2.692	.007

a. Dependent Variable: sustainability of water projects

From multiple regression analysis equation

$Y= a+\beta_1X_1 + \beta_2X_2 + \beta_3X_3 + e$

Where: Y= Sustainability of water projects

β1, β2, β3 and β4 are constants or unknown parameters

X_1= Community participation

X_2= Management skills

X_3= Technology

e = Error term

Multiple regression results indicated that:

Sustainability of water projects (Y) = 1.482 (a) + 0.169 (Community participation) + 0.225 (Management skills) + 0.133 (Technology) + e

These findings indicated that all study's independent variables have positive and significant influence on sustainability of water projects.

4.6.4.1 The Influence of Community Participation on Sustainability of Water Projects

Multiple regression analysis results indicated that community participation have positive and significant influence on sustainability of water projects (β=0.169, t=3.202, p=0.002). This implies that improvement in community participation have a positive influence on sustainability of water projects in Pangani District by 16.9%.

4.6.4.2 The Influence of Management Skills on Sustainability of Water Projects

The findings through multiple regression analysis indicated that management skills have positive and significant influence on sustainability of water projects (β=0.225, t=4.509, p=0.000). This implies that each unit increase in management skills have a

positive impact on sustainability of water projects by 22.5%.

4.6.4.3 The Influence of Technology on Sustainability of Water Projects

Multiple regression results indicated that technology employed have positive and significant influence on sustainability of water projects (β=0.133, t=2.692, p=0.007). This implies that improvement of technology have a positive impact on sustainability of water projects by 13.3%.

4.6.4.4 Hypothesis Testing

This study had three hypotheses which were supposed to be accepted or rejected by multiple regression results of this study in this part:

H1: Community participation have positive and significant influence on sustainability of water projects; this hypothesis has been accepted because multiple regression analysis confirmed that community participation have positive and significant influence on sustainability of water projects (β=0.169, t=3.202, p=0.002).

H_2: Management skills have positive and significant influence on sustainability of water projects; this hypothesis has been accepted as it has been confirmed by multiple regression results that management skills have positive and significant influence on sustainability of water projects (β=0.225, t=4.509, p=0.000).

H_3: Technology employed have positive and significant influence on sustainability of water projects; this hypothesis has also been accepted because the multiple regression analysis results have confirmed that technology employed have positive influence on sustainability of water projects and the association has statistical significance (β=0.133, t=2.692, p=0.007).

4.7 Qualitative Results

Qualitative data collected through interviews were analyzed using thematic analysis and its findings concurred with quantitative findings through descriptive analysis and multiple regression analysis. The interview findings indicated that community participation, management skills and technology are the important factors which influence sustainability of water projects. In order to achieve sustainability of water projects, we need the community that participate fully in water projects (participate through labor, money, materials and so on), the leaders that have proper skills needed (this include technical skills and expertise, skills in resource management, community mobilization and so on) and the proper choice of technology (including the choice of pumping technology, operators' skills, availability of spare parts, community adoption of technology and so on).

4.7.1 Qualitative Results on Community Participation in Water Projects

Interviewees' opinions about community participation in water projects were in line with the quantitative results of this study as 19 out of 20 interviewees revealed that there is good community participation in water projects. The interviewees said that sustainability of water projects highly need community involvement from the design stage up to the implementation stage. They further explained that there are different forms in which the community members have been involved. According to the findings through thematic analysis, 9 out of 20 interviewees equivalent to 45% of interviewees said that the community members participate in meetings while 7 out of 20 interviewees equivalent to 35% of interviewees revealed that the community participates in decision making.

Qualitative findings also indicated that 13 out of 20 interviewees equivalent to 65% said that the community participates in water projects through money contributions. It was also revealed that 11 out of 20 interviewees equivalent to 55% participate through materials while 8 out of 20 interviewees equivalent to 40% revealed that the community contributes to water projects through labor. These findings are illustrated in figure 4.1. Furthermore, the interviewees explained that community participation through the mentioned forms is so fundamental as it influences sustainability of water projects. To put much emphasis on this, one interviewee said that:

> *The government acknowledges the importance of community participation in the projects that belongs to the community that is why nowadays the community is highly involved to participate in meetings as well as in decision making. This brought about the community ownership of the project which in turn, it enhances sustainability of community based projects like water projects.*

Another respondent added that:

> *Nowadays the community members are involved in water projects and much other community based projects because the benefits of doing so have been clear. Due to community involvement in meetings and in decision making, it in turn motivated them to voluntarily participate through labor, materials and in cost sharing. The community participation is very important in bringing about sustainability of water projects as they conserve their projects through cost sharing, buying spare parts and so on.*

Another interviewee said that:

> *In order to achieve sustainability of water projects we need the community which is highly involved in project design and implementation, this contribute in enhancing community ownership of the project. For instance, the community contributes to the project through money, materials and labor and some of them have formed the community based water and sanitation organizations which have been in charge of water projects management and the supply of water in rural areas in Tanzania. Through these organizations, the community members participate directly in water fee collection and in maintenance of project infrastructures. The community participation in water projects through different means have enormous contribution towards achieving sustainability of water projects.*

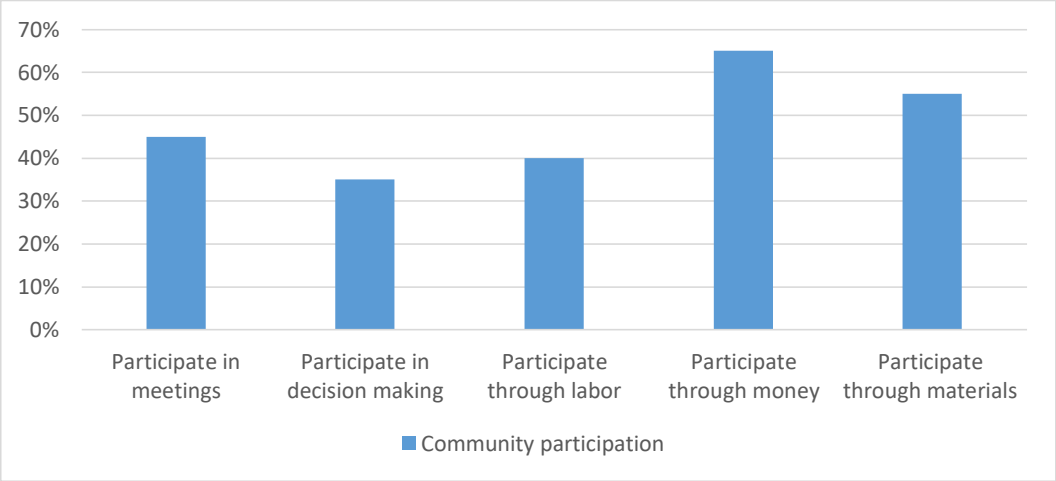

Figure 4.1: Interviewees' Opinions on Community Participation

4.7.2 Qualitative Results on Management Skills in Water Projects

Qualitative results obtained through interviews revealed that 18 out of 20 interviewees said that officials in charge of managing water projects have reliable management skills needed for project sustainability while 2 interviewees denied that. The interviewees explained that management skills are vital especially when it comes on the goal to achieve sustainability of water projects. It was revealed that 10 out of 20 equivalent to 50% of interviewees revealed that officials involved in project management have management skills including skills in resource management while 14 out of 20 equivalent to 70% of interviewees revealed that leaders have skills in community mobilization.

It was also revealed that 13 out of 20 equivalents to 65% of interviewees revealed that project implementers have expertise on what they are doing. Figure 4.2 illustrate these findings graphically. It has also been revealed that there are some community based water and sanitation organizations (CBWSOs) which have been trusted by the government to manage the existing water projects. Even in these CBWSOs, people

in charge should possess good management skills in order to attain sustainability of water projects. For instance, one interviewee said that:

> *If people trusted to manage the projects while they have no management skills may jeopardize all the expectations of the community and the government. Management skills such as skills and expertise in their job, skills in community mobilization and skills in resource management have enormous contribution to the sustainability of water projects. Hence, it is better to have the leaders and staff that possess such qualities in water projects so as to ensure sustainability of the projects.*

Another respondent said that:

> *The issue of management skills is not only needed to government officials including RUWASA officials and ward executive officers who are involved in management of water projects, but also management skills is vital to all people involved including water committee members and the staffs of the community based water and sanitation organizations. As specified earlier, the community based water and sanitation organizations have been appointed by the government to manage water projects in rural areas including in Pangani district. Therefore, it is our hope that these CBWSOs have staff who have technical skills and expertise, skills in resource management and so on.*

Another interviewee said that:

> *The skills in management of water projects is highly needed because the government and other stakeholders such as donors have invested a lot in water projects, hence such investment cannot be put in danger by having leaders who have no management skills. The leaders should have technical skills and expertise in managing these projects, they should also have skills in resource management and community mobilization as the community plays a great role in these projects. Management skills among leaders are highly emphasized because sustainability of water projects dependents on it.*

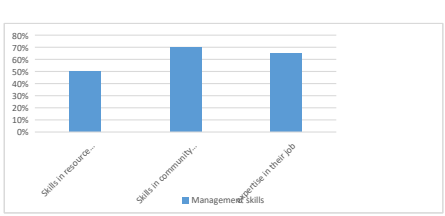

Figure 4.2: Interviewees' Opinions on Management Skills

4.7.3 Qualitative Results on Technology Employed in Water Projects

The findings obtained through questionnaire are consistence with the findings obtained through interviews. The interviewees explained that technology related matters such as a choice of pumping technology, availability of spare parts and technology adoption are vital as they have direct effect on sustainability of water projects. The study revealed that 18 out of 20 interviewees equivalent to 90% said that the choice of pumping technology was appropriate depending of the nature of the villages in Pangani district.

According to the findings, 19 out of 20 interviewees equivalent to 95% said that water infrastructures are well maintained as the government gave authority community based water and sanitation organization to manage these water projects including collection of water tariffs and maintaining project infrastructures. The adoption of technology is very slow as 16 out of 20 interviewees equivalent to 80% said that the community slowly adopt the technology while 4 equivalent to 20% of interviewees said that there was fast adoption of technology. Furthermore, 11 out of 20 interviewees equivalent to 55% said that the spare parts are adequately available while 9 out of 20 interviewees equivalent to 45% said that the spare parts are not adequately available. On this, one interviewee was quoted saying that:

> *Technology employed is a key towards achieving sustainability of water projects because in case you make wrong choice of pumping technology it might lead to unavailability of water which affects sustainability of water projects. If there is unavailability of spare parts, then it affects maintenance of water infrastructures which in turn it may affect sustainability of water projects. Therefore, the issue of technology should be taken seriously because sustainability of water projects highly depends on the good choices of technology.*

Another interviewee added that:

> *The type of technology matters when it comes to sustainability of water projects… there are some pumping technology have been very convenient as its lifespan is high, which is good for sustainability of water projects. For instance, Nira handpumps are more functional than other pumping technologies and are believed to be sustainable.*

Another interviewee added that:

> *As it has been important to have community participation and leaders with the management skills needed, it has also been important to have appropriate technology. For instance, we need a water pumping technology that produce water in all year round and durable, the spare parts should be available, the operators should have technical skills and expertise in order to conduct maintenance of water infrastructures correctly and we need fast adoption of technology by the community. All these are technology related factors that can bring about sustainability of water projects in Pangani District.*

Table 4.14: Interviewees' Opinions on Technology Employed in Water Projects (n=20)

Variables	Responses	Frequencies	Percentage
Choice of pumping technology	Appropriate choice of technology	18	90
	Not adequate choice of technology	2	10
Maintenance of infrastructures	Well maintained	19	95
	Not well maintained	1	5
Adoption of technology	Fast adoption	4	20
	Slow adoption	16	80
Availability of spare parts	Adequately available	11	55
	Not adequately available	9	45

4.7.4 Qualitative Results on Sustainability of Water Projects

The interview findings are in line with the findings obtained through questionnaire. It has been elaborated that there is a potential to achieve sustainability of water projects taking consideration to the existing indicators. For instance, the community is highly empowered through water projects as they participate in meetings and in decision making and foremost, they have been granted permission to form community based organizations in charge of water management and supply in rural

Tanzania. There are a number of CBWSOs that have been doing a great job in managing the projects and ensure maintained project gains through water fee collection, maintain the project infrastructures and availability of water in year-round. For instance, one interviewee explained that:

> *Sustainability of water projects is a thing that every district intend to achieve, taking consideration that now there are community based water and sanitation organizations which collaborate with the government, there is a potential to achieve sustainability of water projects. The community has been empowered through these community based water and sanitation organizations as they have a chance to participate directly in project management. These community based organizations have been granted authority to collect water fees based on consumption, and through this, there have been maintained project gains and the money collected have been used to conduct continuous maintenance of project infrastructures.*

Another interviewee said that:

> *Taking consideration to the available indicators such as community empowerment, continuous maintenance of the project infrastructures, availability of water in year round and maintained project gains, there is a potential to achieve sustainability of water project. It is hard to say that we have achieved sustainability of water projects now, but we are confident that in the future we can achieve that. This is because, the government is working closely with the community and with the existing developments, there is a potential to achieve sustainability of water projects.*

According to qualitative findings, 18 interviewees equivalent to 90% said that there is availability of water in year round while 15 interviewees equivalent to 75% said that the water infrastructures are well maintained which is vital for sustainability of water projects. It was revealed that 13 interviewees equivalent to 65% said that the community is empowered as they have given a chance to form community based organizations in charge of managing the established water projects and they are doing a great job. Furthermore, 17 interviewees equivalent to 85% said that there are maintained project gains as the CBWSOs in charge of collection of water tariffs are

doing their job well in collecting and maintaining the project funds.

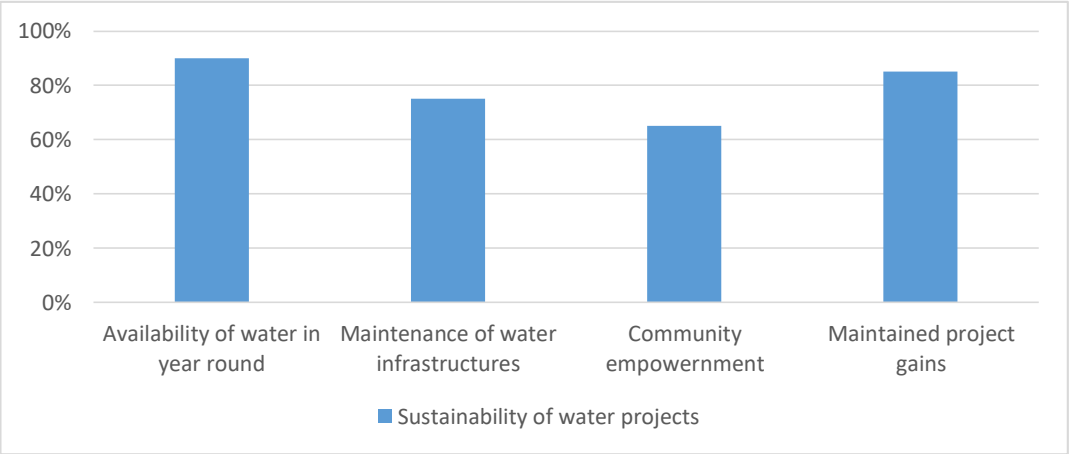

Figure 4.3: Interviewees' Opinions on Sustainability of Water Projects

CHAPTER FIVE

DISCUSSIONS OF THE FINDINGS

5.1 Overview

This chapter discusses the findings in response to the specific objectives of this study. This study intended to assess the effect of community participation on sustainability of water projects, to examine the influence of management skills on sustainability of water projects and assess the influence of technology employed on sustainability of water projects.

5.2 The Effect of Community Participation on Sustainability of Water Projects in Pangani District

This study intended to assess the effect of community participation on sustainability of water projects. The findings through descriptive statistics implied that people in the community participate in water projects through labor, materials, cost sharing and in decision making, Multiple regression analysis results indicated that community participation have positive and significant influence on sustainability of water projects. With these results, the study accepted the alternative hypothesis which stated that "*Community participation have positive and significant influence on sustainability of water projects".* In the same way, qualitative findings obtained through interviews also indicated that the community is involved in meetings and in decision making. Qualitative findings also indicated that the community participate in water projects through money, labour and materials.

These findings are in line with the findings from other studies, for instance Rik and Rutten (2016) revealed that community-based project sustainability is influenced by

multiple factors; of which community involvement is identified as the most important. Bernard et al. (2016) in their study they found that community participation in public development projects in Kenya has undergone tremendous transformation by the way of approaches and resources by which communities are now engaging in and contributing to public development projects. Pearson (2016) revealed that involvement and participation of the local community as a main factor for program sustainability. The study by Pearson (2016) concluded that this process of involvement should begin at an early stage, preferably during the program's planning phase. To accomplish this, the community must genuinely recognize the need for the program, recognize the value of the program's results, and be ready to provide local resources for the program.

In contrary, Kinyata and Abiodun, (2020) who conducted a study on the causes of the failure of many African development projects which were funded in 1980s and 1990s by Donors and implemented without involving local communities or beneficiaries of the projects found that ignorance of bottom up approaches is a major barrier that led to failure of the projects implemented at that particular time approach. Placid, (2013) added that the local communities are involved in information giving and contributions rather than making important decisions concerning the project as a result it had a negative impact on sustainability of water projects.

Rashied and Begum, (2016) also revealed that there is low community participation in community development projects in low income communities. The study by Rashied and Begum, (2016) added that people from the host community are usually

not involved, in case the local people have been included, they are always told what to do, and there is no equal partnership. Due to this, many projects fail and are merely not sustainable because they are not community oriented.

Bikuba and Kayunze, (2019) indicated that there is low participation of the community in community development projects because the projects were implemented without involving the community at early stages during project design stage. As a result, the community development projects done without involving the community fail. There are some studies indicated that community participation have negative and insignificant influence on sustainability of water projects, however, the current study's stance is that community participation have a positive and significant influence on sustainability of water projects.

5.3 The Influence of Management Skills on Sustainability of Water Projects in Pangani District

This study intended to examine the influence of management skills on sustainability of water projects in Pangani District. Descriptive statistics results indicated that leaders in charge of water projects' management have technical skills and expertise, have skills in resource mobilization, and have skills in community mobilization. Multiple regression analysis results indicated that management skills have positive and significant influence on sustainability of water projects. Therefore, the study accepted an alternative hypothesis which stated that "*Management skills have positive and significant influence on sustainability of water projects"* Similarly, qualitative results indicated that leaders have skills in resource management, skills in community mobilization and have expertise in their job.

These findings concur with the findings of Tafara, (2013) who revealed that there is a relationship between management skills and sustainability of community based water projects. The mentioned skills that leaders should have include sufficient technical expertise to manage the projects, adequate experience in management, skills in estimating the project schedule and budget and skills in risk management. Ballard and Belsky (2010), added that having community leaders with more experience in resource management might be considered as a sign of success for the conversion of data from monitoring into management decisions.

Kairu and Ngugi (2014) in their study also found that the level of education of project management committee members is the most significant variable in influencing effective implementation of the project. In the same way, Pearson (2016) revealed that effective community leadership was seen as an important and crucial factor for program sustainability and should be involved from the design phase. The study by Pearson also indicated that having a leader who is well-known in the neighbourhood increases effectiveness of the community based project.

This did not concur with the findings of Masombe and Omwenga (2020) who revealed that technical expertise of leaders were insufficient as a result it had a negative impact on sustainability of water projects. Muro and Namusonge, (2015) added that governance factors including accountability, transparency, misuse of funds and corruption affects community mobilization programs in community development projects. This is because, community can be mobilized to participate with different means such as money, materials and labour, but lack of accountability, lack of transparency, misuse of funds and corruption may discourage community

participation in community development projects. And with low community participation in community development project affects sustainability of community development projects like water projects.

Furthermore, Kavina, (2018) revealed that accountability and transparency are the variables of good governance; therefore, government officials as well as project officials should ensure accountability and transparency. Most of projects are not effectively implemented just because there is no accountability and transparency. There have been different findings from different study on the influence of management skills on sustainability of water projects, but the current study stands with its findings that management skills have positive and significant influence on sustainability of water projects.

5.4 The Influence of Technology Employed on Sustainability of Water Projects In Pangani District

This study intended to examine the influence of technology employed on sustainability of water projects in Pangani district. The findings through descriptive statistics implied that water pumping technology used in water projects is useful, there availability of spare parts, water infrastructures are well maintained, the community adopted the project infrastructures and operators have skills and expertise. Furthermore, the findings through multiple regression inferred that technology employed have positive and significant influence on sustainability of water projects. In this case, this study accepted an alternative hypothesis which stated that "*Technology employed have positive and significant influence on sustainability of water projects".* In the same way, qualitative findings obtained

through interviews revealed that choice of pumping technology was appropriate, infrastructures are well maintained and spare parts are available, but technology adoption was slow.

These findings are consistent with the findings from several studies. For instance, Tafara, (2013) assessed the impact of technology on sustainability of water projects in Kenya and found that technology was a critical factor affecting the sustainability of the community based water project through reduction of operations costs, improving the efficiency of the project and increasing the longevity of the projects. This study also indicated that technology have positive and significant impact on sustainability of water projects. Chumbula and Massawe, (2018) conducted a study in Iringa District and revealed that local institutions' management of water projects through provision of technical assistance is very critical as it enhance the life span of the projects. Cronk and Bartram, (2017) added that fee collection has enhanced higher water system functionality in Nigeria and Tanzania as the money collected has been useful for maintenance of water infrastructures and continuous improvement of the project, which in turn lead to sustainability water projects.

There are several studies which had different findings. For instance, the findings by Masombe and Omwenga (2020) were not consistent with the findings of the current study as their study found that the level of adoption of technology was very low as a result it had negative impact on sustainability of water projects. Olela, (2018) revealed that 94% of the water supply projects beneficiaries do not take party in the selection of technology used with explanation that it is the country government and development organization who implement the project chose the technology.

Odie, (2012) added that many rural water projects completed have either stopped operating or are not operating optimally in spite the major efforts. This implies that there is lack of spare parts which could be used in maintenance of water infrastructures and there is lack of operators with skills and expertise in maintenance. Muriuki and Luketero (2019) also indicated that there is slow adoption of technology among people in the community, as a result it affects water supply to the community member who are the beneficiaries of water projects. Although there are some studies indicated that technology have negative and insignificant influence on sustainability of water projects, the current study's stance is that technology have a positive and significant influence on sustainability of water projects.

CHAPTER SIX

SUMMARY, CONCUSION AND RECOMMENDATIONS

6.1 Overview

This part presents the summary of research findings, conclusion and recommendations based of the research findings.

6.2 Summary of the Research Findings

6.2.1 The Effect of Community Participation on Sustainability of Water Projects in Pangani District

The first objective of this study was to assess the effect of community participation on sustainability of water projects. Descriptive analysis findings indicated that 65.4% agreed that there is community participation regarding water projects while 26% did not agree with this statement and 8.6% were not sure. It was also revealed that 67.3% of research participants agreed with the statement that the community participates in decision making for water projects and 22% did not concur with this statement whereas 10.5% were neutral about this. It was also revealed that 78.9% of respondents agreed that they participate in water projects through labour whereas 12.2% disagreed on the statement while 8.9% were not sure.

The findings through questionnaire also revealed that 58.8% of respondents participate in water projects through cost sharing whereas 29.2% disagreed on the statement while 11.8% were not sure. It was also revealed that 63.5% of respondents agreed that they participate in water projects through materials whereas 28.7% disagreed on the statement while 7.8% were not sure. Multiple regression analysis results indicated that community participation have positive and significant influence

on sustainability of water projects (β=0.169, t=3.202, p=0.002). In the same way, qualitative findings obtained through interviews also indicated that the community is involved in meetings and in decision making. Qualitative findings also indicated that the community participate in water projects through money, labour and materials.

6.1.2 The Influence of Management Skills on Sustainability of Water Projects in Pangani District

This study intended to examine the influence of management skills on sustainability of water projects in Pangani District. The findings after descriptive analysis indicated that 72.3% of respondents agreed that leaders in charge of water projects' management have technical skills and expertise whereas 14.5% disagreed on the statement while 13.2% were not sure. The findings also indicated that 76.3% of respondents agreed that leaders have skills in resource management whereas 16.8% disagreed on the statement while 3.9 were not sure. It was also revealed that 80% of respondents agreed that leaders have skills in estimating project schedule and budget whereas 13.8% disagreed on the statement while 5.9% were not sure.

Moreover, questionnaire findings indicated that 72.1% of leaders managing water projects have skills in community mobilization whereas 16.4% disagreed on the statement while 11.5% were not sure. Furthermore, multiple regression analysis results indicated that management skills have positive and significant influence on sustainability of water projects (β=0.225, t=4.509, p=0.000). Similarly, qualitative results indicated that leaders have skills in resource management, skills in community mobilization and have expertise in their job.

6.1.3 The Influence of Technology Employed on Sustainability of Water Projects in Pangani District

On the side of the influence of technology employed on sustainability of water project in the selected district, descriptive analysis findings indicated that 90.8% of respondents agreed that the water pumping technology used in water projects is useful and convenient to them whereas 5.9% disagreed on the statement while 3.3 were not sure. The findings also indicated that 97% of respondents agreed that spare parts are always available to repair the water infrastructures whereas 1.5% disagreed on the statement while 1.3% was not sure.

In the same way, 98.7% of respondents agreed that the infrastructures of water projects are well maintained whereas 0.9% disagreed on that while 0.3% was not sure. It was also revealed that 74.6% of respondents agreed that the community adopted the technology used in water projects whereas 9.9% of respondents disagreed on the statement while 15.5% were not sure. The findings also indicated that 97% of respondents agreed that operators have skills and expertise whereas disagreed on the statement while 0.6% was not sure. Furthermore, the findings through multiple regression inferred that technology employed have positive and significant influence on sustainability of water projects (β=0.133, t=2.692, p=0.007). In the same way, qualitative findings obtained through interviews revealed that choice of pumping technology was appropriate, infrastructures are well maintained and spare parts are available, but technology adoption was slow.

6.2 Conclusion

This study concludes that community participation, management skills and

technology are among the factors influencing sustainability of water projects. In particular, community participation in meetings, in decision making, cost sharing and participation through labor and materials is vital towards achieving sustainability of water projects. The management skills which are highly needed in order to achieve sustainability of water projects are technical skills and expertise, skills in resource management and mobilization and skills in estimating project schedule and budget.

The technological related factors that have enormous contribution towards achieving sustainability of water projects are the good choice of technology, availability of spare parts, maintenance of project infrastructures, adoption of technology and operators' skills and expertise. Since that this study concludes that community participation, management skills and technology have positive influence on sustainability of water projects; it is the duty of project implementers to involve the community in every stage of the project including the design stage and the implementation stage, to choose leaders who have appropriate management skills needed and employ technology that have the capacity to supply water to the community in year-round and are durable, it can be used for a long time.

6.3 Implication of the Study

This study succeeded to accomplish its objectives because now it is vivid that community participation, management skills and technology have positive and significant effect on sustainability of water projects as hypothesized. The findings of this study are very important for policy formulation and well as in improving practice in water supply. The community, who are seen as the primary beneficiaries

of such water projects, can benefit from this study's contribution to improving water management methods. Furthermore, by involving the community fully in water projects from the planning stages onward, the study raises community knowledge of the value of project ownership.

In order to conduct more research or develop policies that could improve the sustainability of water projects, especially those executed in rural areas, the data provided in this study about the factors affecting their sustainability can be utilized as a reference or baseline. The study, in particular, can provide policy makers with evidence to help them formulate suitable policies on community involvement, management skills, and technology deployment in water projects that could improve the sustainability of water projects.

6.4 Recommendations

With regards to the study findings on the three specific objectives of the study, this study has three correspondent recommendations:

Firstly, community participation in water projects as well as other community based projects which are implemented for the benefits of the community should be priority among the community members and project implementers. This will enhance community ownership of the project and acceptance of the project by the community members. Community participation should be in a form of cost sharing, participation in meetings and decision making as well as participation through labor and materials. These forms of community participation have been proved by the study findings to have an influence on sustainability of water projects in Pangani District.

Secondly, project implementers and people or institutions involved in managing water projects should ensure that people selected in managerial positions should have proper management skills useful for enhancing lifetime of the project. The skills that are greatly needed are such as technical skills and expertise, leadership skills in estimating project schedule and budget, leadership skills in resource management and leadership skills in community mobilization.

Thirdly, the choice of technology matters on enhancing the project lifetime, hence, the authorities should make sure that technology employed is good enough towards attaining sustainability of water projects. This study reached to this suggestion because the study results confirmed that the choice of pumping technology, operators' skills and expertise, availability of spare parts, maintenance of project infrastructures and adoption of technology are among technology related matters influencing sustainability of water projects.

6.5 Limitations and Areas for Further Study

This study had several limitations which were considered in advance and the study addressed such limitation in order to ensure validity in this research. One of the limitations was related to qualitative and quantitative approach as each approach had its kind of limitation. In response to this limitation, this study opted to use mixed approach in order to minimize the weaknesses of using qualitative approaches alone or using quantitative approaches alone. The limitations of using quantitative approaches alone includes inability to control the environment and limited outcomes, in which by using mixed study approach the environment was controlled, new outcomes were added through open ended questions interview guide. On the other

side, the limitation of using qualitative approach alone includes the inability to establish the level and the magnitude of the problem, in which by using mixed study approach, the level of community participation in community development projects was determined and the magnitude of the problem concerning the problem under study was determined.

Another limitation is that due to use of questionnaire as a tool for data collection the responses depended on memory of respondents, so memory variations among respondents provided a threat of reducing the precision and accuracy when responding to the questions. This limitation was addressed by conducting a pilot study, in which the questionnaires were given to 10% of respondents before the actual data collection in order to ensure relevance of the questions and to determine whether respondents were comfortable with the questions included. Also more than one method of data collection was used including questionnaire and interview in order to reduce errors as the methods complement each other.

About the areas for further study, this study found that in Pangani district there are some community based water and sanitation organizations (CBWSOs) which are in charge for managing water project, collect water fees and are in charge of maintenance of water infrastructures. This is an opportunity for future researchers to conduct a study about the influence of CBWSOs on sustainability of water project in Pangani district or other districts in Tanzania. Since that water tariffs have not been included in this study as one of the independent variables, it is important for researchers to examine the influence of water tariffs on sustainability of water projects.

REFERENCES

Alinoor, R. H. (2017). *Factors influencing sustainability of community based projects; A case of Health project in Garissa country.* Nairobi, Kenya.

Ballard, H. L. & Belsky J. M. (2010) Participatory action research and environmental learning: implications for resilient forests and communities. *Environ Educ Res,* 16, 611–627.

Bamberger, M. & Cheema, S. (1990). *Case Studies of Project Sustainability, Implications for Policy and Operations from Asia Experience.* washington, D.C: the world bank.

Bikuba J. R. & Kayunze K. A. (2019). Enhancing Community participation to improve sustainability of irrigation projects in Geita district, Tanzania. *Journal of Agriculture Extension and Rural Development,* 11(10), 169-175

Bonett, D. G. & Wright, T. A. (2014). Cronbach's alpha reliability: Internal estimation, hypothesis testing and sample size planning. Retrieved in January 2023 from; https://wileyonlinelibrary.com.

Brest, P. (2010). *The power of theories of change,* Stanford Social Innovation Review Spring. Stanford University, USA.

Chigbu, U. E. (2012). Village renewal as an instrument of rural development: evidence from weyran, Germany. *Community development,* 43(2), 209-224.

Creswell, J. (2014). *Research design: qualitative, quantitative, and mixed methods approaches.* Thousand Oaks: SAGE Publications, Inc. Development.

De-Silva, M., Breuer, E., Lee, L., Asher, L., Chowdhary, N., Lund, C. & Patel, V. (2014). Theory of Change: a theory-driven approach to enhance the Medical Research Council's framework for complex intervention. *Trials,* 15, 267.

Hassan, A. (2017). *Factors influencing sustainability of community based projects. Nairobi Kenya Mixed Method Study.* Washington, DC: Sage Publications.

INSP, (2005). *Theory of Change Tool Manual*, INSP.

Jacqueline, T., Niklaus, H. & Dale, Y. (2013). *A review of Sanitation and Hygiene in Tanzania.* Msabi, Maji Safi Kwa Afya Bora Ifakara.

Kairu, P. N. & Ngugi, P. K. (2014). Factors affecting effective implementation of constituency development fund projects in Machakos Town Constituency, Machakos County in Kenya. *International Journal of Current Business and Social Sciences, 1*(2), 146-167.

Kinyata. G. S. & Abiodun. N. L. (2020). The impact of community participation on project's success in Africa: A Bootom-Up Approach. *International Journal of Research in Sociology and Anthropology*, 6(3), 1-8.

Korstjens, I. & Moser, A. (2018). Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *European Journal of General Practice*, 24(1), 120-124.

Mselle, L. (2013). Community participation in TASAF Funded projects, a Case of Babati Town Council. Unpublished Master dissertation, Mzumbe University, Morogoro, Tanzania.

Mugenda, O. M. & Mugenda, A. G. (2003). *Research Methods, Quantitative & Qualitative Approaches.* Acts Press: Nairobi.

Muriuki, D. K. & Luketero, S. W. (2019). Factor Influencing Sustainability of Community Based Country Projects in Kenya. Nairobi: *International Academic Journal of Information Sciences and Project Management*, 3(3), 164-184.

Muro, J. M. & Namusonge, G. S. (2015). Governance factors affecting community participation in public development projects in Meru District in Arusha in Tanzania. *International Journal of Scientific and Technology Research*, 4(6), 106-110.

Olela, E. S. (2018). Factors influencing sustainability of water projects for rural communities in arid and semi arid land. Unpublished master dissertation, Nairobi, Kenya.

Persoon, L. (2016). Factor Influencing Sustainability of Community Based Programs:

Persoon, L. (2016). Factors influencing the sustainability of community based programs: a mixed method study. Factors influencing the sustainability of community based programs, 1-11.

Rashied, M. & Begun, H. (2016). Community participation in development projects in a low income community. *Johanginagar University Planning Review,* 14, 65-76.

Saunders, B., Kitzinger, J. & Kitzinger, C. (2015). Anonymising interview data: Challenges. *Qualitative Research,* 15(5), 616–632.

Stephen, M. (2020). Factors affecting the procurement performance in public organizations in Tanzania was conducted as a case of Arusha Urban Water Supply and Sanitation Authority (AUWSA). Unpublished Master Dissertation, Institute of Accountancy Arusha, Arusha, Tanania.

Tadesse, A., Bosona, T. & Gebresenbet, G. (2013). Rural water supply management and sustainability: The case of Adama area, Ethiopia. *J. water resource, Prot,* 5, 208-221.

Tafara, A. (2013). Factors influencing sustainability of Rural Community Based Water Projects in MtitoAndei, A report of Kibwezi Sub-County. Kabwezi,

UNDP, (2010). *Millenium development goals report: Trends and Prospects towards Meeting MDG by 2015.* Adis ababa: UNDP Ethiopia Office.

WCED, (1987). Our Common Future. World Commission and Environment WCED.

APPENDICES

APPENDIX I: QUESTIONNAIRE

1. CHARACTERISTICS OF RESPONDENTS

No	Questions/Variable	Response	Code
a)	Gender	Male Female	1 2
b)	Age		
c)	Education level	No formal education Primary education Secondary education University Education	1 2 3 4
d)	Occupation	Pastoralist Farmer Civil servant Business person Others.....	1 2 3 4 5
e)	Income level per month	0-100,000 100,001-300,000 300,001-500,000 More than 500,000	1 2 3 4

2. COMMUNITY PARTICIPATION

Kindly indicate the extent to which you agree with the following statements concerning community participation in water projects. Use the scale of (1-Strongly disagree 2-Disagree 3-Neutral 4-Agree 5-Strongly agree)

	STATEMENT	1	2	3	4	5
a)	Villagers participate in meetings concern water issues					
b)	Villagers are given opportunity to participate in decision making concern water issues					
c)	Villagers are given opportunities to participate in water project as source of labour					
d)	The community participate in one way or another in material collection and mobilization					
e)	The cost of project are shared by local community (cost sharing)					

3. MANAGEMENT SKILLS

Kindly indicate the extent to which you agree with the following statements concerning management skills of leaders and members in water committee. Use the scale of (1-Strongly disagree 2-Disagree 3-Neutral 4-Agree 5-

Strongly agree)

	STATEMENT	1	2	3	4	5
a)	Committee members, RUWASA officials and local leaders have good skills in community mobilization.					
b)	Committee members, RUWASA officials and local leaders have good skills in resource management.					
c)	The committee members, RUWASA officials and local leaders are expertise and have technical skills					
d)	The committee leader, RUWASA officials and local leaders have skills in estimating project schedule and budget					

4. TECHNOLOGY

Kindly indicate the extent to which you agree with the following statements concerning Technology in water projects. Use the scale of (1-Strongly disagree 2-Disagree 3-Neutral 4-Agree 5-Strongly agree)

	STATEMENT	1	2	3	4	5
a)	Operators in water projects are skilled and expertise					
b)	The infrastructure of water projects are well maintained					
c)	The water pumping technology used in our community based water project is useful and convenient to us					
d)	In case there is a problem in water facilities the spare parts are always available to fix					
e)	The community adopted the technology used in our community based water project					

5. SUSTAINABILITY OF WATER PROJECT

Kindly indicate the extent to which you agree with the following statements concerning sustainability of water project in your village. Use the scale of (1-Strongly disagree 2-Disagree 3-Neutral 4-Agree 5-Strongly agree)

	STATEMENT	1	2	3	4	5
a)	The availability of water service in years around is of satisfiable					
b)	There is a continues improvement of water project					
c)	There is maintained benefits from the projects					
d)	The projects depend on reliable water sources					
e)	Resources for water project are easily available					
f)	Water Projects ensure Environmental protection and conservation					
g)	Water Projects help to empower locals/villagers in one way or another					

APPENDIX II: INTERVIEW GUIDE

INTERVIWEE INFORMATION

Gender: Male / Female:

Age:……

Your position:…… ……....

Number of years in your position:…… …….

QUESTIONS

1. In your opinion, do you think the community is well involved in important matters about water projects such as in decision making, through labour or in cost sharing?

   .....

   .....

2. Do you think that the community is well involved in deciding the type of technology for water abstraction and in selection of committee members

   .....

   .....

3. In your experience as a leader, do you think people involved in water projects have the required expertise and skills to carry out their duties

   .....

   .....

4. What about the leaders, do they have important leadership skills to make important decisions about the project and provide proper guidance to the implementers and the community?

.....

.....

.....

5. In your opinion, this water project technology for water pumping and abstraction is good enough?

.....

.....

6. In case of the breakdowns, does the maintenance team provide maintenance services on time in order to avoid disturbing the community?

……

……

……

……

7. What about the availability of materials, are the materials always available in order to perform maintenance on time?

……

……

……

8. In your opinion, do you believe that your community water project is sustainable in service provision and that the community is satisfied with sustainability of such project?

……

……..

THANK YOU FOR YOUR COOPERATION

THE OPEN UNIVERSITY OF TANZANIA

DIRECTORATE OF POSTGRADUATE STUDIES

P.O. Box 23409
Dar es Salaam, Tanzania
http://www.out.ac.tz

Tel: 255-22-2668992/2668445
ext.2101
Fax: 255-22-2668759
E-mail: dpgs@out.ac.tz

Our Ref: PG202000432

19th August 2022

Manager,

Rural Water Supply and Sanitation Agency (RUWASA),

Pangani District,

P.O.Box 89,

TANGA.

RE: RESEARCH CLEARANCE

The Open University of Tanzania was established by an Act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No.55 in the official Gazette. The Act was however replaced by the Open University of Tanzania Charter of 2005, which became operational on 1st January 2007.In line with the Charter, the Open University of Tanzania mission is to generate and apply knowledge through research.

To facilitate and to simplify research process therefore, the act empowers the Vice Chancellor of the Open University of Tanzania to issue research clearance, on behalf of the Government of Tanzania and Tanzania Commission for Science and Technology, to both its staff and students who are doing research in Tanzania. With this brief background, the purpose of this letter is to introduce to you **Mr. KUCHIMBA, Jumbe Said, Reg No: PG202000432** pursuing **Master of Project Management (MPM).** We here by grant this clearance to conduct a research titled **"Assessing Factors Affecting the Sustainability of Water Project in Rural Areas: A Case of Pangani District"** He will collect his data at your Office from 22nd August 2022 to 22nd September 2022.

In case you need any further information, kindly do not hesitate to contact the Deputy Vice Chancellor (Academic) of the Open University of Tanzania, P.O.Box 23409, Dar es Salaam.Tel: 022-2-2668820.We lastly thank you in advance for your assumed cooperation and facilitation of this research academic activity.

Yours,
THE OPEN UNIVERSITY OF TANZANIA

Prof. Magreth S.Bushesha
DIRECTOR OF POSTGRADUATE STUDIES.

THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF WATER
RURAL WATER SUPPLY AND SANITATION AGENCY
DISTRICT MANAGER RUWASA – PANGANI, P.O BOX 62 – PANGANI
Web site: www.ruwasa.go.tz,
E-mail: panganidm@ruwasa.go.tz

In Response Please Quote: **20/08/2022**
Ref. No. RUW/CONST.PANG/AC/53/55/01/12

Deputy Vice Chancellor (Academic) ,
The Open University of Tanzania,
P.O Box 23409,
DAR – ES - SALAAM.

RE: RESEARCH CLEARANCE

Reference is made to the above heading. Also, reffer the letter with reference Number No.PG202000432 dated on 19th Augost, 2022 regarding to introduce **Mr. KUCHIMBA, Jumbe Said**, **Reg.202000432** pursuing **Master of Project Management (MPM)** to provide cooperation and facilitation on data collection as he conducting a research titled "**Assessing Factors Affecting the Sustainability of Water Project in Rural Areas: A Case of Pangani District**" to the RUWASA - Pangani District Office from 22nd Augost, 2022 to 22nd September, 2022.

RUWASA Pangani District Office is hereby to provide assurance that **Mr. KUCHIMBA, Jumbe Said**, will be provided cooperation and facilitation for his research academic activity (data collection) concern with the subject for the said period.

Wish you all the best in advance,

"RUWASA MAJI BOMBANI"

Yours,

.....
Eng. Rajabu Yahya
DISTRICT MANAGER- RUWASA
PANGANI.

RUWASA DISTRICT MANAGER
PANGANI