

**FACTORS INFLUENCING SUSTAINABILITY OF COMMUNITY-BASED WATER  
PROJECTS IN KAJIADO COUNTY, KENYA: A CASE OF KAJIADO CENTRAL  
SUB-COUNTY**

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**DECLARATION**

This research project report is my original work and has never been presented for a degree award in any other university.

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## **DEDICATION**

This work is dedicated to my spouse Catherine and my children Stacey, Jeff and Charles for their love, understanding and invaluable support. My father James Githinji (posthumously) and mother, Naomi for instilling the value of hard work in me and believing in my capability at an early age.

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## **ABBREVIATIONS & ACRONYMS**

AfDB	-African Development Bank
CBOs	-Community-based Organisations
CIDA	-Canadian International Development Agency
DGD	-Democratic Governance for Development
ICRC	-International Committee of the Red Cross
IFAD	-International Fund for Agricultural Development
KHRC	-Kenya Human Rights Commission
KNBS	-Kenya National Bureau of Statistics
MDGs	-Millennium Development Goals
MWI	-Ministry of Water and Irrigation
NACOSTI	- National Commission for Science, Technology and Innovation
NGO	-Non-Governmental Organisation
NIA	-Neighbours Initiative Alliance
RPLRP	- Population Regional Pastoral Livelihoods Resilience Project
SDGs	-Sustainable Development Goals
SPSS	-Statistical Package for Social Sciences
SSA	-Sub-Saharan Africa
UN	-United Nations
UNDP	-United Nations Development Programme
UNICEF	-United Nations Children's Fund
USAID	- US Agency for International Development
VLOM	-Village Level Operation and Maintenance
WASH	-Water Sanitation and Hygiene
WEDC	- Water Engineering and Development Centre
WHO	-World Health Organisation

## ABSTRACT

For the sustainability water services to both rural and urban areas in Kenya, good management of water points is paramount. However, despite the efforts made by the Ministry of Water and Irrigation in conjunction with international and local NGOs towards the improvement of the situation at the grassroots, in most of the parts of the country, the water coverage remains at infancy. The estimates of the population that can obtain clean water are just 60% despite most of the region having reliable sources of water and sufficient rainfall. The condition is more severe in rural regions, inhabited by the largest portion of the population. The study investigated some of the factors influencing the sustainability of community-based water projects in Kenya, focusing on Kajiado Central sub-county. Four objectives guided the study: To determine the influence of community participation; to examine the influence of socioeconomic factor; to determine the influence of financial resources and to assess the influence of the choice of technology on the sustainability of community-based water projects in Kajiado Central Sub-county. Henceforth, this study intention was filling the knowledge gap on factors influencing the sustainability of community-based water projects by assessing the situation in Kajiado Central sub-county. Theories utilized in the study were the stakeholders and the sustainability theories. The study employed a descriptive survey research design and a cross-sectional approach used to collect quantitative data by use of a closed-ended questionnaire. The total target population was 3092. By use of cluster, random and purposive sampling methods, a sample of 77 respondents was selected from the target population of 3,092. A questionnaire was administered to the respondents by the researcher and his assistants to collect quantitative data which were measured either in the form of nominal and ordinal scale and then coded, keyed into SPSS version 22 for further analysis. The data analysis was done by the use of both descriptive and inferential statistical methods. To determine the correlation between the dependent and independent variables, the Pearson correlation coefficient method was applied. This indicated the level of significance of each variable and how it influenced the sustainability of rural water projects. The study findings revealed that the average mean of 3.51 agreed that community participation influenced the sustainability while a mean of 2.83 showed that socioeconomic factor influenced the sustainability of community-based water projects. Besides, means of 3.47 and 2.62 showed financial resources and choice of technology influenced the sustainability of community-based water projects respectively. And finally, a mean of 3.47 showed an influence on the sustainability of community-based water projects in Kajiado County in Kenya. There was then a positive strong correlation between community participation, socioeconomic factor and financial resources and influence of the sustainability of community-based water projects while a positive weak correlation was observed between choice of technology and influence of sustainability of community-based water projects in Kajiado County in Kenya. The study recommended that community participation was a key aspect in project management hence beneficiaries should be actively involved in all stages of the project life cycle and decision making for ownership and sustainability of projects, ensure there is adequate representation through gender balance in projects to minimize on conflicts that may arise and also reasonable decisions being made, ensure there is adequate financial resources, transparency and accountability in project management for the sustainability of projects and finally there should be investment of proper and advanced choice of technology by leaders and the management that is easily obtained and necessary skills and training acquired in operation of the technology which influences the sustainability of projects. Further research ought to be done in consideration to other numerous vital factors that had the potential to influence sustainability of community-based water projects and better understand project management to a larger population in other counties in Kenya for comparative purposes.

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of the study

Rural people, in developing countries, face challenges with projects that fail prematurely, leading to wasted resources and false expectations, with estimates indicating that 30% to 40% of systems either are not functional in totality or operating considerably lower than their capacity (James, 2011). Globally, studies have established that 40% of programs from a non-profit organization and community-based organizations terminate in the first few years after initial funding has been discontinued which means they are not sustainable (Ceptureanu et al., 2017). In Sub-Saharan countries such as Kenya's, empirical evidence reveals 66.7% of projects are not sustainable in the long-term (Oduwo, 2014). Ninety-five per cent of projects to end hunger in Samburu County collapsed soon after the funding period (Keura & Moronge, 2016).

There a broad range of factors which affects the water access service sustainability, these factor consist not only the physical and technical attributes but additionally they include the organizational, financial and managerial capabilities of the providers of the services, that demonstrates the possibility of continued provision of the service. Governments (national and regional) and development partners recognize the level of the challenges attributed to poor sustainability and are now shifting focus on requirements for addressing the underlying causes more holistically and systematically (James, 2011).

Clean water access has been a global concern over the past centuries. In the year 2000, one hundred and ninety-one member's states of the United Nations held a millennium summit and agreed on eight global goals which should be attained by year 2015. The goal 7 which ensuring environmental sustainability had four major targets: Target 7c was to reduce the population that lacked access to sustainable drinking water that is safe and basic sanitation by 50 per cent by the year 2015 (UNDP, 2001). The percentage of the population lacking access to improved drinking water (between 1990 and 2015) was cut in half in Latin America and the Caribbean, Southern Asia, South Eastern Asia, Eastern Asia and Western Asia.

Despite Sub-Saharan Africa achievement of a 20 % increment in the usage of improved sources of drinking water, they failed to attain the MDG target. In 2015, a total number of 663 million people across the globe were approximated to have been using sources of drinking water that were unimproved which included surface water as well as unguarded springs and wells. Almost 50% of the people that use unimproved sources resides within sub Saharan Africa, where a 5th reside in (UNDP, 2015). To continue with the realization of these global objectives, in 2015, the United Nations General Assembly outlined 17 Sustainable Development Goals (SDGs) that all nations need to achieve by 2030. The SDG 6, specifically, target 6.1 is on attaining access to safe and affordable drinking water with a focus to stretching services to 844 million individuals that are deprived of even the basic water service, and continuously refining the quality of service to 2.1 billion individuals that do not have access to water on the premises, obtainable when wanted and free from tainting. It likewise suggests going past family units and giving access to services in schools, medicinal services offices and other institutional set up (United Nation (UN) - Water, 2018).

Globally, there was an increment from 81% in 2000 to 89% in 2015 on the population that used a basic drinking water service at least. Though, just one out of five nations beneath 95% coverage on track to accomplish universal basic water services by 2020 (United Nation (UN) -Water, 2018). Availability of clean water in Sub-Saharan Africa is faced by challenges such as extreme weather events, increasing pollution, over-cultivation along with water sources, low political will, poor institutions and ineffective governance (UNDP, 2017). However, the 2030 SDG aims to ensure all people despite their geographical location, ethnicity or income have access to clean water. According to UNDP (2017), there's a need to strengthen water and sanitation interventions to solve issues that hinder access to safe water. It is, therefore, necessary for policymakers to understand the factors that hinder access to safe water and adequate sanitation first, to develop a comprehensive solution. Kenya is categorized by the UN as a chronically water scarce country (UNICEF, 2018). Kenyan's access to clean water sources is 58 per cent out of which 22 per cent reported access to piped water to their yard or house and 30 per cent had access to basic sanitation. Available data also shows 50 per cent of all illnesses in Kenya are water, sanitation and hygiene-related (UNICEF, 2017).

Kajiado County is situated at the southern side of the previous Rift Valley Province, borders Nairobi and stretches to the Tanzania border further south and has a population of 687,312 and an area of 21,292.7 km<sup>2</sup>. Kajiado County has five sub counties with similar socio-demographic characteristics except for Kajiado North which has a higher urban population compared to the others. The other 4 sub Counties of Kajiado are Kajiado South, Kajiado East, Kajiado Central and Kajiado West. Kajiado Central which will be the focus of our study has wards namely Purko, Ildamat, Dalalekutuk, Matapato North and Matapato South. The Maasai were the original inhabitants of the areas, however other people from different ethnic groups have increasingly moved into the area. The annual rainfall in Kajiado County ranges from 500 to 1,259 mm and it is a water strained region (Practical Action, 2012).

The county has four principle work zones specifically, Pastoral all species, Agro-Pastoral, and Mixed Farming vocation zones, with populace extents of 52, 12 and 5 percent correspondingly. 31% is comprised of casual waged labor, normal employment, and business livelihood zones (Population Regional Pastoral Livelihoods Resilience Project (RPLRP) - Kenya). Mostly livelihood is dependent of availability of water for drinking of for domestic purposes, irrigating crops, water for live stocks as well as industry and more often the sources includes boreholes, wetlands, springs, riverbeds and open water reservoirs. Unpredictable rains, high temperature and recurring as well as lengthy droughts describes Kajiado county. The changes in frequency and intensity of the aforementioned conditions may be sign of changes in climates whose full effects are yet to be completely comprehended. In the past, the region had a rainfall pattern which was bi-modal which could be perceived in the latest changes majorly leading to lack of reliability and continued unpredictability (Watershed, 2018).

Kajiado County being semi-arid, mostly water is found in riverbeds beneath the sand and the communities fetch from the scoop holes despite the being unsafe sources. As a result of the expensive cost of drilling boreholes, just a few have been drilled and there a large population is left without water. In comparison to the county level where the average access to safe water level is 66.2% in Kajiado county is 62.3% while the national average is at 62.0%.

Mostly the water comes from community boreholes where 47.5 % of the respondents said that the availability of water in the borehole was throughout within the year whereas 352% said the availability of water was not predictable (Mbogo, Karanja & Lugayo, 2018).

## **1.2 Statement of the Problem**

Rendering to UNICEF and WHO Joint Monitoring plan report contends that only one in three individuals residing in rural areas used safe drinking water. More than 30 minutes was spent by 263 million in fetching water per one trip from sources that are improved in 2015 which was considered as limited drinking water service (UNICEF, 2017). Conversely, because mostly much infrastructural investment as well as management systems are required by water projects, the worries are not only in accessing water, however the capacity to set up water-related innovations too associations with different clients who share certain water sources.

Prior investigation gives figures of operational rates of failure from each African nation moving from 30% to 60% (Lockwood 2014). A 55% estimation of all rural water supplies in east Africa were found not to be operational (Baumann, 2009), and notwithstanding the frequency with which it seems in development discourse, the certainty of sustainability rests unknown. Various faults have been associated with the extensive water supplies failures; it was not the desire of the community to intervene, the recurrent costs were too expensive for the community, repairing and maintaining is neglected due to lack of ownership, lack of materializing of the pledged benefits, lack of proper training as a result of short training programmes or trained members losing interest (Carter, Tyrrel & Howsam, 2011).

In Kenya, many of the water projects continues to perform miserably with many of them ending up to being non operation or needing restoration. It is somewhat a normal occurrence to find water projects that are non-functional in many of the parts within the country (MWI, 2011).

For the sustainability of delivery of water resources not only in the rural population but also in the urban population in Kenya, management of water points is paramount (Kakumba



2010). Despite the efforts made by the MWI in conjunction with organizations from international and local towards improvement of the situation in the grassroots, in most of the parts of the country the water coverage remains at infancy. The estimates of the population that can obtain clean water is just 60% despite most of the region having reliable sources of water and sufficient rainfall. The condition is more severe in rural regions, inhabited by the largest portion of the population (MWI, 2011).

In Kajiado County access to safe water was discovered to being 66.2% in comparison Kenya's national average of 62.0%. Commonly, the water comes from community boreholes with 47.5% of the residents estimated to have water throughout the year while supply to 35.2% is unpredictable (Mbogo, Karanja & Lugayo, 2018). There's a need to strengthen water and sanitation interventions to address issues that hinder access to safe water. It's, therefore, necessary for policymakers to understand the factors that hinder access to safe water and adequate sanitation first, to develop a comprehensive solution (UNDP, 2017).

In spite of the relative achievement in the delivery of new rural water infrastructure in the last few decades, investigation in most of the nation's indicates that about 30 to 40 percent of the amenities are non-functional or are performing way under their potential. In Kenya, more than a quarter of the newly finished water projects finished will be rendered non-functional in the starting three years after finish point (ICRC, 2011). As per (CIDA, 2000), more investment in rural water supply expansion the previous decade by the state and other development partner has translated to the required levels of service expected.

Not only is accessing of water a basic need but also is important for social development of populations living in rural Kenya. Several studies have been conducted in Kajiado Central Sub-county focusing on the the sustainability of donor-funded projects in different sectors like education, health and water. The focus on contributing factors for example community participation, socioeconomic factors, and financial resources on the sustainability of water access projects implemented by NGOs has been limited. Most residents of Kajiado have insufficient or no access to clean water despite available literature showing there have been many projects implemented to solve this problem. The purpose of this study is understanding

the status of previously implemented projects and investigate the factors that would influence the sustainability of water projects.

### **1.3 Purpose of the Study**

The purpose of this study was to investigate factors influencing the sustainability of community-based water projects in Kenya: A case of Kajiado Central Sub-county.

### **1.4 Objective of the Study**

The below objectives guided the study:

- i. To ascertain influence of community participation on the sustainability of community-based water projects in Kenya: A case of Kajiado Central Sub-county.
- ii. To examine influence of socioeconomic factor on the sustainability of community-based water projects in Kenya: A case of Kajiado Central Sub-county.
- iii. To investigate influence of financial resources on the sustainability of community-based water projects in Kenya: A case of Kajiado Central Sub-county.
- iv. To establish influence of choice of technology on the sustainability of community-based water projects in Kenya: A case of Kajiado Central Sub-county.

### **1.5 Research Questions**

The research questions below guided the study:

- i. To what extent does community participation influence the sustainability of community-based water projects in Kenya: A case of Kajiado Central Sub-county?
- ii. To what extent do socioeconomic factor influence the sustainability of community-based water projects in Kenya: A case of Kajiado Central Sub-county?
- iii. How financial resources influence the sustainability of community based water projects in Kenya: A case of Kajiado Central Sub-county?
- iv. To what extent does choice of technology influence of community-based water projects in Kenya: A case of Kajiado Central Sub-county?

## **1.6 Significance of the Study**

This study may be of great significance to the county governments and Non-Governmental Organisations since it will improve the understanding of factors determining the sustainability of water projects, and that would contribute to enhancing access to water services. The findings of this study may be used by the government to get the insights on how community participation plays a role in projects sustainability, how Socioeconomic factor influence projects sustainability, how Financial resources impact on projects sustainability and how choice of technology contribute to projects sustainability.

The research study may also assist future researchers by enriching existing body of knowledge and therefore be a vital source of reference in literature review for their research studies as well as a source of secondary data reference. Future researchers may use their research to compare their findings undertaken in the same field of study over some time.

The findings of this study may be, therefore, help understanding whether strategies used to increase access to water, have been sustainable and the factors which have been of influence in the sustainability of water projects. The study findings may be beneficial to the participants in the water sectors like non-governmental organizations, donors, community stakeholders, county government, national government and other stakeholders interested in developing water projects that are sustainable in Kajiado County. The research finding and recommendations can be a useful source of information to water stakeholders in counties and countries because the challenges may be similar and the solutions can be transferable.

## **1.7 Delimitations of the Study**

There were varying conceptual and operational definitions of sustainability among professionals in practice and academia, with limited consensus. This made it difficult to comprehensively study all factors that influence sustainability given the scope of this study. This study focused on four factors only and the scope of sustainability limited to continuous provision of basic water services, which were whether or not water continued to flow over time (beyond 3 to 5 years) after donor support has been terminated.

The research was conducted in Kajiado Central Sub-county targeting water boreholes projects implemented by Amref and Neighbors Alliance Initiative (NIA) in Kajiado Central and East Sub-counties. To effectively assess sustainability, the researcher selected projects that were commissioned in 2015 and/or before, post-rehabilitation or as newly dug boreholes. This enabled to determine the success or failure after donor support was withdrawn. From the list provided the number of projects fitting the selection criteria were 51, 30 projects in Central and 21 projects in Kajiado East. The main research was done in Kajiado Central Sub-county and the 30 projects constituted the target population for the study. The projects in Kajiado East were used for the pilot study in testing the research instrument reliability. The respondents comprised of three members of the management committee for each selected project and 10% of beneficiaries (members of a household, preferably the head), per project. In addition to the respondents at the grassroots level, the researcher interviewed other key stakeholders in the water sector, who included one senior manager at county headquarters and two sub-county water officers (Central and East). The study examined four independent variables, namely community participation, socioeconomic factor, financial resources and choice of technology, while the dependent variables was water project sustainability.

### **1.8 Limitation of the Study**

The researcher encountered some limitations that hindered access to information from respondents especially regarding projects that had failed. Some of the respondents selected were reluctant in giving information since they were afraid that the facts requested would be applied to frighten them or paint a negative image about their performance or that of their organization/project. To increase the return rate of the questionnaires and to gain relevant information and data, the researcher (and his/her assistant) had an introduction letter from the University of Nairobi to assure the respondents that confidentiality was maintained and that the information revealed was for academic purposes only. The NACOSTI license assisted in addressing the concern of victimization for those revealing sensitive information in the questionnaire.

## **1.9 Assumptions of the Study**

The researcher had the following basic assumptions such as: that all target respondents had the willing of participating in the study; that all questionnaires issued were completed and given back for analysis; that all respondent responded honestly to the questions in the instrument.

## **1.10 Definitions of Significant Terms Used in the Study**

Several keywords and terms had been used in this report, which is defined in this study as follows:

**Choice of Technology:** Alludes to the creation, change, utilization, and knowledge of tools, machines, procedures, specialties, systems, and techniques for organization, so as to take care of a problem, improve a prior solution for a problem, accomplish an objective, handle an applied input/output connection or play out a particular function.

**Community Participation:** This is the manner in which leaders and member of the community are involved in the process of making decision in design, and implementation of a project.

**Financial Resources:** Refers to funds at the exposure of the project for expenditure and are either I hard cash, liquid securities and credit lines.

**Financial Sustainability:** This refers to the ability of an initiative to generate adequate financial resources to continue even after donor support had been stopped.

**Local Leaders:** Members of the community who have been elected or appointed and given authority to judge all matters of a given part of the community.

**Project:** A project is an undertaking that has an objective of meeting human needs and aspiration and has a specific budget and timeframe.

**Socioeconomic Factor:** Are demographic variables which might affercy the community water based projects sustainability. They consist of educational level, income level, sex and age of the people who are participants in the process of formulating the budget.

**Sustainability of Water Projects:** Entails the capacity of a project to continuously satisfy the demands of the community which extend beyond the time of donor agency engagement.

**Water Project:** This refers to a project that is designed and implemented with the purpose of provision of safe drinking water to the community.

### **1.11 Organization of the Study**

This study was formed by five sections:

Chapter one was made up of background of the study, the research problem, study purpose, research questions and objectives, value of the study, delimitations, limitations and the study assumption. Definition of the key terms as applied in the study was also included.

Chapter two focused on a review of the literature on the sustainability of water projects and the influence of community participation, socioeconomic factor, financial resources and choice of technology on the sustainability of water projects. It also focused on theoretical framework and conceptual model signifying the connection amongst the study variables. This chapter also highlighted the knowledge gaps and summary of the literature review.

Chapter three focused on research methodology which included an introduction, research design, population size, sample size, research instruments, data collection procedure, validity and reliability of the research instruments and ethical considerations, operationalization of the variables and methods of data analysis techniques.

The fourth chapter consisted of data analysis, presentation and interpretation, while the fifth and last chapter covered of an introduction, summary of findings, and discussion of findings, conclusions, recommendation and suggestion for further research.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

Literature review enabled the research to gain a better understanding of the study, it therefore focused on the following areas; sustainability of water projects, community participation, socioeconomic factor, financial resources and choice of technology influence on the sustainability of community-based water projects.

#### **2.2 The sustainability of Water Projects**

Sustainability is characterized as whether something keep on working after some time or not. The idea of sustainability continuous to be ill-defined despite its significance being widely understood (DeMiglio & Williams, 2013). In a study on prevention of fall, there was a mixed understanding about sustainability amongst the people involved (Hanson & Salmoni, 2011). It was regarded by some that sustainability implied the continuity of the project in its totality whereas others associated it to particular elements of the projects (DeMiglio et al., 2013). The ability of a project to continually provide the anticipated benefits with a lengthy period is a definition of project sustainability that has been supported by global development agencies as well as economists (Bamberger and Cheema, 2010). When a development project can provide suitable level of benefits for a lengthy period after termination of main managerial, financial and technical support by the external donor, it is said to be sustainable (US Agency for International Development, 2008). In a further precise context of rural water sector, various entities refer to sustainability as the upkeep of an investment project beyond the finish of the active implementation period.

Rendering to a study conducted at the WEDC beneath the DGD- finance knowledge and research project plans for sustainable hand pump project in Africa, Numerous definition of sustainability exists though most generally indicate that as sustainable project is that which do not exploit the available sources of water but replenishes water naturally (Abrams, 2014).

Much efforts have been made in conjunction with international donors aimed on provision of supplies of safe water for drinking to groups across the globe. Most of them have

unfortunately been unsuccessful. Hand pump, that makes available safe supplies of water to almost half of Africa's rural population has been estimated to function at rate of 66% (RSWN 2010). For sustainability to be realized, the project facilities should be maintained in conditions which ensure consistent and sufficient water supply. The advantages of the water supply ought to be continuously recognized by all user over a lengthy period and ought to likewise show a financially savvy utilization of resources that can be recreated. Various community concerns for example apparent absence of ownership, absence of training on water supply and sanitation, poor administration framework and restricted demand are associated to low rates of sustainability of water supply projects. Various factors that have consistently impacted the functioning of the rural water supply projects includes time and distance required in collecting water, inadequate water facilities, pathetic physical structures, low awareness relating to their users and unreliable services and designs of the facilities. Financial, socio, technical, environmental and institutional angles can rectify this (USAID, 2015).

In the context of water and sanitation, sustainability has been referred to as continued delivery of services that are functional over time and tolerates changes for a lengthy period. It was also pointed out in his book that sustainability necessitates one to take into account the non-technical part of technology, social implication as well as the restrictions present in the economy and the degradation in the environment (Kuhlman & Farrington, 2010).

Looking at sustainability factors and possible indicators, water supplies sustainability is categorized into three aspects which are persons, performance and place. Sustainability is the connection amongst the water supply management its environment and the cultural location. To advance the clarification on this revealed indicators of environment like availability of water, quality of water, aquifer changes, wastage of water and pollution of water. Sustainability is perpetual quality as institutional features and capacity of laying down land for solving problems and local potential of improving the management. Finally, through engagement in management personally, participation by community in public audience and meeting as well as responsibility, sustainability can be accomplished even amid shortage and inconsistent access to water. In their study, participation, in this situation was seen as far as



values and attitudes that would propel people in to engaging in the general water system management (Iribarnegaray & Seghezzo, 2012).

Three factors were acknowledged when considering planning for sustainability of water projects as per Montgomery, Elimelech and Bartram 2009. These factors included societal demand, dynamic operation and maintenance and local financing, cost recovery. Through engagement and involvement in planning, effective community demand is accomplished. Notwithstanding, this has experienced challenges which include constrained incentive, inadequate awareness and choice of technology. Local financing and cost recovery are connected to domestic borrowing and saving, subsidies from the community that are characterized by absence of accountability and transparency. Neglecting of rural communities and local technician that are not motivated and are not well rewarded are some of the challenges that are encountered by dynamic operations and maintenance (Montgomery, 2009).

As per a field study done by Harvey and Reed (2003) it was noted that feeling of ownership necessarily do not translate to a sense of responsibility for, or desire in managing (maintenance and operation). Two claims have also been made in the same article by the authors. First they suggest that Consistent support is needed from institution for community programme to successful and secondly capacity building by community does not translates to willingness in managing of supporting a water supply financially in the long run. It is implied from the statement that introduction of a fee for the water user, capacity building and trainings exercises have the capacity of only yielding benefits that are only short lived.

A lot of efforts has been made by both the water sector participants and the government in making sure that organizational potentials are improved through systems and policies for sustainable delivery of service. There is a necessity to go past advancement of infrastructure to guaranteeing providers of water services get capacity building with an emphasis on technical capacity, governance and furnished with data. Because of the inability of rural water supply project to recover costs whether operation costs or capital maintenance costs despite them collecting revenue from sales, there has been a challenge when it comes to

funding them. Strategies of recovering cost should be thought of by rural schemes. In case of broken parts or replacement of infrastructures, the government is normally requested to come and fix without bearing in mind the Life Cost Cycle Approach (The World Bank, 2017).

### **2.3 Community Participation and Sustainability of Community-based Water Projects in Kajiado County, Kenya**

Majority of donor-funded projects are done in the communities and therefore community ownership and sustainability can perform a significant part in the victory and sustainability of a project. Community involvement helps local members understand the importance of a project and therefore affects its sustainability positively. On the other hand, a hardware project that is done by an external project implementer without community involvements is doomed to fail after some time since the community may not have a technical as well as technical capacity to sustain it. Therefore, a well-organized and applied project with community involvement may be more successful than a project that did not involve the community from the beginning (European Union Energy Initiative, 2015).

According to the Development Trusts Association Scotland (2016), there are several levels of community involvement in the development and management of a project. The first level is informing which helps in provision to individual with the right information concerning the new work the organisation intends to carry out in the community and how it's going to affect them. In most times this phase helps people feel valued and informed and in most times it helps community volunteers and dedicate local resources to the project. The second level is consulting in which the project designers or implementers seek opinion on the needs of the community, the involvement of the local community in the planning of the project and as the project continues it's important to gather ideas and information on how to improve the project design. This stage also helps to minimise the risk of opposition and conflicts. The third level of community involvement is engaging where local people are directly involved in decision making and add into delivering the project in realistic methods. Involving persons is important because local people best understand their needs; it gives them a chance to understand how the project affects them and creates avenues for local people to embrace future projects. Therefore, it's important to understand levels in which community are being

involved and the extent to which they were involved because it may directly affect project success.

As per Katz and Sara (2008), the overall sustainability of water project is influenced by existence of formal community organization that runs the systems, revealing that the sustainability was notably lower in in communities where those organizations did not exist. However, it is important to differentiate between community management and community participation as there may be a great variation on the perception of the term. The latter is a consultative process intended to set up communicates as the real decision makers whereas the former is a bottom up approach whereby the recipients of the water supply accept full accountability, authority and power over it.

Community participation due to low sustainability levels of water supply in the rural areas across the developing countries has attracted an extensive approval as a requirement for sustainability, that is to attain efficiency, equity, effectiveness and replicability (Gleitsmann, 2015) whereas on the contrast community management has failed (Harvey & Reed,2013). Numerous reasons are supporting the failure of management systems. The main reason is the delusion that the communities can manage the services entirely and the only thing required from the government is promoting the involvement by beneficiaries and after which they step aside in the course of delivering the service by support agencies from externally. (Harvey and Reed, 2013). To begin with, sustainability is not forthright, and for it to be a reality, democratic involvement and social inclusivity is required (Gleitsmann, 2015). Secondly, without the suitable institutional support, community management or any other substitute of management at the 'lowest appropriate level' cannot be sustainable. (Harvey and Reed, 2013), where the government fails to abandon its responsibilities in enabling communities to recognize this. Noting this, a capable government agency or organization is required in ensuring the schemes remains functional in the long-term and they are supporting the program which they advocate. It is required as a wellspring of trained technicians, empowering and spurring the communities, occasionally checking the performance of the service and ensuring a productive and a suitable supply chain of spare parts together with any support that is needed. As reference before, there is opportunity to get better in most of the

regions as far as institutional support and capacity building is concerned. Little consideration is at present given to which organizations accomplish such results.

Ananga (2015) studied the “role of community participation in water production and management” in Kisumu County, Kenya. The study surveyed communities living in project areas and study participants were sampled using random sampling technique and data analysed using logistic regression. Among the significant factors includes the provision of paid or unpaid labour in water schemes, community financial mobilization, community reporting of pipe vandalism, and attendance to the meeting. The study found a lack of adequate community participation would impede the success of water schemes. However, the study also found despite involving the community members in the design, implementation and management of the project it is imperative to ensure issues such as intra-community conflicts are well studied by the project implementers. It’s important to also form water consumer groups and formation of structured community office for water point’s management with paid staffs.

Kimani (2014) studied “the influence of community participation in the performance of constituency development funded rural borehole water projects in Kiambu county Kenya” using data collected from household members and water projects management committees. The study found in areas where community participation in several steps of the project was high those particular projects had higher levels of functionality and sustainability and projects with low community participation had not been sustainable. Therefore, it’s important to involve community stakeholder in design, implementation and management of projects.

Akumu and Onono (2017) studied “community participation and sustainability of the Kenya comprehensive school health program in Kajiado County, Kenya” using data collected from parents, school management and project implementers. The study found there is low involvement of community stakeholders in several steps of the project cycle. Factors that negatively affected community stakeholder’s participation in the projects include high levels of illiteracy, lack of enough information on the project, and lack of community representation during project matters.

## **2.4 Socioeconomic Factor and Sustainability of Community-based Water Projects in Kajiado County, Kenya**

The main anticipated results of community-based water projects is broad implementation and management by community and therefore the social capital held by the community is of paramount significance and performs a major role towards the project failure or success. Several reasons support this case. Firstly, social capital is possibly going to assist the community members in developing and enforcing rules (Isham 2002). Bearing in mind there are organization and networks the pre-exists, there is a possibility that members of the community know ways of interacting together, not only personally but also professionally, geared to realization of common gains. Furthermore, mechanisms of sanction be it informal or formal may be existing which would assist in creation and enforcement of both rules and regulation related to the new project. People are more averse to go about as free-riders inside a social climate that has built up sanctioning system (for example public shaming). Lastly, higher prior levels of social capital can disentangle the foundation and water committee regulations (a major segment of most projects) just as go about as for data dispersal and access to important abilities, parts, or tools.

From the prior studies done on community-based water supply projects, it has been discovered that social capital has been a determinant that is positively related to design participation and monitoring of construction. Supplementing this is the logic that decision making locally notably enhances the Project service design satisfaction (Isham 2002). This does not imply that they ought not be engaged in territories of low social capital, however, the current social infrastructure ought to be recognized and the procedure moved in like manner to guarantee the most noteworthy probability of success. This could be as expanded investment in social mobilization endeavors (for example through reinforcing local organizations) or increasingly participating in supervisions of the organizations.

The roles that is played by women in providing, managing and safeguarding water is a subject of governance that has drawn a lot of interest in association with sustainability (AfDB 2008). Their roles were addressed by the Dublin statement (1992) and also the Rio Declaration (1992) where they acknowledged that their involvement is important to

development which is sustainable and not far ago the World Summit on Sustainable Development came up with a MDG target concerned with empowerment of women and gender equality (AfDB 2008). Gender equality in the context of MDGs is regarded as an end by itself. Not only in this case but also others, it is a way of accomplishing the main objective of sustainable access of safe water. Women traditionally were given the responsibility of fetching water for different domestic purposes. There it is only fair that their say may be heard when it comes to deciding on water supply projects. Projects which are to be a success will engage not only the men but also women in the management process. This gives women the privilege of making choices that will positively impact their lifestyles and additionally that of men and implement them (Kabeer 2003).

This kind of empowerment on women not only supports the gender equality objective but also is geared toward sustainability of the project. Improved water access more importantly will give both girl and women an opportunity for education and engagement in activities that are more productive. Notwithstanding, participation by female is not established easily. Women are not appointed in decision making of water supply projects in communities that face problems with this goal. Hence, for the success of a project, females must participate in the roles of making the decisions. Just as absence of social capital, lack of gender equality requires more resources to be utilized in promoting a social culture favorable to a sustainable project.

For the prior decade, the issue of gender and sustainability have been part of emancipatory talk and practices. Promoters of the concepts have suggested that they permit representation of the highly disadvantaged groups- the poor and the women (Akerkar, 2012). Research done in Africa By Baah - Ennumh et al., Karpowitz et al (2012), Agbalajobi (2010), Ihmeje (2013) and Mgbada et al. (2013) contend that they are numerous challenges encountered by women participation in governance in Africa consisting of culture belief and religion, women being given numerous roles in family setting, absence of economic empowerment, absence of proper ways of implementing affirmative action, male dominating in political seats, women attitude towards governance, lower levels of education and lack of confidence. This has been a challenge in the community-based programs sustainability.

A research conducted by Angba (2009) assessing the influence of social economic traits of youths in the rural areas about community projects sustainability in Rivers State, Nigeria. Using questionnaire, data was acquired from 210 youths who came from 27 communities. Sampling method employed was multi stage random sampling whereas Pearson Correlation was applied to analyse the data. It was discovered from the results that some socio-demographic traits such as level of education had a relationship with the youths' attitude about the community development projects.

The higher the level of education on the attitude about community development project the more it was likely to be more favourable. The education level influenced the attitude of one engaging in community development projects. It is additionally noted that the education level increases sustainability, though beyond the high school level, the increment is more in non-church associated entities. Communication as well as human relations skills were further noted to be requirement of effective sustainability and these skills ought to be learnt: therefore, those who are more educated are better position for sustainability since their perception in more favourable (John, 2009).

In establishment of democratic principles of public participation in governance, higher education levels are important (KHRC, 2010). The desire for effectiveness and efficiency in use of public resources is activated by for more participation by the public is triggered. As per John (2009) sustainability correlates negatively with education levels that are low in devolved units. KHRC (2010) report on public participation give a highlight of the realism of education in a civic procedure that enlightens public participation. It is contended in the report that people that are not educated cannot understand information, henceforth, they do not have interest in public duties for example formulation of budget. Mboga (2009) appeals the correlation to the effect education level exhibit in public participation in Kenya. He contends that the potential of the public to have a say in a clear and organized process such as formulation of budget is expanded by education.

Campos (2008), in a study conducted in Peru regarding water supply regarded community training to be an essential element in which different ways of training inclusive of audio

visual were used by the project. He insisted that when the communities are empowered through training for example in an area like operation and maintenance they can take care of the water supply and therefore the sustainability is enhanced.

Tadesse 2013, linked sustainability of rural water supply system to cost-sharing through consumers' payment for services delivered to them. He also highlighted service providers and consumers are expected to assess the costs of operations and maintenance when setting consumers fees. Through this process, funds from consumers who are the community are expected to be utilized for major replacements. He, therefore, identified cost-sharing as one alternative for projects to mobilize funds. However, water service providers are faced with a major challenge involving capital maintenance. These are the repair, replacements of parts and rehabilitation as water assets lifespan deteriorates with frequent use. Maintenance may be reactive in response to failure or proactive. It is therefore essential to look at the socio-economic aspects involving sustainability when it comes to raising funds by service providers. (Abebe Tadesse, 2013).

## **2.5 Financial Resources and Sustainability of Community-based Water Projects in Kajiado County, Kenya**

Financial sustainability is the ability of an initiative to generate adequate financial resources to continue even after donor support had been stopped. It should be considered in the planning stage of a program and strategies implemented over time.

Nturibi (2004) posit that so as development project to be sustainable financially, it needs to have a firm financial foundation emanating from a dependable financing source, financial systems for facilitating accountability and projection for cash flow and advancement of products that are marketable for generation of income that exceed the project expenses. For an undertaking to be sustainable strategies to support conveyance, new models and models ought to be created, tried, acknowledged and actualized. Both economic and financial analysis is critical for sustainability of a project. When clear and equitable economic or financial gains are not delivered by a project, that are expected by the stakeholders, it is most probably not going to be sustained when the donor funding depletes (Bossert, 2009).



Some of the tested and successful financial sustainability strategies are the use of tariffs. A tariff refers to the money consumers are required to pay to access services offered. Money collected from these tariffs is then used for expenditure on the cost incurred for operation, maintenance, repair or rehabilitation of the project. An evaluation report by the world bank noted that sustainability can only be guaranteed when the collected tariffs can raise resources that are sufficient for the operation of the systems, financing of the service expansion to new clients and most importantly for replacement of the infrastructure when they are fully depreciated (Paraguay ICR, 1999). Also a key post project determinant of sustainability that is success of cost recovery efforts shall be affected by the degree to which people and member of the committees gets support, training and guidance concerning the structures of tariffs and wider management of finances. In case there is lack of the guidance from external sources, it is most possibly result to slowly diminishing of the cost recovery effort success.

However, since donor projects are done for societal benefits it is imperative to ensure the cost of services (tariff) is such that it doesn't deter local members to access the services. A study by Muhia (2015) investigating how finances influence sustainability of WASH projects in Garissa County using data collected from community members and local leaders found the projects were highly dependent on external funding, which meant that these projects are not self-sustaining.

Persoon (2006) in his study of aspects influencing community-based program sustainability found that when beneficiaries do not contribute, too much dependence by the project or the community it tied to external resources. As a result, the achievement of sustainability is made almost impossible since the project with forced to come to a closure when the external parties stop giving their financial support. It was mentioned by all the interview that the community ought to make some contributions financially for increasing funding internally.

Strong stakeholder relationships dictate the position an organization will be in. A genuine partnership happens when provision of financial support as well as back up not only is done in good times but also in bad times. Developing relationships that focuses in both the future and the present needs is the key to attainment of financial sustainability. This suggests

developing of confidence of the financier as the time goes by. For example, it's not right to request for more funds presently, if you have confidence that they will provide more funds in the future. It is inappropriate to accepting funding for a project that is not feasible, only because there are funds available. This can destroy the relationship with the financier and can diminish the possibility of getting more financing which you might require in the unforeseen future (Myers, 2014). Funds that are set aside by an organization and accumulate within its lifetime meant for meeting unanticipated events in the future are referred to as financial reserves. At times these funds are kept in special reserves bank account and independently shown on the financial statements. Dependence on financier is reduced through accumulation of such reserves, it also assist in period of shortages in cash flow and assist in withstanding financial shocks and unexpected expenses (Tyler, 2014).

Wachira (2016) studied “factors affecting the financial sustainability of local NGO’s in Kenya, Kiambu County” using data collected with staffs of local NGOs. Data was acquired via use of questionnaire afterwards analysed via descriptive statistics and linear regression used to test the hypothesis. The results revealed financial sustainability was significantly associated with income diversification, management competence, and donor relationship management.

A key factor in tariff setting is cost recovery plans can be used to set tariffs. This is to ensure long term plans of operations and maintenance which was in turn ensure sustainability. It is a reality the water sector must address to effectively implement self-sustaining water systems. By ensuring this is done, water service providers would ensure accountability and provide desirable services to ensure communities comply with the cost recovery plans. While setting tariff factors including metered connections are key. Metered connections could be at community tap, water kiosks and or individual connections to households and institutions. Payment per consumption is key to ensuring appropriate revenue collection a cost recovery measure. Cost of meters could be subsidized through longitudinal fees included in the billing system to customers with meters. According to in a study in Kenya, indicated the positive correlation between water tariff paid by community and sustainability. It is in contradiction of this scenery that respondents in the study agreed that the tariff was important to raise

revenues for maintenance of the water systems. It was however important to note the readiness of paying and the fee set up requires consideration of the financial capability of the community and the capital cost of the water system (Mwangangi, 2016).

## **2.6 Choice of Technology and Sustainability of Community-based Water Projects in Kajiado County, Kenya**

Adoption of technology has a significant impact on the community-based water projects sustainability since it makes it easy for maintenance and operations. For sustainability of water project, effective functioning and preservation of rural water supply system is important. The choice of technology should be based on user-friendliness for local people to operate and maintain. Rendering to World Bank (2011), VLOM)type of water pumps should be easy to operate, repair and maintain needing least abilities and few tools. The spare parts for the equipment used should be available in the market and at affordable prices. Inadequate supply chain and procurement processes in the case of imported spare parts affect the working of equipment whenever maintenance and replacement are required affecting long-term sustainability. Some of the equipment and infrastructural facilities used for water projects in Africa include use of tokens, pulley water pumps, hand pumps, water pumped out of well to storage and water piped into households, all of which require maintenance and repairs. Sometimes piped water requires meter installed to monitors consumption of water which consumer prepay or post-pay depending on the levels of consumptions. In Kenya, the mode of payment can be via mobile money, cash or through a bank account. The common challenges in operations include vandalism, breakdown of generator pumps, breakage of pipes, blockage of pipes, expensive parts and fuel prices (World Bank, 2012).

Awoke (2012) studied “challenges of sustainable rural water supply in Ethiopia” using data collected from water supply projects such as natural protected springs and hand-dug wells completed in the past two years. The study selected six functional and six non-functional water supply systems to understand specific factors affecting their sustainability. The results revealed the choice of technology was of high significance in the influencing sustainability of water projects. The choice of technology was done in consideration of factors such as the ability of local operators to use, obtainability of spare parts and local skills in maintenance of

the technology infrastructure. The more local leaders are engaged in making of decision of the type of technology and consideration of local skills, the more the projects were likely to be sustainable.

Kwena (2015) studied the “determinants of sustainability of rural water projects in Kajiado, Kenya” using data collected from WASH users and committee and project sponsors. The study found the technology used must be appropriate, the community must be involved in the technology choice and there should be consideration of local availability of technology spares parts. Tafara (2013) also studied “factors influencing the sustainability of rural community-based water projects” in Makueni County, Kenya, using data collected from household heads. However, the study found there was low adoption of technology in water projects and this led to reduction in the sustainability of these projects. Therefore, the choice of technology should be based on ease of operation and maintenance and the local operators should be trained on its operation and maintenance.

To promote service delivery promptly, reduce waiting and improve accountability, ICT innovations in the water sector have been promoted such as *mMaji* which has been piloted and found to inform management on water availability, price and quality. Accurate data helps make informed decision on water use and WASH asset or infrastructure maintenance (Ndaw, 2015). These technologies also include billing systems which would ensure accountability and improve on revenue collection. Other examples include digitized water meter readers which improve meter reading unlike the manual way which at times are inaccurate thus leading to discrepancies in billing. These technologies allow for better management through monitoring of functionality such as the Sweet sense in borehole sensors piloted in northern counties which help reduce response time in borehole repairs, use of *mWater* piloted in Niger which helps at water quality testing, MPESA which has improved billing in Kenya, *Majivoice* a complaint mechanism aimed at receiving feedback critical to management, *Jisomee Miita* piloted in 2014 by Nairobi water. These tools have advantages and disadvantages but have shown great potential of assisting in management of Water Infrastructure and service delivery (Ndaw, 2015).

## **2.7 Theoretical Framework**

Various theories may apply in regard to sustainability of water projects. Stakeholders' theory and sustainability theory were used in this study and were discussed below.

### **2.7.1 Stakeholder's Theory**

Stakeholder's theory was proposed by Freeman (1984) in an attempt to analyse the relationship between an organisation and a group of individuals affected by it. The theory, therefore, defines a stakeholder as any person impacted by an outcome of a project and is normally donors, employees, communities and managers. Since communities are affected directly by some of the organisation activities they must be made to own the organisation's activities at the centre. Other definitions of stakeholders include any group of people with interests or right of claim on organisation's activities (Jefkins, 1997); a group or entity that has direct or indirect interest with organisation's activities (Donaldson and Preston, 1995). According to Bussy and Ewing (1997), an organization depends on diverse stakeholders to realize its objectives. These stakeholders by far affect the future of the organization and should be well managed to maximize the organization's objectives. As per Freeman (1984), there are two distinct types of stakeholder: primary and secondary stakeholders.

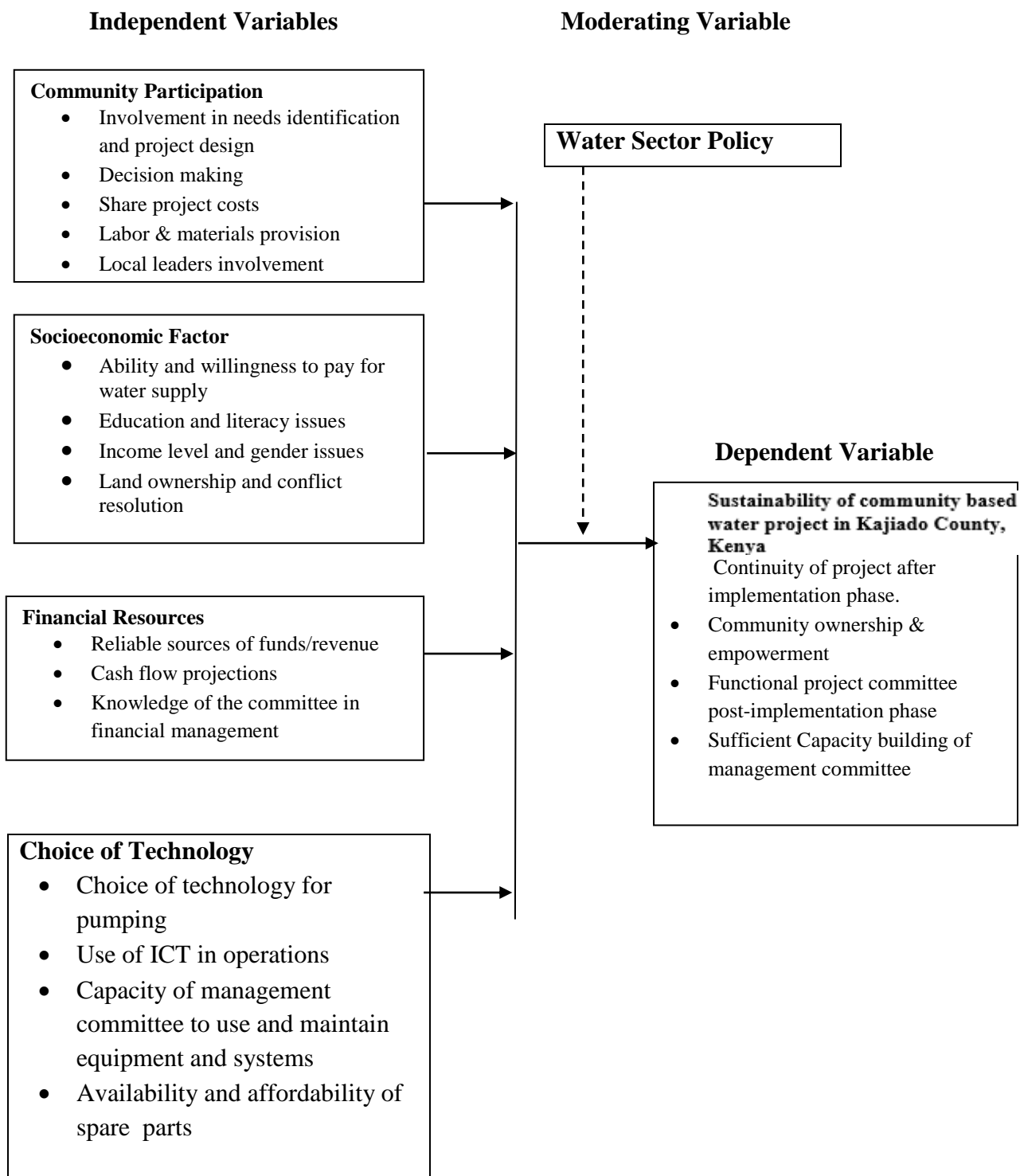
Primary stakeholders have a direct effect on the organization, include shareholders, investors, managers, clients, employees and suppliers and therefore directly impacts on company's mission. According to Garriga and Mele (2004), secondary stakeholder includes activist, public administration, media, and consumer communities. The relevance of this theory to the study is because it points out the needs to clearly understand who the stakeholders of the projects are and ensure they are well considered in the implementation and post-implementation phase of the project. It is imperative to understand which stakeholders are tangled in the design and implementation phases of the project and how it is likely to affect the sustainability of donor-funded community-based projects.

### **2.7.2 Sustainability Theory**

Sustainability theory was popularized by the United Nations (White, 1996). Based on the theory, sustainability is the capacity to maintain some outcomes over time without interruption. The theory main foundation is economics with the assumption that resources are finite and utilisation of natural resources need to consider the fact that future generations may require the same resources (Baariu, 2015). Therefore, the concept of sustainability as outlined in the theory has three pillars: social, ecological and economic. The economic pillar seeks to ensure natural and financial resources are sustainable; the ecological pillar seeks to ensure ecological integrity and biological diversity; and social pillar seeks to ensure social systems realize human dignity (Jenkins, 2010). Sustainability of any community-based project should factor in issues such as basic human needs, community participation, social accountability, local self-reliance, equity resource distribution, affordability, appropriate technology, and sound development structure (Tryzna, 1995; Baariu, 2015). This study applies the theory of sustainability in the sense that all community-based projects seeking to increase access to safe water ought to be able to continue after the project implementation phase. This means the community should be able to continue enjoying the project outcomes during and after the implementation period. As pointed out in the theory, project sustainability is achieved if there is community participation, political actors' primary motive is ensuring social systems achieve human dignity, sociocultural factors do not hinder the success of the program, and economic factors such as financial resources are well managed to enhance sustainability. Variables from sustainability theory have been discussed in the empirical literature.

### **2.8 Conceptual Framework**

The framework outlined the variables as discussed in the literature review and elaborated in the Figure 1 below. It helped one to gain understanding of the association amongst the study variables. This relationship was affected by the water sector policies that was a moderating variable and was not measured in this study. The reason of not measuring was because it does not affect the dependent variable directly.



**Figure 1: Conceptual Framework**

**Table 2. 1: Summary of Literature Review and Knowledge Gaps**

<b>Variable</b>	<b>Author &amp; year of Study</b>	<b>Title of the study</b>	<b>Findings</b>	<b>Knowledge Gap</b>
Community-based water projects Sustainability	Bartaram and Elimelech (2009)	Increment of operational Sustainability of Water and Sanitation Supplies in Rural Sub-Saharan Africa	Effective community demand, local financing, cost recovery, and dynamic operation and maintenance determine long-term functioning of water and sanitation supplies,	Application of this in water sector in Kajiado, Kenya
Community-based water projects Sustainability	Iribarnegaray & Seghezzo, (2015).	From Indicators to Policies: Open Sustainability Assessment in the Water and Sanitation Sector	Developing open sustainability assessment, based on indices would help decision makers improve the water and sanitation management systems, and promote more sustainable water policies	Relevance of this findings in water sector in Kajiado county
Community participation	Erick Oniango Ananga (2015)	Role of community participation in water production and management <sup>27</sup> in Kisumu County, Kenya	Importance of forming water consumer groups and structured community office for water point's management with paid staffs.	The existence of such or similar structures in Kajiado county's water projects and how well they are functional
Community participation	Akumu and Onono (2017)	Sustainability of the Kenya comprehensive school health program in Kajiado County, Kenya	There's low involvement of stakeholders in various stages of project life cycle. The contributing factors include high levels of illiteracy, lack of enough information on project, and lack of community representation	Assessment of the situation in water projects in Kajiado and determine level of involvement and contributing factors



Socioeconomic factor	Angba (2009)	Effect of socioeconomic characteristics of rural youths on their attitude towards participation in community development projects	Relationship exists between socio-demographic characteristics Socio-demographic characteristics such as age, occupation, educational level and the attitude of youths towards community development projects	Assessing the situation in Kajiado with a similar socioeconomic orientation
Socioeconomic factor	Olela, E. S. & Wanyonyi, L. (2018).	Factors influencing sustainability of water supply projects for rural communities in arid and semi-arid lands: a case of Garbatula sub county in Isiolo county, Kenya	Most of the residents have no formal education and policy makers should come up with a water sustainability and maintenance curriculum which is affordable to encourage adequate training of the beneficiaries	Assessing the situation in Kajiado with a similar socioeconomic orientation
Financial resources	Muhia (2015)	Factors influencing sustainability of WASH projects implemented by sustainable development & peace building initiatives at Fafi constituency, Garissa county Kenya.	Using data collected from community members and local leaders he found that the projects were highly dependent on external funding, which meant that these projects are not self-sustaining	Determining operational model which can increase probability of achieving financial sustainability while running community-based water project.
Financial resources	L.Persoon, (2016)	Factors affecting the sustainability of community-based programs.	When beneficiaries do not contribute financially, sustainability is difficult to achieve.	Financial sustainability models in Kajiado county's water projects in regard to donor

Choice of technology	Awoke (2011)	<b>Challenges of sustainable rural water supply in Ethiopia</b>	Choice of technology is important and should be guided by ability of local people to operate and maintain in addition to availability of spare parts	dependence and effective tariff collection  Assessment of the situation in Kajiado county in Kenya in regard to how choice of technology is made and the appropriateness in influencing sustainability
Choice of technology	Kwena (2015)	<b>Determinants of sustainability of rural water projects in Kajiado</b>	Using data collected from WASH users and committee and project sponsors, the study found technology used must be appropriate and community must be involved in the technology choice	Kwena covered projects done by SNV in Kajiado while this study targets two different NGOs and wider geographical coverage

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## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This section outlined the methodology employed in conducting the study, which consisted of research design technique employed, target population of the study, sample size determined, research instruments employed, data collection process, reliability and validity of the research instruments and ethical considerations, operationalization of the variables and methods of data analysis techniques.

#### **3.2 Research Design**

According to Orodho (2003), a plan or a scheme outline which is employed in generating answers in response to research problems is research design. A descriptive survey was utilized by the study after well defining the problems on top of the research possessing some insight on the problem (Mugenda & Mugenda, 2003). A survey entails an examination of a situation, trying to clarify why the situation is how it is (Kothari, 2007). With this design used it was made easier accounting as well as for sufficient description of events, people and objects. Not only did the design type provide explanations and descriptions but additionally it recognized and did a prediction of the relationship amongst the study variables (Kothari, 2007).

In the gathering of the data from the respondents, a cross-sectional approach was adopted. The method was quite faster and less costly since it gave self-reported facts concerning the respondents, their opinions, feelings, habits and attitudes (Kothari, 2007). Additionally, the survey design empowered the researcher in making a correct assessment, suggestion and associations of situations, issues and events (Mugenda & Mugenda, 2003). Through the utilization of a descriptive survey design the understanding of the prevailing status of affairs and ideas on the field of study was made easier (Zells, 2011).

#### **3.3 Target Population**

As per Ngetich (2009), a distinct grouping of individuals, services, households, events or items that are under investigation is referred to as a population. Population studies are

considered more symbolic since the possibility of being incorporated in the sample which is derived is equal (Bryman, 2016). The population of interest in this study was the Amref and NIA funded rural water schemes in Kajiado Central and Department of water in Kajiado County. Particularly, the study focused on existing boreholes that have rehabilitated and are powered by diesel, solar generator or electricity.

In this study, 30 boreholes were the population which included all Amref and NIA funded water boreholes projects in Kajiado Central Sub-county. A sample of borehole projects to be studied was then selected from this population. The respondents were persons involved in the projects management and beneficiaries (members of household preferably the head) who provided opinion or data about these water projects. This study targeted two management staff at the department of water in Kajiado County, three management committee members from each of the 30 boreholes totalling 90 and 3000 beneficiaries. This made a target population of 3092 respondents grouped into four categories.

**Table 3. 1: Target Population**

<b>Category</b>	<b>Total Population</b>
Management committee members	90
Water officers	2
Beneficiaries	3,000
<b>Total</b>	<b>3,092</b>

**Source: Researcher (2018)**

### **3.4 Sample Size and Sampling Procedure**

A sample is a group in the research study on which information is obtained while sampling is the process of selecting these individuals. It is the selection of respondents that are chosen in a manner that they characterize the total population (Kothari, 2007).

### 3.4.1 Sample Size

The selection of sample size is of paramount importance for the optimisation of time investment in the study, through the selection of not too big sample size and to build the confidence of the findings of the study by the sample size not being too tiny (Kothari, 2003).

**Table 3. 2: Sample Size**

<b>Category</b>	<b>Total Population</b>	<b>Sample Size</b>
Management committee members	90	15
Water officers	2	2
Beneficiaries	3,000	60
<b>Total</b>	<b>3,092</b>	<b>77</b>

**Source: Researcher (2018)**

### 3.4.2 Sampling Procedure

The method of choosing a specified quantity of subjects from a definite population to represent that population is referred to as sampling (Orodho and Kombo, 2003). The researcher used a multistage sampling procedure and combine cluster, simple random and purposive sampling methods. The researcher created 5 clusters of projects for each of the 5 wards and then selected one project per ward, by use of random sampling technique. From the sampled projects the researcher purposively selected three management committee members per project (chairman, treasurer and caretaker/operator) and 10% of project beneficiaries (one per household). As per to Mugenda and Mugenda (2003), when a researcher is intending to apply a purposive sampling technique the criteria for selecting the respondents must be specified. Our respondents constituted three members of the management committee who operated and maintained the water facilities under the study and beneficiaries for each borehole. In addition to the respondents at the grassroots level, the researcher interviewed the Kajiado central sub-county water officer and the director in charge of water at the county headquarters. The latter were water officers at the headquarters who had been purposively selected because they were involved in supporting the water projects in Kajiado Central Sub-county.

Our total number of respondents was, therefore, 77 and this diverse group provided information on how each of the variables affected the operation of their water facilities and provided insightful responses.

### **3.5 Research Instruments**

The questionnaire was utilized in gathering the data. Questionnaire enabled the researcher to obtain data on the opinions, knowledge and the attitudes of the respondents about the determinants of sustainable community-based water projects in Kajiado County. All the items individually on the questionnaire were structured in such a way that they will capture the intended specific objective of the study. A questionnaire was utilized since it was practical and was utilized in obtaining data from a big quantity of individuals within a limited time and in a quite inexpensive way. To test the reliability and validity of the instrument piloting was done. The questionnaire was administered by the researcher and selected enumerators who at one point were translators in cases where target respondents were not able to use the language in the questionnaire. The close-ended questions were used to enable the researcher to easily quantify results with the use of SPSS 22.0.

#### **3.5.1 Pilot Testing of the Instruments**

In advance of administering the research instrument to the respondents, pre-testing (also known as piloting) was conducted for guaranteeing relevance, clarity and prudence of the questions. Pre-testing aimed to assess the clarity of the questionnaire and ease of use and included the phrasing, structure and order of the questions. As per to Orordho (2008), ambiguous questions and insufficiencies in the questionnaire or their authenticity are revealed through pilot testing, that is the extent to which empirical measures of the concept is correctly measured. The questionnaires were pre-tested for determining their appropriateness to the member of committee, beneficiaries and water officers. Pilot testing was done by purposively selecting one project out of the 21 projects in Kajiado East and targeted similar categories of respondents as was done in the main research. These included a total of at least 2 committee members, 5 beneficiaries, and one sub-county water officer. The information obtained was used to revise the questionnaire by modifying questions that were sensitive,

confusing or biased. The data was also analysed and used to develop dummy tables that eventually appeared in the report once the actual data was collected and analysed.

### **3.5.2 Validity of the Research Instrument**

Validity is the quality of the findings, conclusions or recommendations. Mugenda and Mugenda (2003) refer to validity as the correctness and significance of inferences that is founded on the research findings. It is the extent that the obtained outcomes from the data analysis give a representation of a situation under investigation. To obtain the validity of the research instrument, content validity was employed. Content validity is a measure to which data gathered utilizing a specific instrument speaks to a particular area of indicator or substance of a specific idea (Mugenda and Mugenda, 2003). The researcher selected a representative sample of indicators from the domain of indicators of the concept, and then sought expert opinion from the supervisor, another university lecturer and the two program managers (NIA and Amref). In addition, in establishing the research instrument validity, opinions were sought from expertise from the study field especially the researcher supervisor and lectures. This enables the required alteration and revision of the instrument hence improving its validity.

### **3.5.3 Reliability of the Research Instrument**

Reliability entails the uniformity of the measurements or the degree to which an instrument gives similar results every time it is utilized under a similar situation with similar subjects. Reliability is estimated but not measured and reliability does not guarantee the validity since a scale might be measuring the consistency of something but not most importantly what is thought to be measuring. Research process attempts to increase the reliability of data collected and should, therefore, be addressed early and reported in the final document. The study used the test-retest method of estimating the dependability of the instrument and a co-efficient value of 0.8 or more was considered an indication of high reliability.

### **3.6 Data Collection Procedure**

After obtaining a research permit from the University of Nairobi and the NACOSTI, the researcher sought authorization from the respective administrators in Kajiado County and set dates, as well as the time when conducting the interviews would start.

The main instrument that was utilized in the gathering of primary data was a questionnaire. Tryon (2000) refers to a questionnaire as a form that consists of questions or empty tables that are completed by the interviewer through filling them following obtaining of information from the respondents or the respondents filling the forms altogether. The purposes of the questionnaire in researcher are the provision of a standard tool for collecting data and achieving objectivity in a survey, it additionally aids the tabulation and analysis after the data is classified through codes (Stone & Archibald, 2003). Data was collected through a researcher administered questionnaire with research assistants hired to facilitate the collection of data from Kajiado central. Before on boarding, the research assistants, a briefing on the procedures of administration of the questionnaire, recording data and ethical concerns were done.

### **3.7 Data Analysis Techniques**

Following data collection, the researcher scrutinized all questionnaires for completeness, accuracy as well as the conformity. The next step was coding of the information and categorizing of the responses into meaningful groups to elicit the essential pattern. A codebook comprising of all the variables drawn from both the research questions and objectives as demonstrated in the questionnaire was advance. The coding gave values representative of the subject's responses and these were then entered into a computer. The tool for use in analysing data was the SPSS version 22 software. The analysis was then done by the use of both descriptive and inferential statistical methods. The former included tables, percentages and other measures of central tendency like mean, frequency and standard deviation. To determine the correlation amongst the variables, the Pearson correlation was applied. This indicated the level of significance of each variable and how it influenced the sustainability of rural water projects



### **3.8 Ethical Considerations**

Data collected during the study were treated with the confidentiality expected of such an undertaking. The respondents were voluntarily employed in the study and were free to quit the study at any moment if they so wish to. All the County Governments and NGO employees had a firm policy on confidentiality and one paid the ultimate price for violating the confidentiality policies. Revealing information by employees to a third party exposed the organization to litigation and hence ethical concerns were critical because the respondents were sometimes sceptical in the disclosure of information. To address the concerns of trust clarification of the significance of the study to the respondents, the assurance that the data was dealt with in a professional manner and that their identities were going to be withheld. The confidentiality of the information collected from interviewees was preserved by ensuring that their names and other information that could reveal their identities were not revealed in the data collected.

The respondents were as well be made to recognize their contribution to the collection of data activity by providing answers to the research problem. To avoid imposing the interviews on respondents, they were accorded the option of not participating if the interview would influence them in any way or if for some reasons they were not at ease in taking part in the study.

### 3.9 Operationalization of Variables

The table 3.3 describes the operationalization of variables on factors influencing sustainability of community-based water projects in Kenya: A case of Kajiado County.

**Table 3. 3: Operationalization of Variables**

Research Objectives	Variable	Indicator	Tools of Analysis	Measurement Scale	Types Of Analysis
To determine the influence of community participation on sustainability of community based water projects in Kenya: A case of Kajiado County.	Independent Community participation	Involvement in design phase & needs identification Sharing costs and provision of labour/materials	SPSS	Interval	Descriptive & Inferential Statistics
To assess the influence of socioeconomic factor on sustainability of community based water projects in Kenya: A case of Kajiado County.	Independent Socioeconomic factor	Ability & willingness to pay for water supply Education & Literacy levels. Income & gender issues. Land ownership & conflict resolution.	SPSS	Interval	Descriptive & Inferential statistics
To establish the influence of financial resources on sustainability of community based water projects in Kenya: A case of Kajiado County.	Independent Financial resources	Reliable sources of funds & financial systems, cash flow projections, Committee members' knowledge on financial management	SPSS	Interval	Descriptive statistics Correlation Inferential Statistics
To assess the influence of choice of technology on sustainability of water projects community based water projects in Kenya: A case of Kajiado County.	Independent Choice of technology	Choice of technology Maintenance required Capacity of committee to operate & maintain, use of ICT and availability of spare parts.	SPSS	Interval	Descriptive statistics Correlation Inferential Statistics

Research Objectives	Variable	Indicator	Tools of Analysis	Measurement Scale	Types Of Analysis
	Dependent Sustainability of water projects	Continuity of project after implementation phase. Implementer's technical support on the projects. Community ownership Functional project committee post-implementation phase			

**CHAPTER FOUR**  
**DATA ANALYSIS, PRESENTATION AND INTERPRETATION**

**4.1 Introduction**

The chapter gives the results of the primary data which was collected through the use of closed-ended questionnaires and analyzed through descriptive and inferential statistical methods. The results were analyzed in the form of response rate, socio-demographic characteristics.

**4.2 Questionnaire Return Rate**

58 questionnaires out of 77 were correctly filled and given back achieving a 75% return rate which was appropriate since according to Kothari (2007) a response rate of more than 70% is appropriate for analysis.

**Table 4. 1: Response Rate**

<b>Return Rate</b>	<b>Frequency</b>	<b>Percent</b>
Returned Questionnaires	58	75
Unreturned Questionnaires	19	25
<b>Total</b>	<b>77</b>	<b>100</b>

**4.2.1 Reliability Statistics**

The test-retest method of estimating the dependability of the instrument was utilized and a co-efficient value 0.8 was obtained which was an indicator that the instrument was reliable.

**Table 4. 2: Reliability Statistics**

<b>Variables</b>	<b>Cronbach's Alpha</b>	<b>N of Items</b>
Community Participation	.869	4
Socioeconomic Factor	.607	7
Financial Resources	.821	5
Choice of Technology	.693	5
Sustainability	.742	4
<b>Overall Reliability</b>	<b>.820</b>	

### **4.3 Demographic Characteristics of Respondents**

The study pursued the socio-demographic characteristics of the respondents mainly the location, how long one had lived there, gender, highest level of education, occupation and the average income range per month in Kenya shillings.

#### **4.3.1 Location of the Respondents**

The study sought information on the location of the respondents as displayed on table 4.3.

**Table 4. 3: Distribution by Location**

<b>Location</b>	<b>Frequency</b>	<b>Percentage</b>
Olobelibel	10	17
Enkaroni	11	19
Lorg'osua	12	21
Ng'ataek	13	22
Ildamat	12	21
<b>Total</b>	<b>58</b>	<b>100</b>

Majority of the respondents at 22% were from Ng'ataek while 19% were from Enkaroni, locations. 21% each were from and Lorg'osua and Ildamat . Only 17% constituted Olobelbel location.

#### 4.3.2 Years Lived in Location by the Respondents

The study looked for data on how long the respondents had lived in the said location as displayed on table 4.4.

**Table 4. 4: Distribution by Years Lived**

<b>Years</b>	<b>Frequency</b>	<b>Percentage</b>
10 years and below	10	17
11-20 years	14	24
21-30 years	19	33
31 years and above	15	26
<b>Total</b>	<b>58</b>	<b>100</b>

The study outcomes discovered that most of the respondents at 33% had lived in their locations between 21-30 years while 26% had lived between 31 years and above. 24% and 17% had lived between 11-20 years and 10 years and below respectively.

#### 4.3.3 Gender of the Respondents

The study looked for information on the respondents' gender as displayed on table 4.5.

**Table 4. 5: Distribution of Respondent by Gender**

<b>Gender</b>	<b>Frequency</b>	<b>Percentage</b>
Male	39	67
Female	19	33
<b>Total</b>	<b>58</b>	<b>100</b>

Males were the highest number of the respondents at 67% whereas female were only 33%. This showed unbalance in the gender distribution.

#### 4.3.4 Highest Level of Education

The study asked for information on the respondents' highest educational level of the respondents as depicted on table 4.6.

**Table 4. 6: Distribution of Respondent by Highest Education Level**

<b>Highest Education Level</b>	<b>Frequency</b>	<b>Percentage</b>
Primary Certificate	28	48
Secondary Certificate	7	12
Diploma/ Certificate	2	3
Bachelors' Degree	-	-
No Formal Education	21	36
<b>Total</b>	<b>58</b>	<b>100</b>

The study findings revealed that most of the respondents at 48% had primary certificate while 36% had no formal education. 12% and 3% had secondary and diploma certificate respectively while none had a bachelors' degree.

#### 4.3.5 Occupation of the Respondents

The study asked for data on the respondents' occupation as depicted on table 4.7.

**Table 4. 7: Distribution of Respondent by Occupation**

<b>Occupation</b>	<b>Frequency</b>	<b>Percentage</b>
Livestock Farming	50	86
Crop Farming	3	5
Casual Labourer	3	5
Others	2	3
<b>Total</b>	<b>58</b>	<b>100</b>

The study results showed that most of the respondents at 86% engaged in livestock farming. 5% each engaged in crop farming and worked as casual labourers. Only 3% were involved in other occupations.

#### 4.3.6 Average Income of the Respondents

The study sought information on the respondents' average income range per month in Kenya shillings as displayed on table 4.8.

**Table 4. 8: Distribution of Respondents by Average Income**

<b>Income per month (in Kshs)</b>	<b>Frequency</b>	<b>Percentage</b>
Less than 5000	15	26
5000 - 10000	10	17
10000 - 15000	11	19
15000 – 20000	16	28
More than 20000	6	10
<b>Total</b>	<b>58</b>	<b>100</b>

The findings above showed that majority of the respondents at 28% earned between 15000 - 20000 and 26% earned less than 5000. 19% and 17% earned between 10000 - 15000 and 5000 -10000 respectively. Only 10% earned more than 20000.

#### 4.4 Community Participation and Sustainability of Community-based Water Projects in Kajiado County, Kenya

The first objective was determining the effect of participation by the community on the sustainability of community-based water projects in Kajiado County, Kenya. The data was captured on a 5-point Likert scale and the study findings were as discussed in table 4.9.



**Table 4. 9: Community Participation**

<b>Statements</b>		<b>f</b>	<b>%</b>	<b>Mean</b>	<b>Std. Dev.</b>
Beneficiaries were actively involved in needs identification and project design	Strongly Disagree	6	10		
	Disagree	3	5		
	Neither Agree nor Disagree	7	12		
	Agree	26	45		
	Strongly Agree	16	28		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.74</b>	<b>1.222</b>
Beneficiaries are actively involved in decision making	Strongly Disagree	4	7		
	Disagree	6	10		
	Neither Agree nor Disagree	9	16		
	Agree	23	40		
	Strongly Agree	16	28		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.71</b>	<b>1.185</b>
Beneficiaries contributed materials and/or financially during implementation	Strongly Disagree	8	14		
	Disagree	4	7		
	Neither Agree nor Disagree	10	17		
	Agree	26	45		
	Strongly Agree	10	17		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.45</b>	<b>1.259</b>
Beneficiaries were involved in the commissioning stage and other key stages of the project implementation	Strongly Disagree	7	12		
	Disagree	7	12		
	Neither Agree nor Disagree	21	36		
	Agree	17	29		
	Strongly Agree	6	10		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.14</b>	<b>1.146</b>
<b>Composite Mean and Std. Dev.</b>				<b>3.51</b>	<b>1.203</b>

The study findings displayed in table 4.9 above exhibited a composite mean of 3.51 of the respondents who agreed that community participation influenced the sustainability of community-based water projects in Kajiado County in Kenya. This was supported by the study key statements that majority of the respondents' with a mean of 3.74 agreed that beneficiaries were actively involved in needs identification and project design, followed by a mean 3.71 who agreed that beneficiaries were actively involved in decision making. The mean scores of 3.45 and 3.14 agreed that beneficiaries contributed materials and/or financially during implementation and that beneficiaries were involved in the commissioning stage and other key stages of the project implementation respectively.

#### 4.5 Socioeconomic Factor and Sustainability of Community-based Water Projects in Kajiado County, Kenya

The second objective of the study was to examine the influence of socioeconomic factor on the sustainability of community-based water projects in Kajiado County, Kenya. The data was captured on a 5-point Likert scale and the study findings were displayed in table 4.10.

**Table 4. 10: Socioeconomic Factor**

<b>Statements</b>		<b>f</b>	<b>%</b>	<b>Mean</b>	<b>Std. Dev.</b>
Land ownership and choice of project site has likelihood of causing conflict and/or affecting sustainability	Strongly Disagree	14	24		
	Disagree	20	34		
	Neither Agree nor Disagree	15	26		
	Agree	2	3		
	Strongly Agree	7	12		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>2.45</b>	<b>1.245</b>
Conflicts are easily resolved by the management committee and local leaders	Strongly Disagree	1	2		
	Disagree	8	14		
	Neither Agree nor Disagree	1	2		
	Agree	38	66		
	Strongly Agree	10	17		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.83</b>	<b>0.939</b>
Education and income levels determine the level of participation in water project	Strongly Disagree	9	16		
	Disagree	11	19		
	Neither Agree nor Disagree	29	50		

<b>Statements</b>		<b>f</b>	<b>%</b>	<b>Mean</b>	<b>Std. Dev.</b>
	Agree	6	10		
	Strongly Agree	3	5		
Women are well represented in the management committees	<b>Total</b>	<b>58</b>	<b>100</b>	<b>2.71</b>	<b>1.026</b>
	Strongly Disagree	16	28		
	Disagree	15	26		
	Neither Agree nor Disagree	16	28		
	Agree	8	14		
	Strongly Agree	3	5		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>2.43</b>	<b>1.186</b>
Women and men have equal opportunity to participate in decision making and running of water project	Strongly Disagree	10	17		
	Disagree	26	45		
	Neither Agree nor Disagree	13	22		
	Agree	5	9		
	Strongly Agree	4	7		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>2.43</b>	<b>1.094</b>
I willingly pay for my water regularly and consistently	Strongly Disagree	1	2		
	Disagree	4	7		
	Neither Agree nor Disagree	4	7		
	Agree	34	59		
	Strongly Agree	15	26		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>4.00</b>	<b>0.879</b>
I am unable to pay for water consumed regularly and consistently	Strongly Disagree	27	47		
	Disagree	21	36		
	Neither Agree nor Disagree	1	2		
	Agree	5	9		
	Strongly Agree	4	7		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>1.93</b>	<b>1.212</b>
<b>Composite Mean and Std. Dev.</b>				<b>2.83</b>	<b>1.083</b>

The study findings displayed in table 4.10 above indicated a composite mean of 2.83 of the respondents who agreed that socioeconomic factor influenced sustainability of community-based water projects in Kajiado County in Kenya. This was reinforced by the study key statements that majority of the respondents' with a mean of 4.00 agreed that they willingly pay for their water regularly and consistently. This was followed by means of 3.83 and 2.71 who agreed that conflicts were easily resolved by the management committee and local leaders and that education and income levels determine the level of participation in water project respectively. Moreover, the mean scores of 2.43 each agreed that women were well represented in the management committees and also women and men had equal opportunity of participating in making decision and running of water project.

#### **4.6 Financial Resources and Sustainability of Community-based Water Projects in Kajiado County, Kenya**

The third objective of the study was investigating influence of financial resources on sustainability of community-based water projects in Kajiado County, Kenya. The data was captured on a 5-point Likert scale and the study findings were presented in table 4.11.

**Table 4. 11: Financial Resources**

<b>Statements</b>		<b>f</b>	<b>%</b>	<b>Mean</b>	<b>Std. Dev.</b>
Beneficiaries are consulted by the management committee when setting tariffs	Strongly Disagree	4	7		
	Disagree	3	5		
	Neither Agree nor Disagree	11	19		
	Agree	30	52		
	Strongly Agree	10	17		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.67</b>	<b>1.049</b>
The management committee shares the financial position and/or reports of the project on a regular basis	Strongly Disagree	5	9		
	Disagree	9	16		
	Neither Agree nor Disagree	24	41		
	Agree	13	22		
	Strongly Agree	7	12		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.14</b>	<b>1.099</b>
Management committee are transparent and accountable in regard to handling of finances	Strongly Disagree	8	14		
	Disagree	8	14		
	Neither Agree nor Disagree	22	38		
	Agree	9	16		
	Strongly Agree	11	19		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.12</b>	<b>1.272</b>
I am willing to pay a lump sum amount when there's need for high capital expenditure like pump replacement	Strongly Disagree	1	2		
	Disagree	2	3		
	Neither Agree nor Disagree	12	21		
	Agree	24	41		
	Strongly Agree	19	33		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>4.00</b>	<b>0.918</b>
I appreciate and am aware of the need to hold reserves for funding capital intensive activities like replacement of pump	Strongly Disagree	8	14		
	Disagree	3	5		
	Neither Agree nor Disagree	14	24		
	Agree	23	40		
	Strongly Agree	10	17		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.41</b>	<b>1.243</b>
<b>Composite Mean and Std. Dev.</b>				<b>3.47</b>	<b>1.116</b>

The study results displayed in table 4.11 above indicated a composite mean of 3.47 of the respondents who agreed that financial resources influenced the sustainability of community-based water projects in Kajiado County in Kenya. This was supported by the study key statements that majority of the respondents' with a mean of 4.00 agreed that they were

willing to pay a lump sum amount when there was a need for high capital expenditure like pump replacement while a mean of 3.67 agreed that beneficiaries were consulted by the management committee when setting tariffs. Mean scores of 3.41 and 3.14 agreed that they appreciated and were aware of the need to hold reserves for funding capital intensive activities like a replacement of pump and that the management committee shared the financial position and/or reports of the project regularly respectively. Besides, a mean score of 3.12 agreed that the management committee was transparent and accountable regarding the handling of finances.

#### **4.7 Choice of Technology and Sustainability of Community-based Water Projects in Kajiado County, Kenya**

The fourth objective was to establish the influence of the choice of technology on the sustainability of community-based water projects in Kajiado County, Kenya. The data was captured on a 5-point Likert scale and the study findings were displayed in table 4.12.

**Table 4. 12: Choice of Technology**

<b>Statements</b>		<b>f</b>	<b>%</b>	<b>Mean</b>	<b>Std. Dev.</b>
There are very few incidents of supply interruption due to pump breakdown	Strongly Disagree	4	7		
	Disagree	13	22		
	Neither Agree nor Disagree	12	21		
	Agree	12	21		
	Strongly Agree	17	29		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.43</b>	<b>1.313</b>
Pumps are quickly repaired when they break down	Strongly Disagree	7	12		
	Disagree	14	24		
	Neither Agree nor Disagree	9	16		
	Agree	22	38		
	Strongly Agree	6	10		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.10</b>	<b>1.238</b>
The technology used to pump water is appropriate for our project in regard to cost and reliability	Strongly Disagree	6	10		
	Disagree	10	17		
	Neither Agree nor Disagree	16	28		
	Agree	11	19		
	Strongly Agree	15	26		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.33</b>	<b>1.316</b>
I use M-Pesa to pay for my water bills	Strongly Disagree	32	55		
	Disagree	23	10		
	Neither Agree nor Disagree	1	2		
	Agree	1	2		
	Strongly Agree	1	2		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>1.55</b>	<b>0.776</b>
I use M-Pesa to pay for other bills	Strongly Disagree	38	66		
	Disagree	11	19		
	Neither Agree nor Disagree	1	2		
	Agree	6	10		
	Strongly Agree	2	3		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>1.67</b>	<b>1.145</b>
<b>Composite Mean and Std. Dev.</b>				<b>2.62</b>	<b>1.158</b>

The study results displayed in table 4.12 above indicated a composite mean of 2.62 of the respondents who decided that technology choice impacted the community-based water projects sustainability in Kajiado County in Kenya. This was supported by the study key

statements with the majority of the respondents' with a mean of 3.43 agreed that there were very few incidents of supply interruption due to pump breakdown while a mean of 3.33 agreed that the technology used to pump water was appropriate for their project regarding cost and reliability. More so, a mean of 3.10 agreed that pumps were quickly repaired when they broke down. Lastly, only mean scores of 1.67 and 1.55 agreed that they used M-pesa to pay for other bills and their water bills respectively.



#### 4.8 Sustainability of Community-based Water Projects in Kajiado County, Kenya

**Table 4. 13: Sustainability**

<b>Statements</b>		<b>f</b>	<b>%</b>	<b>Mean</b>	<b>Std. Dev.</b>
There is continuity of the project after implementation phase	Strongly Disagree	1	2		
	Disagree	1	2		
	Neither Agree nor Disagree	7	12		
	Agree	30	52		
	Strongly Agree	19	33		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>4.12</b>	<b>0.818</b>
There is community ownership and empowerment	Strongly Disagree	3	5		
	Disagree	4	7		
	Neither Agree nor Disagree	16	28		
	Agree	18	31		
	Strongly Agree	17	29		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.72</b>	<b>1.121</b>
There is functional management committee after implementation phase	Strongly Disagree	3	5		
	Disagree	8	14		
	Neither Agree nor Disagree	23	40		
	Agree	13	22		
	Strongly Agree	11	19		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>3.36</b>	<b>1.103</b>
There is sufficient capacity building of management committee in operations and technical aspects of running the project	Strongly Disagree	11	19		
	Disagree	13	22		
	Neither Agree nor Disagree	23	40		
	Agree	7	12		
	Strongly Agree	4	7		
	<b>Total</b>	<b>58</b>	<b>100</b>	<b>2.66</b>	<b>1.132</b>
<b>Composite Mean and Std. Dev.</b>				<b>3.47</b>	<b>1.044</b>

The study results displayed in table 4.13 above indicated a composite mean of 3.47 of the respondents who settled that there was an effect on community-based water projects sustainability in Kajiado County in Kenya. This was supported by the study key statements

that majority of the respondents' with a mean of 4.12 agreed that there was continuity of the project after implementation phase while a mean of 3.72 agreed that there were community ownership and empowerment. Again, a mean of 3.36 agreed that there was a functional management committee after the implementation phase. A mean of 2.66 agreed that there was sufficient capacity building of management committee in operations and technical aspects of running the project.

#### 4.9 Correlation Analysis

The study carried out correlation analysis to show the relationship strength amongst both the dependent and the independent variables as presented in summary in table 4.14.

**Table 4. 14: Correlation**

		Sustainability	Community Participation	Socioeconomic Factor	Financial Resources	Choice of Technology
Sustainability	Pearson Correlation Sig. (2-tailed) N	1  58				
Community Participation	Pearson Correlation Sig. (2-tailed) N	.649** .000 58	1  58			
Socioeconomic Factor	Pearson Correlation Sig. (2-tailed) N	.607** .000 58	.491** .000 58	1  58		
Financial Resources	Pearson Correlation Sig. (2-tailed) N	.752** .000 58	.672** .000 58	.626** .000 58	1  58	
Choice of Technology	Pearson Correlation Sig. (2-tailed) N	.201 .130 58	-.335* .010 58	.087 .517 58	.062 .646 58	1  58

The correlation matrix displayed above showed the existence of a positive strong correlation amongst community participation and sustainability which implied that a unit increment in community participation leads to increment in the sustainability of community-based water projects by 0.649.

Again, there was a positive strong correlation between socioeconomic factor and sustainability of community-based water projects which implied that a unit increment in socioeconomic factor leads to increment in the sustainability by 0.607.

A positive strong correlation was also observed between financial resources and sustainability of community-based water projects which implied that a unit increment in financial resources increases the sustainability by 0.752.

However, a positive weak correlation was observed between the choice of technology and sustainability of community-based water projects that implied that a unit increment in choice of technology increases the sustainability of community-based water projects by 0.201.

## CHAPTER FIVE

### SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

The section presents a summary of the findings from the prior chapters, discusses the finds, draws conclusions, and offers recommendations under the area of further study. The conclusions, as well as recommendations derived, were motivated on addressing the purpose of the study.

#### 5.2 Summary of Findings

The study comprised a sample size of 77, out of which 58 questionnaires were correctly completed and given back achieving a 75% return rate. The test-retest method of estimating the dependability of the instrument was utilized and a co-efficient value of 0.8 was achieved indicating the reliability of the questionnaire. The study findings discovered that most of the respondents at 40% were from Lorg'osua while 21% were from Olobelibel locations. 19% each were from Enkaroni and Ildamat respectively. Only 2% constituted Ildamat location. Majority of the respondents at 33% had lived in their locations between 21-30 years whereas 26% had lived between 31 years and above. 24% and 17% had lived between 11-20 years and 10 years and below respectively. Furthermore, the study has shown that most of the respondents were male at 67% while the female was only 33%. This showed unbalance in gender distribution. In addition, majority of the respondents at 48% had secondary certificate while 36% had no formal education. 12% and 3% had secondary and diploma certificate respectively while none had a bachelors' degree. The study findings continued to show that majority of the respondents at 86% engaged in livestock farming while 5% each engaged in crop farming and worked as casual labourers. Only 3% were involved in other occupations. Majority of the respondents from the study also revealed that 28% earned between 15000 - 20000 and 26% earned less than 5000. 19% and 17% earned between 10000 - 15000 and 5000 -10000 respectively. Only 10% earned more than 20000.

An average mean of 3.51 revealed that community participation influenced sustainability while a mean of 2.83 showed that socioeconomic factor influenced sustainability. In addition, means of 3.47 and 2.62 showed financial resources and choice of technology influenced respectively. Finally, a mean of 3.47 showed an influence on the sustainability of community-based water projects in Kajiado County in Kenya.

### **5.3 Discussion of Findings**

This section focused on an intensive discussion of the major findings of the study that drew the study's conclusion and recommendations.

#### **5.3.1 Sustainability of Community-based Water Projects in Kajiado County, Kenya**

The study revealed a composite mean of 3.47 of the respondents who agreed that there was an influence on the sustainability. This was supported by the study key statements that majority of the respondents' with a mean of 4.12 agreed that there was continuity of the project after implementation phase while a mean of 3.72 agreed that there were community ownership and empowerment. Again, a mean of 3.36 agreed that there was a functional management committee after the implementation phase. A mean of 2.66 agreed that there was sufficient capacity building of management committee in operations and technical aspects of running the project. According to Carter, Tyrrel & Howsam, (2011) various faults have been associated with the extensive water supplies failures; it was not the desire of the community to intervene, the recurrent costs were too expensive for the community, repairing and maintaining is neglected due to lack of ownership, lack of materializing of the pledged benefits, lack of proper training as a result of short training programmes or trained members losing interest. The results were also consistent with study findings of World Bank (2017) on the need to move beyond infrastructure development and ensure capacity building with an emphasis on governance and technical capacity to ensure sustainable service delivery.

#### **5.3.2 Community Participation and Sustainability of Community-based Water Projects in Kajiado County, Kenya**

The study findings supported by the study key statements showed a majority of the respondents' with a mean of 3.74 had agreed that beneficiaries were actively involved in

needs identification and project design, followed by a mean 3.71 who agreed that beneficiaries were actively involved in decision making. The mean scores of 3.45 and 3.14 agreed that beneficiaries contributed materials and/or financially during implementation and that beneficiaries were involved in the commissioning stage and other main steps of the project implementation respectively. Generally, a composite mean of 3.51 agreed that community participation influenced the sustainability of community-based water projects in Kajiado County in Kenya.

Katz and Sara (2008) agreed to the above results when they noted that the overall sustainability of water project is influenced by the existence of formal community organization that runs the systems, revealing that the sustainability was notably lower in communities where those organizations did not exist. Gleitsmann (2015), further explained Community participation as a result of low sustainability levels of water supply in the rural areas across the developing countries has attracted an extensive approval as a requirement for sustainability, that is to attain efficiency, equity, effectiveness and replicability. A study by Ananga (2015) found out that lack of adequate community participation would impede the success of water schemes.

### **5.3.3 Socioeconomic Factor and Sustainability of Community-based Water Projects in Kajiado County, Kenya**

The study findings reinforced by the study key statements indicated a majority of the respondents' with a mean of 4.00 had agreed that they willingly pay for their water regularly and consistently. This was followed by means of 3.83 and 2.71 who agreed that conflicts were easily resolved by the management committee and local leaders and that education and income levels determine the level of participation in water project respectively. Moreover, the mean scores of 2.43 each agreed that women were well represented in the management committees and also women and men had equal opportunity to participate making decision and running of the water project. Generally, a composite mean of 2.83 agreed that socioeconomic factor influenced the sustainability of community-based water projects in Kajiado County in Kenya.

In agreement to the above findings was a study done by Angba (2009) assessing the influence of social-economic traits of youths in the rural areas about sustainability of community development projects in Rivers State, Nigeria which discovered that some socio-demographic traits such as level of education had a relationship with the youths' attitude about the community development projects. Also revealed that human relations and communication skills ought to be learnt for sustainability that is effective; thereof those who are more educated are more empowered for sustainability since their attitude would possibly be more favourable. And according to John (2009), lower level of education in devolved units negatively correlates with sustainability. It is therefore essential to look at the socio-economic aspects involving sustainability when it comes to raising funds by service providers. (Abebe Tadesse, 2013).

#### **5.3.4 Financial Resources and Sustainability of Community-based Water Projects in Kajiado County, Kenya**

The study results reinforced by the study key statements showed a majority of the respondents' with a mean of 4.00 had agreed that they were willing to pay a lump sum amount when there was need for high capital expenditure like pump replacement while a mean of 3.67 agreed that beneficiaries were consulted by the management committee when setting tariffs. Mean scores of 3.41 and 3.14 agreed that they appreciated and were aware of the need to hold reserves for funding capital intensive activities like a replacement of pump and that the management committee shared the financial position and/or reports of the project on a regular basis respectively. In addition, a mean score of 3.12 agreed that the management committee was transparent and accountable in regard to the handling of finances. Generally, a composite mean of 3.47 agreed that financial resources influenced the sustainability of community-based water projects in Kajiado County in Kenya.

In agreement with these findings was Nturibi (2004) posit that so as development project to be sustainable financially, it needs to have a firm financial foundation emanating from a dependable financing source, financial systems for facilitating accountability and projection for cash flow and advancement of products that are marketable for generation of income that exceed the project expenses. For an undertaking to be sustainable strategies to support

conveyance, new models and models ought to be created, tried, acknowledged and actualized Both economic and financial analysis is critical for sustainability of a project. When clear and equitable economic or financial gains are not delivered by a project, that are expected by the stakeholders, it is most probably not going to be sustained when the donor funding depletes (Bossert, 2009).

Persoon (2006) in his study of aspects influencing community-based program sustainability found that when beneficiaries do not contribute, too much dependence by the project or the community it tied to external resources. As a result, the achievement of sustainability is made almost impossible since the project with forced to come to a closure when the external parties stop giving their financial support. It was mentioned by all the interview that the community ought to make some contributions financially for increasing funding internally.

### **5.3.5 Choice of Technology and Sustainability of Community-based Water Projects in Kajiado County, Kenya**

The study results reinforced by the study key statements indicated a majority of the respondents' with a mean of 3.43 had agreed that there were very few incidents of supply interruption due to pump breakdown while a mean of 3.33 agreed that the technology used to pump water was appropriate for their project in regard to cost and reliability. More so, a mean of 3.10 agreed that pumps were quickly repaired when they broke down. Lastly, only mean scores of 1.67 and 1.55 agreed that they used M-pesa to pay for other bills and their water bills respectively. Generally, a composite mean of 2.62 agreed that the choice of technology influenced the sustainability of community-based water projects.

The results were consistent with study findings of Awoke (2012) who studied “challenges of sustainable rural water supply in Ethiopia” using data collected from water supply projects and the results revealed the choice of technology was very important factors in the influencing sustainability of water projects. He further claimed that the choice of technology was done in consideration of factors such as the ability of local operators to use, availability of spare parts and local skills in maintenance of the technology infrastructure. The more local leaders were involved in decision making of the type of technology and consideration of



local skills, the more the projects were likely to be sustainable. Kwenya (2015) also studied the “determinants of sustainability of rural water projects in Kajiado, Kenya” using data collected from WASH users and committee and project sponsors hence the study found that the technology used must be appropriate, the community must be involved in the technology choice and there should be consideration of local availability of technology spares parts.

#### **5.4 Conclusion**

From the above discussion, several conclusions were made:

The study revealed that community participation influenced the sustainability of community-based water projects in Kajiado County in Kenya. This was attributed by beneficiaries being actively involved in needs identification and project design plus in decision making, beneficiaries contributed materials and/or financially during implementation and also beneficiaries being involved in the commissioning stage and other major steps of the project implementation.

Socioeconomic factor influenced sustainability attributed by respondents willingly paying for their water regularly and consistently. In addition, conflicts were easily resolved by the management committee and local leaders and that education and income levels determine the level of participation in water project respectively. Moreover, women were well represented in the management committees and also women and men had equal opportunity to participate in decision making and running of the water project.

Again, financial resources also influenced the sustainability of community-based water projects in Kajiado County in Kenya attributed by respondents’ willingness to pay a lump sum amount when there was the need for high capital expenditure like pump replacement and beneficiaries being consulted by the management committee when setting tariffs. Also, respondents appreciated and were aware of the need to hold reserves for funding capital intensive activities like the replacement of pump and the management committee shared the financial position and/or reports of the project on a regular basis respectively. Furthermore, the management committee was transparent and accountable in regard to the handling of finances.

Generally, the study showed a positive influence of sustainability of community-based water projects in Kajiado County in Kenya attributed by the continuity of the project after the implementation phase, community ownership and empowerment, functional management committee after implementation phase and sufficient capacity building of management committee in operations and technical aspects of running the project.

In summary, there was a positive strong correlation amongst community participation, socioeconomic factor and financial resources and influence of sustainability of community-based water projects while a positive weak correlation was observed between the choice of technology and influence of sustainability of community-based water projects in Kajiado County in Kenya.

### **5.5 Recommendations for Policy Action**

The below was recommended based on the findings of the study:

1. Community participation is a key aspect in project management hence beneficiaries ought to be effectively associated with all stages of the project life cycle and decision making for ownership and sustainability of projects.
2. Ensure there is an adequate representation of gender balance in projects in order to minimize conflicts that may arise and also reasonable decisions being made.
3. Ensure there is adequate financial resources, transparency and accountability in project management for the sustainability of projects.
4. There should be an investment of proper and advanced choice of technology by leaders and the management that is easily obtained and the necessary skills and training acquired in operation of the technology which influences the sustainability of projects.

#### **5.5.1 Suggestions for Further Studies**

The study investigated factors influencing the sustainability of community-based water projects in Kenya: A case of Kajiado Central Sub-county. Considering that there are other numerous vital factors that have the potential to affect influencing the sustainability of community-based water projects and better understand project management, future studies

should be done to a larger population in the other counties in Kenya for comparative purposes.

### **5.6 Contribution to the Body of Knowledge**

The research study may assist future researchers by enriching existing body of knowledge and therefore be a vital source of reference in literature review for their research studies as well as a source of secondary data reference. Future researchers may use their research to compare their findings undertaken in the same field of study over some time.

The findings of this study may be, therefore, help to understand whether strategies used to increase access to water, have been sustainable and the factors which have been of influence in the sustainability of water projects. The study findings may be beneficial to the participants in the water sectors like non-governmental organizations, donors, community stakeholders, county government, national government and other stakeholders interested in developing water projects that are sustainable in Kajiado County. The research findings and recommendations can also be a useful source of information to water stakeholders in other counties and countries because the challenges may be similar and the solutions can be transferable.

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## APPENDICES

### Appendix I: TRANSMITTAL LETTER

Stephen Njoroge Githinji,

P.O. box 8128- 00200,

0722 729 996,

Nairobi.

Dear Respondents,

**RE: FACTORS INFLUENCING SUSTAINABILITY OF COMMUNITY-BASED  
WATER PROJECTS IN KENYA: A CASE OF KAJIADO COUNTY.**

I am a postgraduate student at the University of Nairobi pursuing a Masters of Arts in Project Planning and Management. I am carrying out research on the factors influencing the sustainability of community-based water projects in Kajiado County, Kenya as part of requirements for the Award of this Degree. Your organization has been selected and consequently, you have been sampled as part of the respondents. I therefore humbly request you to respond to the questions as asked in the questionnaires. I assure you that the information provided will be solely used for the academic purpose of this study and treated with the highest confidentiality standards.

Thank you in advance

Yours faithfully,

Stephen Njoroge Githinji

**Appendix II: QUESTIONNAIRE**

**SECTION A: PROJECT IDENTIFICATION INFORMATION**

1) Location: \_\_\_\_\_ Sub-location: \_\_\_\_\_

2) Village: \_\_\_\_\_

3) Name of the Water project: \_\_\_\_\_ Year of Establishment .....

**SECTION B: SOCIO-DEMOGRAPHIC CHARACTERISTICS**

*(To be answered by a person above 18 years in a household, preferably a household head)*

4) Are you a resident of ..... village (village named above)

Yes

No

If yes, how long have you lived here,

10 years and below

11-20 years

21-30 years

31 years and above

5) Gender of Respondent

Male

Female

6) What is your highest education level? (Tick as applicable)

- a) Primary certificate
- b) Secondary certificate
- c) Diploma/certificate
- d) Bachelors' degree
- e) No formal education
- f) Others (Specify).....

7) What is your occupation?

- a) Livestock farming
- b) Crop farming
- c) Casual laborer
- d) Other Specify .....

8) What is your average income range per month in KES (from all sources?)

- a) Less than 5000
- b) 5000 – 10000
- c) 10000 – 15000
- d) 15000 – 20000
- e) More than 20,000

**SECTION C: COMMUNITY PARTICIPATION AND SUSTAINABILITY OF WATER PROJECTS**

9) The following statements relates to beneficiary participation in rural community-based water projects. To what extent are they reflected in your community-based water projects?

Use the Likert scale 5-1 where 5=strongly Agree, 4= Agree, 3 = Neither Agree nor Disagree, 2= Disagree, 1= Strongly Disagree

SN	Statement	5	4	3	2	1
1	Beneficiaries were actively involved in needs identification and project design					
2	Beneficiaries are actively involved in decision making					
3	Beneficiaries contributed materials and/or financially during implementation					
4	Beneficiaries were involved in the commissioning stage and other key stages of the project implementation					

**SECTION D: SOCIOECONOMIC FACTOR ON SUSTAINABILITY OF WATER PROJECTS**

10) In your opinion, rate the following statements on influence of gender, income and education level in regard to beneficiary participation in water projects.

Use the Likert scale 5-1 where 5=strongly Agree, 4= Agree, 3 = Neither Agree nor Disagree, 2= Disagree, 1= Strongly Disagree

SN	Statement	5	4	3	2	1
1	Land ownership and choice of project site has likelihood of causing conflict and/or affecting sustainability					
2	Conflicts are easily resolved by the management committee and local leaders					
3	Education and income levels determine the level of participation in water project					
4	Women are well represented in the management committees					
5	Women and men have equal opportunity to participate in decision making and running of water project					
6	I willingly pay for my water regularly and consistently					
7	I am unable to pay for water consumed regularly and consistently					

**SECTION E: FINANCIAL RESOURCES ON SUSTAINABILITY OF WATER PROJECTS**

11) In your opinion, kindly rate the following statements in regard to management of financial resources for community-based water projects in Kajiado County?

Use the Likerts scale 5-1 where 5=strongly Agree, 4= Agree, 3 = Neither Agree nor Disagree, 2= Disagree, 1= Strongly Disagree

<b>SN</b>	<b>Statement</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>1</b>	Beneficiaries are consulted by the management committee when setting tariffs					
<b>2</b>	The management committee shares the financial position and/or reports of the project on a regular basis					
<b>3</b>	Management committee are transparent and accountable in regard to handling of finances					
<b>4</b>	I am willing to pay a lump sum amount when there's need for high capital expenditure like pump replacement					
<b>5</b>	I appreciate and am aware of the need to hold reserves for funding capital intensive activities like replacement of pump					

**SECTION F: CHOICE OF TECHNOLOGY ON SUSTAINABILITY OF WATER PROJECTS**

**12)** In your opinion kindly rate the following statements in regard challenges affects constant supply of the water to the Households from the boreholes?

Use the Likert scale 5-1 where 5=strongly Agree, 4= Agree, 3 = Neither Agree nor Disagree, 2= Disagree, 1= Strongly Disagree

<b>SN</b>	<b>Statements</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>1</b>	There are very few incidents of supply interruption due to pump breakdown					
<b>2</b>	Pumps are quickly repaired when they break down					
<b>3</b>	The technology used to pump water is appropriate for our project in regard to cost and reliability					
<b>4</b>	I use M-Pesa to pay for my water bills					
<b>5</b>	I use M-Pesa to pay for other bills					

**SECTION G: SUSTAINABILITY OF WATER PROJECTS**

13) The following statements relates on sustainability of the rural community-based water projects. To what extent are they reflected in your community-based water projects?

Use the Likerts scale 5-1 where 5=strongly Agree, 4= Agree, 3 = Neither Agree nor Disagree, 2= Disagree, 1= Strongly Disagree

<b>SN</b>	<b>Statements</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>1</b>	There is continuity of the project after implementation phase					
<b>2</b>	There is community ownership and empowerment					
<b>3</b>	There is functional management committee after implementation phase					
<b>4</b>	There is sufficient capacity building of management committee in operations and technical aspects of running the project					