INFLUENCE OF COMMUNITY PARTICIPATION IN PROJECT LIFE CYCLE MANAGEMENT ON SUSTAINABILITY OF RURAL PIPED WATER SUPPLY PROJECTS: A CASE OF ALEGO SUB-COUNTY, SIAYA COUNTY, KENYA

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A Research Project Report Submitted in Partial Fulfillment of the Requirements for the Award of the Degree of Master of Arts in Project Planning and Management of the University of Nairobi

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DECLARATION

This research project report is my original work and has not been presented for examination in any other university.

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This research project report has been submitted for examination with my approval as the University Supervisor.

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DEDICATION

This research project report is dedicated to my parents; Rose Amolo and George Oduor. To my siblings; Vincent Owino, Boaz Omondi, Solomon Okoth, Mercyline Anyango, Micah Ragen and Joyce Akinyi; I thank you for your prayers and moral support. I also dedicate this research project report to my son, Aenon Owino and niece, Kimberly Atieno.

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ABBREVIATIONS AND ACRONYMS

CIDA : Canadian International Development Agency

JMP : WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation

KIWASH : The Kenya Integrated Water, Sanitation, and Hygiene Project

KNBS : Kenya National Bureau of Statics

Kshs : Kenya Shillings

LVSWSB : Lake Victoria South Water Service Board (Kenya)

M&E : Monitoring and Evaluation

NACOSTI : National Commission for Science, Technology and Innovation (Kenya)

NGO : Non-Governmental Organization

O&M : Operation and Maintenance

SDGs : Sustainable Development Goals

SIBO : Siaya Bondo Water and Sanitation Company

SID : Society for International Development

SPSS : Statistical Package for the Social Sciences

UNDP : United Nations Development Programme

UNICEF : United Nations Children's Fund

USAID : United States Agency for International Development

USD : US Dollar

WASH : Water, Sanitation and Hygiene

WASREB : Water Authority Services and Regulatory Board (Kenya)

WHO : World Health Organization

WRA : Water Resource Authority (Kenya)

ABSTRACT

Piped water supply sustainability is a major concern in the rural areas due to perceived low participation of the community in which the project exists as well as costly and poor maintenance of existing systems. Despite increased investment in piped water supply by governments and donors in rural areas, water projects have not resulted in desired results, pointing to a lapse in project life cycle management. This study sought to assess the influence of community participation in project life cycle management on the sustainability of rural piped water supply projects in Alego Sub-County, Siaya County. The study objectives were: To establish the influence of community participation in project planning on sustainability of rural piped water supply projects in Alego Sub-County, Siaya County; to determine the influence of community participation in project implementation on the sustainability of rural piped water supply projects in Alego Sub-County, Siaya County; and to examine the influence of community participation in monitoring and evaluation on the sustainability of rural piped water supply projects in Alego Sub-County, Siaya County. The study population was drawn from Mbaga zone in Alego Sub-County, Siaya County and entails those households which were connected to piped water and registered as active users by the water service provider company. The population for this study consists of 270 beneficiary households and 12 water committee members making a target population of 282. A sample size of 168 respondents was selected from the study population through stratified random sampling. Beneficiary households in Mbaga zone and water committee members formed the strata for this study during sampling. The study used a mixed-method research design, employing a cross-sectional descriptive survey. Data collection was done using a closed-ended questionnaire consisting of 5-point Likert scale, and an interview guide for key informants. Content and construct validity were tested during pilot testing on 10% of the actual sample size. The reliability of the research instrument was also done through calculating Cronbach's Alpha in SPSS which generated a value of 0.917. Descriptive statistics was employed during data analysis. The study revealed that community participation influenced the sustainability of rural piped water supply projects in Alego Sub-County, Siaya County. The study found that community participation in project planning (mean=4.15), community participation in project implementation (mean=4.06), and community participation in monitoring and evaluation (mean=3.70), all influenced sustainability of rural piped water supply projects to great extent. The study recommended that the governments, water service providers and local communities invest more resources and assure participatory approaches are adopted in water supply projects. From the study findings, it was suggested that further research need to be done on the influence of demographic factors such as level of education on participation in development projects, more so in rural areas.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Water supply sustainability is a major concern in the rural areas due to perceived low participation of the community in which the project exists, as well as costly and poor maintenance of existing systems. These concerns have contributed to scholars and development partners debating on Sustainable Development. For example, the United Nations adopted Sustainable Development Goals (SDGs) in the year 2015 and among the goals, goal number six aims to 'Ensure availability and sustainable management of water and sanitation for all'. According to a report published by Joint Monitoring Programme (JMP, 2012) five out of six persons living in regions that are rural, globally, do not access improved drinking water. More so the rural areas of sub-Saharan Africa have been affected as having low access to improved water supplies. Improved drinking water, in this case, is defined by three criteria which are water accessibility, availability, and quality (JMP, 2017). In terms of water accessibility, Hope and Rouse (2013) argued that the number of Africans who did not access, improved water in the year 2010 was higher compared to 1990. This situation has remained despite various groups advocating for water sustainability after the water decade from 1981 to 1990 and in spite of the significant investments made and policy reforms in the water sector.

It is approximately 30 years since the water decade of the 1990 and the question of how to achieve 'sustainability' in water projects continues to be of concern among Water, Sanitation and Hygiene (WASH) providers. More so, development partners who have been financing development projects in which the majority are water-related. Similarly, Black (2013) observed that despite policies and programs on water supply and sanitation and despite debates on top-down vs. bottom-up approaches, sustainability in water supply and sanitation still remains elusive.

The Government of India (2011) report indicated that as the population continues to increase specifically for rural areas, more investments would be needed in piped water supply sector. Targeting tap connections in homesteads, while leaving water point sources to areas that are difficult to access. According to Bentley, Han and Houessou (2015) in Africa, data collected

from 34 countries from the year 2011 to 2013 by Afrobarometer report showed that on average 44% of populations in Africa, has no piped water access. Regarding water scheme sustainability in Africa, Brikke and Bredero (2003) noted approximately 30 to 60 percent of the water systems were not working at any given time. For example, in Malawi, Kleemeier (2000) pointed out that half of the rural piped water schemes which were 3 to 26 years old were poorly performing. Some of the reasons contributing to the failure of these systems were due to weak managing of water asset and regulatory lapses. These water schemes sometimes failed or simply abandoned (Hope & Rouse, 2013). Moreover, communities lack a sense of ownership especially for infrastructures that were built with little of their inputs. The Afrobarometer report further showed that on water accessibility, East African countries were mostly affected with 61% lacking piped water, compared to North Africa which had only 16% lacking the commodity (Bentley, Han & Houessou, 2015). The situation in Kenya according to KNBS and SID (2013) report indicated that 56% of the population in rural areas had access to unimproved water sources.

A report by Lake Victoria South Water Service Board (LVSWSB, 2017) indicated that Siaya County, which is largely rural, was faced with water shortages. The rural population in Siaya County is 89.2 % which is higher than the country's average rural population of 74.4% (Ornit, 2019). The County is in the bottom 10 counties regarding accessibility of improved water having only 36% of her population using improved water sources, while the proportion accessing piped water is 6.6% (KNBS & SID, 2013). Whereas according to Siaya County Integrated Development Plan 2018-2022, the report indicates 6% of households in the county access piped water supplies (County Government of Siaya, 2018).

Accessibility of improved water is linked to the sustainability of already constructed water projects. Development partners and stakeholders have shown concern to sustainability of these projects. One of the prerequisites for the sustainability of rural piped water supply projects is community participation. The concepts of community participation and sustainability have been areas of focus by scholars (Kumar, 2002; Rao & Mansuri, 2003; Olukotun, 2008; Tadesse, Bosona &Gebresenbet, 2013; Oino et al., 2015). Community participation in project life cycle management is thus proposed as a pathway to sustainability (Labuschagne & Brent, 2005). Participation of community members in project life cycle management plays a big role in using resources effectively, to meet the demands of the community, this way contributing to achieving

sustainability. In the last three decades, there has been a lot of emphasis on community participation majorly focusing on benefits that are supposed to come from the participatory approach. Along this line, community participation in project life cycle management is beneficial to a project's efficiency, sustainability, and collective community force (Labuschagne & Brent, 2005; Marks, Komives & Davis, 2014). In addition, by engaging the local community, they will be empowered, thus contributing to improved societal cohesion as well as growth in the capacity for local development (Hassan, Ong'ayo, Osore, Morara & Aura, 2017). Additionally, the Secretary-General for the United Nations, while giving a report regarding updates for sustainable development for Agenda 2030 (United Nations, 2017), highlighted that in order to realize management of water effectively, the participation of the local communities which forms part of the stakeholders have to be relied upon

1.2 Statement of the Problem

In the context of project life cycle management, the following are believed to have contributed in the low sustainability of the rural piped water supply projects, in Siaya County: weak community participation, low revenue mobilization from Water Service Providers, high operational costs, and poor maintenance of already installed water systems which leave users with erratic water supply (LVSWSB, 2017). In addition, non-revenue water was reported at 53% by Water Authority Services and Regulatory Board (WASREB, 2016). As such, half of the water produced cannot be accounted for either through illegal connections, leakages or wastages. Furthermore, the poor maintenance of water systems has played a role in leakages in distribution pipes and storage tanks, and metering that are not working. These challenges point to a lapse in the project's life cycle management. Therefore there is need to study the role of community participation in project life cycle management to determine its influence on sustainability of rural piped water supply projects, with a focus on Mbaga Zone area in Alego Sub-County. Mbaga Zone was chosen as it occupies a largely rural area on the outskirts of Siaya town, besides it is in this area where both the Abura water abstraction site and water treatment plant that supplied the town and its environs were located.

1.3 Purpose of the Study

The purpose of this study was to assess the influence of community participation in project life cycle management on the sustainability of rural piped water supply projects in Alego Sub-County, Siaya County.

1.4 Objectives of the Study

This study was guided by the following objectives:

i. To establish the influence of community participation in project planning on the sustainability of rural piped water supply projects in Alego Sub-County, Siaya County.
ii. To determine the influence of community participation in project implementation on the sustainability of rural piped water supply projects in Alego Sub-County, Siaya County.
iii. To examine the influence of community participation in monitoring and evaluation on the sustainability of rural piped water supply projects in Alego Sub-County, Siaya County.

1.5 Research Questions

The study sought to answer the following research questions:

i. How does community participation in project planning influence sustainability of rural piped water supply projects in Alego Sub-County, Siaya County?
ii. How does community participation in project implementation influence the sustainability of rural piped water supply projects in Alego Sub-County, Siaya County?
iii. How does community participation in monitoring and evaluation influence the sustainability of rural piped water supply projects in Alego Sub-County, Siaya County?

1.6 Significance of the Study

Findings from the study are likely to help the county government of Siaya come up with strategies, that when implemented can contribute to achieving sustainable piped water supply in rural parts of Siaya County. Besides, findings will be beneficial to officials from the county government in understanding the concepts of community participation and sustainability of water projects, hence endeavor to involve local communities optimally in such projects. Non-Governmental Organizations will also benefit from the study findings insights especially in understanding community participation or lack of it, in the implementation of rural water projects. This understanding will help the NGOs have confidence and more knowledge in the

participatory approach, and how to integrate such an approach in the project life cycle. In addition, findings from this study would be helpful to communities so as to understand the association between their participation and sustainable water supply. This knowledge may enhance community participation and in return increase communal ownership which then results in social sustainability. Equally, study findings will contribute knowledge in sustainable community projects in the rural sector. Moreover, the study may be of great help to other scholars who will be exploring the same field, do further research on the same.

1.7 Limitations of the Study

This study encountered two shortcomings in the process of data collection. First, the population in rural areas is sparsely populated coupled with the fact that to qualify to be a respondent, one must be an active piped water user. Due to this, the interviewers covered a wide area of coverage during data collection before finding qualified respondents, this prolonged fieldwork days. This limitation was addressed by allocating more days for data collection.

Low level of education of the community members was the other drawback. Low level of education is typical to the rural population. Illiteracy level led to respondents giving varied responses due to the difference in understanding the research questions. To overcome this shortcoming, the study adopted a face-to-face interviewing methodology also with the help of a translator, since the majority of the respondents were conversant and comfortable using the local language. This way the interviewer explained and elaborated the questions to the respondents so that they could be well understood, uniformly, before recording the responses in the questionnaire.

1.8 Delimitations of the Study

To achieve the objectives of this study, the study was carried out in Siaya County which is in the bottom ten counties in regards to improved water accessibility. Furthermore, the study was delimitated to Alego North location and specifically Mbaga Zone area, since the water abstraction and treatment plants are located in this area. The target respondents were users of piped water supply within the Mbaga zone. The study also assessed the influence of community participation in project planning on, project implementation and M&E, on sustainability of rural piped water supply projects as was guided by the study conceptual framework.

1.9 Assumptions of the Study

The sample size selected was presumed to be adequate for the study so as to make a valid conclusion. Besides, it was presupposed that the interviewees understood the research questions and they willingly and freely participated in the survey without demanding for incentives.

1.10 Definition of significant terms

Community Participation: As used in the study, it is the voluntary involvement and participation of members of the community in project activities during planning, implementation, and monitoring and evaluation phases of a project.

Monitoring and Evaluation: Refers to a project phase where the local stakeholders are involved in setting up of operation and maintenance indicators for monitoring, then assessing the O&M process of the project.

Project Implementation: This is the project phase where the project activities such as election of water project steering committee members, sharing of O&M costs and training of community on maintenance are carried out.

Project Life Cycle Management: This entails dealing with or controlling project activities in the following phases common to a project; initiation, planning, implementation, monitoring and evaluation, and closure. However, for this study three phases which are planning, implementation and monitoring and evaluation have been studied. These three phases were considered crucial in sustaining piped water supply projects. Besides, the project closure phase was excluded from the study since the piped water supply projects are designed to be a continuous project in meeting its purpose. Therefore, according to this study, project life cycle management refers to participating in dealing with or controlling project activities during the planning phase, implementation phase, and monitoring and evaluation phase.

Project Planning: This is the phase of a project where the community is involved in identifying deliverables and how they would be executed such as land identification, acquisition as well as the type of contribution expected from the community.

Sustainability of rural piped water supply: Refers to the ability of project beneficiaries and stakeholders to maintain project activities so that the project's operations are continuous. This is through financial viability, social acceptance and continued service delivery.

1.11 Organization of the Study

This study is categorized into five chapters. Chapter one covers the background of the study, study problem, research objectives, research questions, significance of the study, as well as limitations and delimitations of the study. The first chapter also covers the assumption of the study as well as the significant terms used.

The second chapter contains the literature review, where past studies relevant to the study are examined. It establishes the theories used and conceptual frameworks guiding the study; equally, the section has a literature review summary. It concludes by showing the knowledge gap which informed the study.

Chapter three deals with research methodology giving details on research design, population of the study, procedure for sampling and research instruments. Other areas discussed in this chapter include data collection procedure and data analysis techniques. The chapter finally covers ethical considerations and the operationalization of the variables.

Chapter four presents the findings of the study as drawn out in the research methodology. Furthermore, it provides descriptive analysis and interpretation of the results. The last chapter, chapter five, covers the summary of findings, conclusions, and recommendations based on the study. The study concludes by suggesting areas for further studies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter examines previous scholarly works done, which are relevant to the field of study. Theories and conceptual framework guiding the study have equally been examined. The literature reviewed is based on; sustainability of rural piped water supply, community participation in project planning, community participation in project implementation, and community participation in M&E of water supply.

2.2 Sustainability of Rural Piped Water Supply Projects

Sustainability is a common term in almost all development projects. In cost-intensive projects, for example, water supply projects covering rural areas, sustainability cannot be overemphasized. Designing, constructing and laying the distribution network of pipes, and construction of water abstraction as well as water treatment plants, consume a lot of resources. It's thus prudent that the project once completed ought to be sustainable and serve its purpose as long as the community needs the project's services.

One aspect of sustainable water supply is financial sustainability which involves the ability of populations to financially support the services being provided, through the willingness to pay. It is observed that significant improvement in water services by water providers would encourage willing payment of O&M costs charged to the consumers (Gizachew, 2005; Gebrehiwot, 2006; Bradley & Bartram, 2013).

Sense of project ownership by the community, as another aspect of sustainability, is encouraged so as to create an 'enabling environment' (Bradley & Bartram, 2013) considering that both projects and communities exist within the same environment. Such an environment involves interacting factors at the household and community levels that either eases or frustrates the continuous service delivery for the water supply project hence contributing to community ownership which is an indicator of social sustainability. Such ownership in projects is achieved when participants are allowed to get involved freely since they believe that projects are impactful to their lives. Kwena and Moronge (2015) assert that increasing community participation improves the community's perception of ownership in projects, subsequently contributing to the

sustainability of these projects. Likewise, Whittington et al. (2009) affirm that community contributions towards a facility ordinarily cultivates a perception by the community of owning that facility, and in turn solidifying loyalty to using and maintaining the facility, as long as they are benefiting. Even though the study elaborated on the social aspect of sustainability in rural areas, the aspect of the rural piped water supply has not been broadly discussed, considering the nature and characteristics of rural areas. This, therefore, shows a gap worth studying, with respect to sustainable piped water projects.

Many scholars agree that when a project is sustainable, its purpose is effortlessly achieved thereby continuing the project's operations even beyond its anticipated lifetime. One of the elements that this study considered needful to realizing sustainable piped water supply was community participation (Gizachew, 2005; Gebrehiwot, 2006; Whittington et al., 2009; Bradley & Bartram, 2013; Kwena & Moronge, 2015; Oino et al., 2015). In view of this, this study has focused on community participation and sustainability of rural piped water supply projects.

2.3 Community Participation in Project Planning and Sustainability of Rural Piped Water Supply Projects

One of the important project life cycle phases is that of planning, here the community make project plans based on project options and resources available. Choice is made on project priority grounds, also giving consideration to O&M costs once the project is operational. Project planning is based on deliverables based on the scope of the project. Equally, the project needs to incorporate indigenous knowledge. When presented with options, the community accordingly plans project activities in accordance with project need, which satisfies the demand-responsive approach. However, many obstacles face the planning and scheduling of projects due to difficulty in reaching poor rural people. The procedure of appraising social cost-benefit analysis is complex, thus making doubtful the conditions for decision-making. This in practice gets the community participation in the planning process sometimes to be neglected (Brikke & Bredero, 2003).

The preferred pathway in development intervention is for the community to identify a need or problem and have a shared understanding of solving the problem. Therefore community has to actively pursue ways of addressing the identified needs. One way is to come together into decision-making regarding details of the chosen project. For a water supply system, Brikke and

Bredero (2003) observe that users prefer piped water supply due to lesser time and effort spent obtaining water. During the planning process, the first step considered is to request for improved services usually accomplished by having a consultative meeting with all involved parties, on the project. It is recommended that planning and scheduling of project activities be determined by affordability and projects that are manageable and maintainable at the community level. In addition, cost recovery and the type of contribution required from the community during the initiation phase is given consideration (Brikke & Bredero, 2003; Olukotun, 2008). However, these studies focused on water technology choice from the perspective of community water supply, with little mentioning of sustainable rural water supplies.

A study carried out in Ethiopia by Tadesse, Bosona and Gebresenbet (2013) investigating rural water supply systems found that there was weaker community participation in regards to technology choice that is to be adopted in a project. The low participation could be so since the government and NGOs are the main decision-makers concerning technology type to be used for any water scheme. Data was collected through mixed methodology with 4 water schemes and a total of 148 representatives from households being selected. However, the study focused on assessing independent variables as a stand-alone without relating these variables to a dependent variable to show a causal relationship.

Of critical importance during project planning is the question of land for the project. The community has to have a common understanding of how to acquire or give out land, to put up these facilities. Land identification and acquisition should be given first consideration having in mind that water treatment plant and distribution pipes pass through privately owned as well as public lands, hence community needs to be involved in the process of the land easement. Mumma (2005) in his empirical analysis study of Kenya's new water law observes that part of the contributions that communities make has many times been in the form of land donation which is used in putting up physical facilities like storage tanks and water treatment facilities. The study further emphasizes that one way of acquiring land is through donations, especially by the initiators of the project. However there are some instances when community is unwillingness to contribute land, for example, Twinamasiko and Ahimbisibwe (2013) doing a study of water and sanitation in South-western Uganda, reveal that people feared to surrender their land for construction of communal latrines and water taps for fear that their land would be utilized for the

benefit of leaders. They deem these leaders as selfish and restrictive; by placing the water system on their own property and going further to exclude certain groups from using the system. The study findings by Mumma (2005) are founded on Kenya's Water Act of 2002 which have since been revised, hence the need for more research on the same. The study also does not demonstrate the role of the community participating in land identification and acquisition.

2.4 Community Participation in Project Implementation and Sustainability of Rural Piped Water Supply Projects

Project implementation is where the majority of the project work is done, leading to the project taking shape. It is in this stage that construction of the actual project happens in accordance with project specifications. Since this phase involves the project being built, the project becomes visible to stakeholders. The community, who is the local stakeholder start relating to the project due to its visibility thus making contributions (Baars, 2006).

Considering the growing participatory approach in comparison to previous years, beneficiaries of water schemes have been accorded a new role of partnering actively in water service management. Satisfactory level of participation of the community has been associated with social comfort due to the satisfaction of the community members with their inputs on projects. Members who failed to participate in community projects feared that they would be socially segregated (Sheikh, Redzuan, Samah, Magsi & Shahwani, 2016). On the contrary, Sheikh (2010) revealed that locals were less engaged in active project execution, due to the locals' economic disadvantage. The locals were rarely included in project implementation committees for the fact that most of the management committees were managed by those that are influential in the society. The study, however, has not clearly examined the influence of participation of locals on the sustainability of development projects.

Water committees have considerably played a part in ensuring that water projects have been implemented (Twinamasiko & Ahimbisibwe, 2013). It is thus necessary that project leaders have necessary skills crucial in managing water supply systems. Kwena and Moronge (2015) agree that a sustainable water system is correlated with the managerial skills of water supply management committees. Participation of water users and partnering agencies is increased when water management committees have higher levels of education and skills. This enables the management team to enjoy a better interaction with their customers, thus motivating the locals to

participate in the implementation of water projects. Many costly facilities fall into disrepair due to the failure to mobilize the will of the people, it is, therefore, critical to have committee members who have the skills and will to mobilize the people in order to participate or make contributions in development projects. These studies, however, focused on management which is only one aspect in project implementation; therefore there is a need to further explore other aspects of implementation so as to help explore this particular study objective.

Community participation in project implementation cannot be fully addressed without looking at gender mainstreaming. This brings into perspective women inclusion in the participation of water projects. It is generally viewed that users of water at home are majorly women, and the burden of collecting water for domestic use is shouldered largely by women (Kativhu, Mazvimavi, Tevera & Nhapi, 2017; Mommen, Humphries-Waa & Gwavuya, 2017). Fetching water a distant away from the household disadvantages women because quality time spent collecting water would otherwise be spent on income-generating activities, as well as on education for school-going children. Mommen et al. (2017) explored the benefits of women's involvement in water projects, and contend that participation of women in management correlated to improved performance of the water project, for example by voicing practical water needs considering women have genuine vested interest. Further, involving women in decision making was associated with consistency in attending meetings and better revenue in the instances where women held treasurer positions. The representation of women in management or key positions has been low due to patriarchal norms or power structures that socially seem to be discriminating against women. In clarification, men are perceived to have better knowledge on water projects due to men’s involvement in making decisions regarding the project since the time of project initiation till construction (Leder, 2017).

Ubani, Nwachukwu and Nwokonkwo (2010) reveal that project implementation consumes a lot of resources, involving heavy financial cost. Therefore O&M cost-sharing by users could be realized by ensuring the financial sustainability of the project. Moreover, Kativhu et al. (2017) disclosed that for maintenance of the water supply systems, the community contributed cash, grains, small livestock, and labor when there are repairs to be done to the water points. Trust and openness are needed in sharing the project costs, in order to ensure these activities are sustained. In addition, transparency is needed where leaders call for regular meetings where the community

is briefed on project sustainability efforts and anticipated challenges (Olukotun, 2008). Water users' contributions such as decision- making are important when it comes to O&M costs and expenses. An example of such costs includes payment of staff (Kwena & Moronge, 2015). These studies, however, do not show how the financial sustainability of the project is influenced by users sharing O&M costs in the community. To fill this gap, this study, therefore, focused on the sharing of O&M costs in participatory implementation.

2.5 Community Participation in Monitoring and Evaluation and Sustainability of Rural Piped Water Supply Projects

Monitoring is a continuous process covering all project tasks and aspects of water systems' operations. Evaluation, on the other hand, consists of assessing whether certain project activities are conforming to a set of agreed professional standards. Monitoring and evaluation, therefore, assesses project results and improves project performance. The evaluation process is crucial to water sustainability as it engages stakeholders to identify corrective actions to take (Lockwood & Smits, 2011). The purpose of conducting an evaluation ensures that project activities are on course to delivering projected outcomes in a sustainable manner. Also, participation in evaluation ensures that projects are sustainable by assessing contributions made by the levels of community participation and management. Participatory evaluation again has the intention of identifying those factors that are considered to enhance the performance of a system and at the same time overcoming identified weaknesses so as to strengthen the functioning of the project (Kaliba, 2002).

In view of monitoring of a water project, Brikke and Bredero (2003) emphasize operation and maintenance as involving repairs of the system. These repairs are done depending on material quality used and level of corrective and preventive maintenance that is required. In order that a utility's operations are sustained, it is important that the O&M cost be recovered. It is possible, to find management not having adequate personnel to monitor all throughout, the operations of a project. It is therefore critical that stakeholders, that is, the community be involved in and participates in the tracking progress of a project. Participation of the community would realize a reduction in the apparent loss of water supply as well as a decrease in illegal connections.

As part of monitoring, Francisco, Tanya, Francisco and Daniele (2013) observed that committee members would always be required to report any problem or anomaly they find out related to the

water project. Reporting would assist in the timely handling of the problem as well as the sustainability of the project. In Malawi, describing the various challenges of maintaining rural water systems, Kleemeier (2000) noted that users undermine a system's performance by failing to report faults, even when a credible reporting mechanism is in place. Such inaction could be as damaging as willful vandalism.

In a study conducted on the performance of youth funded agribusiness projects (Waithera & Wanyoike, 2015) found out that the performance of monitoring and evaluation is well determined when staff is trained. Besides, training improves how an organization performs in terms of M&E activities. It was also observed that M&E performed, were done so, as a requirement, instead of being done to improve the system's delivery process. Data was collected through structured questionnaires by the use of descriptive surveys. The sampling approach used was census which was carried out on the target population of 50. The study, however, was centered on the topic of youth funded agribusiness ventures, and data collected using a census methodological approach.

According to Kwena and Moronge (2015), rural water projects call for a thorough evaluation to determine how adequate, functional and beneficial the project is, for continued operation. Achieving financial sustainability requires agreement on strict enforcement of payment rules and laying down action against defaulters, such as sanctioning against consumers who do not pay (Njonjo & Lane, 2002), as well as the use of metering to monitor usage.

2.6 Theoretical Framework

The Empowerment Theory by Perkins and Zimmerman (1995) is found to be relevant to the study. It contributes to understanding how sustainable development can be realized through community participation of those perceived to be less privileged socio-economically. Another theoretical model that is complementary in understanding sustainable development in rural areas is Social Systems Theory. This theory has been advanced by Niklas Luhmann, A German Sociologist. The systems theory aids in understanding the sustainability of water supply and how sustainability interacts with other factors within its environment such as community participation.

2.6.1 Empowerment Theory

This study is backed by empowerment theory, advanced by Perkins and Zimmerman (1995). This model explains the process and efforts made by marginalized individuals or groups to exert control and influence their choices transforming them into desired outcomes touching on both personal and communal life.

According to Rappaport (1987), empowerment is a process by which the community takes charge of, and participates democratically in its life. Titi and Singh (2001) explain that empowerment enables an individual and the community participates amongst themselves so as to realize their goals. One of the important features of empowerment includes participation.

Zimmerman (2000) emphasizes that this model of empowerment when applied to an organization, exhibits empowerment as inclusive of internal processes and structures which enhance participation of its members, thus improving the organization's effectiveness to achieve its goal. With the view of the community, empowerment here refers to shared decision-making and action that improves the community's quality of life.

An empowerment approach to project planning, design, implementation, and evaluation helps in understanding a professional or a manager's role while relating to the target population. The manager collaborates with the community and facilitates, rather than playing an expert role. Regarding professionals from external agencies working with the community, they would need to learn and understand about the participants' cultures, their viewpoints, and their life struggles, and thus act as facilitators. The manager, therefore, works with the community together, rather than advocating for them (Zimmerman, 2000).

This theoretical approach elaborates on how sustainability can be realized through the element of community participation. The definition and meaning of empowerment theory are appropriate to the study considering this to the meaning of Community Participation which (Oakley, 1991) defined as an active process in which the participants take initiatives and actions that are stimulated by their own thinking and by their deliberations over which they exert effective control. Thus, this theoretical model aids in understanding the concept of community participation.

2.6.2 Social System Theory

Social System Theory is sometimes called Systems Theory. This theory helps in understanding the concept of sustainability. Niklas Luhmann is viewed as the main theorist of the system theory. However, the Luhmannian System Theory has been popularized by Wallis and Valentinov (2016).

In a social system, the system is considered open and interacting with its environment. The system as a whole is greater than the sum of its parts. This theory is not only used to explain a phenomena, but it is also applied to an individual or groups in understanding, and then able to solve a problem (Wallis & Valentinov, 2016). This theoretical model, in effect, was useful in addressing sustainability issues of rural piped water supply in the study area. For example, a piped water project is regarded complex due to its interaction with several factors within its environment (Kerzner, 2003). Due to this complexity, Wallis and Valentinov (2016) argue that there is a high level of interconnectedness. They further explain that theories that support these kinds of complexity encourage effectiveness in practical applications such as active participation and involvement of the stakeholders thus able to encourage progress in society.

Social systems theory helped explain the concept of sustainability in this study. According to Murphy (2012), sustainability is a system issue, where interaction on one part of the system affects the other. It is not only a social construct, but it also depends on nature constructions such as the provision of freshwater to a society. In a Social System, even though each component in a sub-system can be said to be working in independence, all the components from the sub-systems contribute towards achieving the overall goal.

In the context of this study, the sustainability of rural piped water supply is taken as a complex system, with many related components within its environment which include socio-cultural and economic interactions. These interactions or factors include the participation of water users, involvement of water management committee members, the involvement of locals, maintenance of the water supply systems, maintenance or conservation of the natural resources such as natural water sources, and also financial contributions. For the whole system to work, that is sustainability, the sum of the other sub-system must also be working, harmoniously (Murphy, 2012). System theory appreciates the function of the sub-system, hence the theory is found to be

adequate for the study; in understanding the role of community participation among other factors, in achieving sustainable rural piped water supply in Alego Sub-County.

2.7 Conceptual Framework of the Study

The figure below displays a conceptual framework that shows relationships between variables. The dependent variable is the sustainability of rural piped water supply projects. It was assessed based on how it is influenced by independent variables; community participation in project planning, community participation in project implementation and community participation in M&E of water supply. The moderating variable is water sector regulation and the intervening variable is the socio-economic environment.

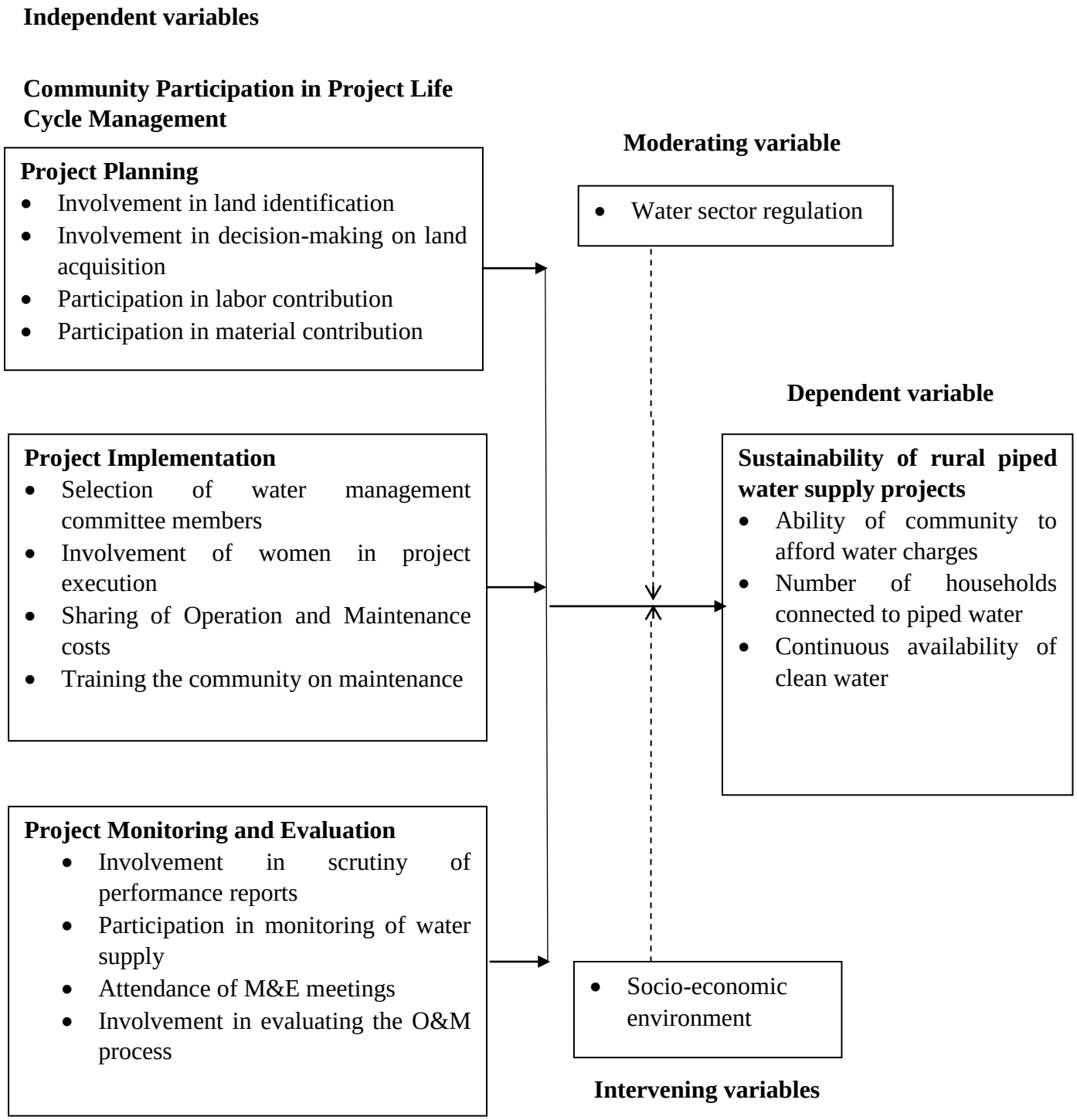

Figure 1: Conceptual Framework showing relationships between community participation in project life cycle management and sustainability of rural piped water supply projects

2.8 Summary of Literature Review

The literature reviewed focused on sustainability of rural piped water supply and community participation in project life cycle management, and how the former is specifically influenced by community participation in project planning, community participation in project implementation, and community participation in M&E.

Incorporating sustainability is today very critical in development projects. In cost-intensive projects like piped water supply projects that require heavy investments, the sustainability component has to be considered and factored in at all times from pre-construction to post-construction. With a growing population and increasing demands of water, it is imperative that water resources be sustained.

On community participation, to achieve sustainability, the community where this project exists has to be involved in the project's affairs being that this community is a stakeholder. Several authors suggest that participation of the community, which acts in response to genuine demands; positively impacts sustainable development projects (Rao & Mansuri, 2003; Olukotun, 2008; Tadesse et al., 2013). In project planning, the community works together to ensure that project deliverables are met and project schedules done, which once completed would contribute to meeting community needs, inconsistency with the demand-responsive approach. However, social cost-benefit appraisal that seem to have complicated procedures render the conditions for decision-making to be doubtful, which in practice get the community participation in the planning process neglected (Brikke & Bredero 2003) especially for the rural sector. Also, to be given consideration during project planning is, land identification and acquisition, Mumma (2005) observed that this has taken the form of land donation on the part of the community's contribution, whereas Twinamasiko and Ahimbisibwe (2013) noted that in Uganda, the community was not willing to surrender land for project development, thus challenging the planning process regarding land question.

Community participating in project implementation of water supply could be done through water management committees Harvey and Reed (2007) advice that this ensures project activities are actualized. It would be necessary that management committees are brought on board and trained on technical and managerial skills for proper management (Twinamasiko & Ahimbisibwe, 2013). Kwena and Moronge (2015) agree that there is an association between sustainable water

supply and proper managerial skills of the water management team, ensuring that water services are sustained. The inclusion of women in water committees encourages gender mainstreaming. Involving women and encouraging their participation improves efficiency and performance in water management. Users of water at home are majorly women, who predominantly ensure that this commodity is available when needed, particularly in water-scarce regions (UNICEF & WHO, 2008). Moreover, the implementation of projects consumes a lot of resources, involving heavy financial cost (Ubani et al., 2010). There is a need therefore for water users to share O&M costs amongst themselves, as one way of achieving financial sustainability.

Monitoring and Evaluation is central to a project's tracking and assessment. The process is important as it engages stakeholders to identify corrective actions to be taken (Lockwood & Smits, 2011). For participation of the community in M&E, Francisco et al. (2013) revealed that committee members would always be required to report any problem or anomaly they find out related to the water project. Additionally, in examining a rural piped water project in Malawi, Kleemeier (2000) noted that users undermined a system's performance by failing to report faults, even when a credible reporting mechanism is in place and that such inaction can be as damaging as willful vandalism. It is thus prudent that community participation in M&E of water supply is advocated for so as to realize gains in project performance which would eventually translate to the project sustainability endeavors.

This study adopted Empowerment theory which attempts to explain the aspect of community participation on the sustainability of rural piped water supply. Another complementary theoretical approach adopted is a Social Systems Theory which aids in understanding the aspect of sustainability and how it could be achieved through factors such as community participation. The variables under study are presented using a conceptual framework showing relationships between community participation factors and the sustainability of rural piped water supply.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter covers the research methodologies giving details on research design, population of the study, procedure for sampling and research instruments. Other areas discussed in this chapter include data collection procedure and data analysis techniques. The chapter finally covers ethical considerations and the operationalization of the variables.

3.2 Research Design

This study employed a descriptive survey design. This design aids in interpreting phenomena and is concerned with relationships that exist (Best & Kahn, 2009). The research design helped the study obtain information concerning community participation on the sustainability of rural piped water supply projects, thus giving a causal relationship. Descriptive survey design produces clear, specific and measurable descriptions of the phenomenon under study and also allows for data to be collected without doing any manipulation to the study and its environs (Grimes & Schultz, 2002). The descriptive survey design, therefore, guided the execution of a mixed methodology, which this study employed. According to Bryman (2016), mixed-method approach provides for complementarity in the data collection.

3.3 Target Population

This study targeted registered users of piped water supply projects drawn from Mbaga zone and water management committee members in the area. The piped water beneficiaries, who were registered according to SIBO data, were 270 users, within the Mbaga zone area. The study participants were the household heads; this is because household heads are the main decision-makers in the home. The target population was therefore 282, grouped as shown below.

Table 3.1: Population of the study

Description	Frequency	Percentage
Water users	270	96%
Water committee members	12	4%
Total	**282**	**100%**

Source: Siaya Bondo Water and Sanitation Company (August 2018)

3.4 Sample Size and Sampling Procedure

This section explains the sample size and sample techniques administered in the study.

3.4.1 Sample Size

Sample size estimation from the study population assists in making inferences about the population based on the sample selected. One strategy of determining sample size according to Singh and Masuku (2014) is by using calculated formula. The formulas are calculated based on different levels of precision, confidence level, and variability. The following formula according to Yamane (1967) was used:

$$n = \frac{N}{1+N(E^2)}$$

Where:

n is the required sample size

N is known population of the study

E is the margin of error tolerated

For fair representation, the sample size was determined at 95% level of confidence (0.05 level of precision). Therefore:

$$n = \frac{270}{1+270(0.05^2)} = 161$$

Given a study population size of 270, the sample size was therefore estimated to be 161. This gives a 60% proportion of the population of water users; the same proportion has been applied to water management committee members thus estimating a sample size of 7 respondents from the study population of 12.

Table 3.2: Sample size of the study, showing the proportion of the study population

Description	Study Population	Proportion	Sample size
Water users	270	60%	161
Water management committee members	12	60%	7
Total	**282**		**168**

3.4.2 Sampling Procedure

Sampling in research is based on selecting a portion of a population so as to be able to make inference of the whole group based on group profile similarity (Hulley, Cummings, Browner, Grady & Newman, 2013). The target population was grouped into two subgroups so as to obtain homogeneity. Water users and Water committee members have formed the two strata. Each stratum is homogenous thus giving a uniform possibility of selection to the study subjects. In addition, stratified random sampling gives more accurate information of the components parts thereby giving an accurate estimate of the whole population (Singh & Masuku, 2014). This study thus adopted a stratified random sampling due to its appropriateness and reliability.

3.5 Research Instruments

Questionnaires were used in the collection of primary data from water users. The questionnaire is a suitable research instrument due to its structured format and convenience for collecting data within a short time. In addition, a questionnaire has the ability to accord a respondent adequate time to respond as well as a sense of anonymity to a respondent. Moreover, it's a cost-effective way of collecting data since a lot of respondents can be interviewed covering a large geographical area (Malhotra, 2006; Walliman, 2011). The questionnaire was chosen as a suitable instrument, for the above reasons.

A closed-ended questionnaire composed of 5-point Likert-scale questions was used. The first section of the questionnaire dealt with respondent's demographic details. The second section covered the variables used for the study. The variables covered under subsections were community participation in project planning, community participation in project implementation,

community participation in M&E and the last variable which was the dependent variable was Sustainability of rural piped water supply projects.

Key Informant Interview Schedule was equally used to collect qualitative data. This presented an opportunity for officials at the water service providers to share insights on the topic of the study. Again, to provide suggestions and new ideas on how to improve existing services and in addition to gather important information from management committee members that can help to address management challenges. The Interview Schedule resultantly complemented the quantitative approach (Bryman, 2016). The already mentioned reasons explain the choice of the Key Informant Interview component. A Guide for Key Informant Interview was therefore designed to help provide responses that would address the study objectives.

3.5.1 Pilot Testing of Research Instruments

Piloting was conducted on respondents drawn from Mbaga village which is within the study target area. The study area was chosen due to respondents' profile similarity to that of the study population. 10% of the sample size (16 household heads) was randomly selected for pilot testing. Pilot testing of research instruments was helpful in checking the instruments' appropriateness and practicality. Moreover, piloting of the research instruments tested coherence and ease of understanding the questions in regards to the wording, structure, and sequence of research questions. Afterward, correction and adjustment were made to the research tools. Pilot testing process was beneficial such that the researcher improved on interviewing skills and rephrased questions that appeared difficult in order to obtain accurate answers.

3.5.2 Validity of Research Instruments

A valid instrument should have content which is relevant to the need established. The validity of an instrument can be improved through expert judgment. The researcher sought the opinion and advice from the university supervisors in establishing the research instruments' content and construct. This was done by having discussions with the university supervisor. Parameters such as sample size, time to conduct research and number of items to be included in the research tool were discussed. The validity of the instruments was therefore checked in terms of the instruments' reliability and appropriateness to data collection aligned with the research topic. The research tool was approved by the university supervisor as valid, meaning the results

obtained were representative of the study variables, thereby able to answer the research questions (Newman, Lim & Pineda, 2013).

3.5.3 Reliability of Research Instruments

The meaning of reliability, according to Ihantola and Kihn (2011) signifies how consistent a test is in measuring the same thing each time. Reliability ensures that data collected has certain internal consistent patterns, whereas a lack of reliability would make it difficult to make inferences about the relationship of the variables being studied. For example, responses that elicit no pattern are indicative of the difficulty in answering questions, that perhaps the respondents are only giving random answers to these questions. Reliability was tested during the piloting of the research instruments

To determine the reliability of the research instrument, the split-half technique was used. The questionnaires were split into two and administered to target respondents during the pre-test. Results from the two sets were correlated through computation to check for consistency. In addition, internal consistency was tested by the use of Cronbach's Alpha Coefficient generated from SPSS. A value of 0.917, shown below, was generated from the Cronbach's Alpha after calculating the reliability statistics from SPSS. Creswell (2012) indicated that instruments used in research scoring a minimum value of 0.7 for composite Cronbach's Alpha, is indicative of reliability. Therefore, the data collection instrument was found to be reliable as it produced a value above 0.7 and would be able to produce a consistent pattern should the research be repeated.

3.6 Data Collection Procedure

First, a letter authorizing data collection was received from the University of Nairobi and research permit granted by the National Commission for Science, Technology and Innovation (NACOSTI). After obtaining the research permit, the researcher notified in writing the County Director of Education and County Commissioner. Equally, a transmittal letter introducing the researcher was shared with all respondents before participating in the study.

A research assistant was recruited and trained on the flow of the questionnaire and interviewing skills. During this training, each item in the instrument was discussed to ensure that they were comprehensible. The questionnaires were administered through face-to-face interviews. The choice of this approach was because this study was done in rural areas where respondents

relatively have a low level of education, thus may encounter difficulty in understanding the questions if left alone to self-administer the questionnaires (Hoyle et al., 2002). Face-to-face interviewing also helped the interviewers to probe responses that are not clear during the process of interviewing. Similarly, (Walliman, 2011) helped ensure a high completion rate due to the interviewer's persuasion of the interviewee.

For the Key Informant Interviews, respondents were recruited among water management committee members. These included staff from SIBO, the company supplying piped water in the area, the Ministry of Water Resources at the County level, and as well as KIWASH which is the local NGO affiliated to USAID. These were among the organizations which formed the water management committee. Convenient time for interviews was agreed upon between the researcher and the respondents as per the interview schedule.

3.7 Data Analysis Techniques

After fieldwork, data collected using the questionnaires were entered into the SPSS software for analysis. Analysis of the quantitative data ensued using SPSS software version 24. The SPSS program is recommended to be used since it is very systematic and covers the most common statistical data analysis, which makes the results easier to read. This was done through descriptive statistics. They included frequency, mean, standard deviation and percentages. Results were presented in table format. For ease of interpretation and reporting, data was ordered thematically such that it helped answer the research questions. Analysis of the qualitative data similarly was ordered as per key themes of the study.

3.8 Ethical Consideration

The researcher sought approval for data collection from the University of Nairobi and thereafter a research permit was obtained from the National Commission for Science, Technology and Innovation, Kenya (NACOSTI). The researcher was responsible for ensuring adherence to the highest standards of ethics in maintaining the dignity of the respondents. A research assistant was recruited and trained a research assistant on research ethics and code of conduct. The interviewer was required to adhere to appropriate behavior while relating to respondents. The researcher and the research assistant dressed decently and used appropriate language; in this manner, their presentation was friendly and approachable. This made respondents to be comfortable with the interviewing process.

During the data collection process, respondents were allowed to participate willingly based on informed consent. Anonymity and confidentiality were upheld on data and information collected from respondents. Confidentiality is assured when the individual answers from a respondent cannot be identified or identifiable (Walliman, 2011). To ensure anonymity of respondents, the researcher avoided acquiring other means of identifying respondents by the information they gave, such as acquiring respondents' names, or their phone contacts. Information gotten from the respondents was not to be used for any other purpose except for the study purpose only. Finally, all material references used in the study is acknowledged, through referencing and citations.

3.9 Operationalization of variables

Table 3.4 Operationalization of variables

Objective	Variable Type	Indicators	Measurement	Measurement Scale	Tools of analysis	Type of Data Analysis
	Dependent Variable	Ability to afford water charges	Ability to pay water charges	Interval	Frequencies Percentages Mean	Descriptive
	Sustainability of rural piped water supply projects in Alego Sub-County	Households connected to piped water supply	Number of households connected to piped water supply	Interval Nominal	Standard deviation	
		Continuous availability of clean water	Availability of clean water	Interval		
To establish the influence of community participation in project planning on the sustainability of rural piped water supply projects in Alego Sub-County	Independent variable	Involvement in land identification	Level of involvement in land identification	Interval	Frequencies Percentages Mean	Descriptive
	Community participation in project planning	Involvement in decision-making on land acquisition	Level of involvement in decision-making on land acquisition	Interval	Standard deviation	
		Participation in labor contribution	Level of participation in labor contribution	Interval		
		Participation in material contribution	Level of participation in material contribution	Interval		

To determine the influence of community participation in the management of water supply on the sustainability of rural piped water supply projects in Alego Sub-County	Independent variable Community participation in project implementation	Selection of water management committee members	Level of community participation in the election of water committee members	Interval	Frequencies Percentages Mean Standard deviation	Descriptive
		Involvement of women in project execution	Level of involvement of women in project execution	Interval		
		Sharing of Operation and Maintenance costs	Degree of sharing O&M costs	Interval		
		Training the community on maintenance	Level of training on maintenance	Interval		
To determine the influence of community participation in monitoring and evaluation on the sustainability of rural piped water supply projects in Alego Sub-County	Independent variable Community participation in monitoring and evaluation	Involvement in the scrutiny of performance reports	Level of involvement in scrutiny of performance reports	Interval	Frequencies Percentages Mean Standard deviation	Descriptive
		Participation in monitoring of water supply	Level of participation in monitoring of water supply projects	Interval		
		Attendance of M&E meetings	Rate of attending M&E meetings	Interval		
		Evaluation of the O&M process	Level of involvement in evaluating the O&M process	Interval		

Source: Researcher (2019)

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSIONS

4.1 Introduction

This chapter presents the findings of the study as discussed in the research methodology. First, respondents' response rate and demographic characteristics are presented. Also, it provides descriptive analysis, interpretation, and discussions of the results based on the key variables being studied. These are sustainability of rural piped water supply projects, community participation in project planning, community participation in implementation, and community participation in monitoring and evaluation of water supply projects.

4.2 Questionnaire Return Rate

A sample size of 161 water users was targeted and on whom a closed-ended questionnaire was administered. Out of the targeted 161, 140 questionnaires that were administered to target respondents were filled accurately through face-to-face interviewing giving a questionnaire return rate of 87%. Baruch and Holtom (2008) argued that a 100% response rate is rarely achieved, though they admit that a higher response rate is likely to have findings that are credible. Whereas for Fosnacht, Sarraf, Howe and Peck (2017) low response rate did not automatically bias survey results. Based on these findings and recommendations, this study's response rate of 87% was found to be adequate (Baruch & Holtom, 2008; Fan & Yan, 2010; Fosnacht et al., 2017) to be able to make inference on the population of study. For key informants, successful respondents were 7 out of a sample target of 7, producing a 100% response rate, as shown in the table.

Table 4.1: Questionnaire Return Rate

Description	Target Sample	Respondent Interviewed	Response rate
Water users	161	140	87%
Water management committee members	7	7	100%
Total	**168**	**147**	**88%**

4.3 Demographic Characteristics of the Respondents

In this section, the demographic details of the respondents were captured in order to understand respondents' background information on age, gender and their level of education. These demographic data were perceived to contribute to influencing community participation in the sustainability of the rural piped water supply. The inclusion of respondents' demographic details was influenced by a study by Sheikh (2014) on factors that influenced farmers' participation in water management and whose finding indicated that socio-economic determinants such education level influenced greatly farmers' participation in community development projects. The study results are presented below according to the sub-themes.

4.3.1 Distribution of Respondents by Gender

The study sought to determine gender distribution of the respondents. The findings from the study are tabulated in table 4.2.

Table 4.2: Distribution of Respondents by Gender

Response Rate	Frequency	Percent
Male	65	46.1
Female	75	53.9
Total	**140**	**100.0**

The results show that out of the 140 respondents who participated in the survey, 65 were male representing 46.1% of the study sample, while that of female was 75 (53.9%). This finding shows that women were the majority. Considering that it is women who are the primary users of water at home and they are the ones preoccupied with looking for water, the results, therefore, indicated that sustainability of rural piped water supply projects would be enhanced due participation of women participation owing to their large number.

4.3.2 Distribution of Respondents by Age

Table 4.3: Distribution of Respondents by Age

Age Group	Frequency	Percent
20-30	34	24.5
31-40	53	38.2
41-50	41	29.4
51 and above	11	7.8
Total	**140**	**100.0**

Respondents were grouped as per the age bracket as indicated. The findings show that the age group between 31-40 were the majority with 53 (38.2%) followed by the age group of 41-50 who were 41 (29.4%), then the age group of 20-30 who were 34 (24.5%) and lastly those aged 51 and above were the least in number at 11 (7.8%). The finding is in agreement with Miseda (2014) who also found that the age category of 31-40 were the majority. The age group of 20-40 combined had 88 (62.7%) of the respondents. This age group comprise of the youth translating to manpower because they are the most energetic, besides younger people are more technology savvy and they are much faster to learn as opposed to older people, thus contributing to the sustainability of the water projects when they participate in these projects. The study findings, therefore, reveal that age was a determinant in labor contribution especially in projects where labor contributions were needed thus positively influencing the sustainability of the projects. However, this study finding on age contradicts Hassan, Ong'ayo and Osore (2019) whose study findings showed no significant relationship between the age categories and participation in development interventions.

4.3.3 Distribution of Respondents by Level of Education

The level of education of individual influences one's attitude and perception, and equally contributes to the understanding of social phenomena. Education, therefore, could determine one's participation in a development initiative (Kwena & Moronge, 2015; Hassan et al., 2019). It influences one's making of informed choices. Twinamasiko and Ahimbisibwe (2013) conducted a study on water scheme sustainability in Uganda and revealed that low education level was one

of the challenges hindering the scheme's sustainability. Considering the aforementioned studies, this study, therefore, attempted to examine background details regarding respondents' education level. Distribution of Respondents by the level of education is presented in table 4.4.

Table 4.4: Distribution of Respondents by Level of Education

Level of education	Frequency	Percent
No formal education	15	10.8
Primary	59	42.2
Secondary	43	30.4
Tertiary	23	16.7
Total	**140**	**100.0**

In table 4.4, a big number of the respondents had attained primary education at 59 (42.2%) followed by secondary education at 43 (30.4%). Respondents with tertiary education were 23 (16.7%) and the least number of respondents with no formal education were 15 (10.8%). Respondents interviewed having no formal education and primary education level were 53.0% combined while those with higher education levels according to the findings were 66 (47.1%). This showed that the majority have low levels of education. This is likely to influence their participation in project activities hence impacting the sustainability of the water projects. Similarly, Shamiyulla and Ramu (2010) in their finding indicated that the literacy level of farmers impacted the performance of participatory irrigation farming, in India. The study found that majority of the respondents have low levels of education, was also reflected by one of the key informants interviewed from NGO who observed that:

> *"The local leaders would occasionally take advantage of the locals to further their own interest because the locals are less educated and cannot articulate their issues in a systematic way. The result is that this would affect the social sustainability of the projects"*

4.4 Descriptive Analysis of Study Variables

4.4.1 Sustainability of Rural Piped Water Supply Projects

The questionnaire administered statements which were relevant to sustainability in the water supply. Respondents expressed their rating of these statements using a 5-point Likert scale and the results are displayed below.

Table 4.5: Respondents' responses on the Sustainability of Rural Piped Water Supply Projects

Statements on Sustainability		SD	D	N	A	SA	Total	Mean	Standard Deviation
I am able to pay for water charges when due	Freq.	0	12	22	74	32	140	3.89	0.855
	Percent	0.0%	8.8%	15.7%	52.9%	22.5%	100%		
Number of households connected to piped water has increased in the last 5 years	Freq.	0	14	16	70	40	140	3.97	0.895
	Percent	0.0%	9.8%	11.8%	50.0%	28.4%	100%		
We have a continuous flow of water in our taps	Freq.	15	78	26	21	0	140	2.37	0.867
	Percent	10.8%	55.9%	18.6%	14.7%	0.0%	100%		
The piped water supplied is clean	Freq.	0	5	23	77	34	140	4.00	0.758
	Percent	0.0%	3.9%	16.7%	54.9%	24.5%	100%		
Composite value								**3.56**	**0.844**

There was no respondent who consented to strongly disagreeing when asked about the ability to pay for water charges when it's due. Only 12 (8.8%) disagreed. 22 (15.7%) respondents responded as neutral when asked about the same statement. Respondents who agreed and strongly agreed to the statement on ability to pay for water charges when due were 74 (52.9%) and 32 (22.5%) respectively. The mean score for this item was 3.89 implying that a sizeable number of respondents interviewed agreed with the statement. Evidently, water users were able to pay monthly fees and other charges such as connection fees and this likely influenced sustainable water supply. This statement had a standard deviation value of 0.855. This finding

contradicts Kwena and Moronge (2015) who found out that a big number of water schemes in rural areas did not manage to collect returns sufficient to take care of the schemes' O&M costs. One of the key informants interviewed from the water service providers agreed with the study findings that the amount charged was affordable to the consumers:

> *"We have supplied the community with water kiosk to increase the accessibility of water and yard taps and that a 20-liter container costs Kshs 2.00 (approximately USD 0.02) or Ksh 3.00 (approximately USD 0.03) depending with the area of operation."*

The second statement regarding the sustainability of rural piped water supply that was asked was whether the number of households connected to piped water has increased in the last 5 years. There was no response having strongly disagreed with this statement, while 14 (9.8%) of the respondents disagreed with the same. Respondents whose responses were neutral to the question were 16 (11.8%) whereas 70 (50.0%) and 40 (28.4%) agreed and strongly agreed respectively to the same statement on increase of domestic connections. Respondents' rating of the statement had a mean of 3.97 which when interpreted shows that the number of users had gone up due to larger number of households being connected to the water distribution network; this is one of the indicators that boost sustainability especially regarding communal ownership.

The third indicator of the sustainability of the rural piped water supply was having a continuous flow of water in the taps. There were 15 (10.8%) and 78 (55.9%) respondents who strongly disagreed and disagreed respectively, to this statement. Those respondents whose responses were neutral were 26 (18.6%). Whereas 21 (14.7%) of the respondent agreed to have a continuous flow of water in their taps. The mean value for this item of 2.37 is interpreted to mean that most of the respondents disagreed that they were having a continuous flow of water. This finding confirms studies done by CIDA (2000), Lockwood and Smit (2011), and Ornit (2019) who all revealed that despite making effort in water coverage levels; there was poor maintenance of already installed water systems which left users with erratic water supply.

The last item in this section that respondents responded to was whether the piped water supplied to them is clean. No respondent strongly disagreed to this statement, while 5 (3.9%) of the respondents disagreed when asked this question. Those who were neutral to the same statement were 23 (16.7%). A large number of respondents were in concurrence that the piped water

supplied to them was clean with 77 (54.9%) and 34 (24.5%) of the respondents agreeing and strong agreeing respectively. This item had a mean of 4.00 which is interpreted that the respondents agreed with the statements suggesting that water supplied is of quality, this again supports sustainability endeavors for the project.

The overall mean for all the four items under this variable was 3.56 and a standard deviation of 0.844. This section's mean of 3.56 indicates that respondents agreed with the statements which are the indicators for sustainability. These indicators or items in this category are similar to components of a sub-system that sum up to a whole (Murphy, 2012) which work harmoniously to achieve an overall goal, that is, the sustainability of rural piped water supply. The results as discussed in this section are therefore in line with the social system theory as used in the study. This theoretical model aided in understanding how several factors affect the sustainability of piped water supply projects (Kerzner, 2003; Wallis & Valentinov, 2016).

4.4.2 Community Participation in Project Planning and Sustainability of Rural Piped Water Supply Projects

In this section, respondents interviewed rated six statements relevant to this variable according to the rating scale provided. Outcomes are shown below.

Table 4.6: Community Participation in Project Planning and Sustainability of Rural Piped Water Supply Projects

Statements		Not at all	Little extent	Moderate extent	Great extent	Very great extent	Total	Mean	Standard deviation
I am involved in the process of land identification for the construction of water facilities	Freq.	0	14	5	81	40	140	4.05	0.849
	Percent	0.0%	9.8%	3.9%	57.8%	28.4%	100%		
I am involved in decision-making on land acquisition for construction of water facilities	Freq.	0	12	10	70	48	140	4.10	0.873
	Percent	0.0%	8.8%	6.9%	50.0%	34.3%	100%		
I am involved in determining the type of labor required from the community	Freq.	0	12	10	60	58	140	4.17	0.902
	Percent	0.0%	8.8%	6.9%	43.1%	41.2%	100%		
I participate in labor contributions	Freq.	0	11	10	60	59	140	4.20	0.879
	Percent	0.0%	7.8%	6.9%	43.1%	42.2%	100%		
I am involved in determining the amount of money the community is required to contribute	Freq.	0	11	7	65	58	140	4.21	0.860
	Percent	0.0%	7.8%	4.9%	46.1%	41.2%	100%		
I participate in monetary contributions	Freq.	0	10	7	74	49	140	4.17	0.809
	Percent	0.0%	6.9%	4.9%	52.9%	35.3%	100%		
Composite								**4.15**	**0.862**

Results indicated that there was no respondent who was associated with responding 'Not at all' to all the items. The first item in this category was being involved in the process of land identification for the construction of water facilities, 14 (9.8%) of the respondents agreed with this statement to a little extent, while only 5 (3.9%) of the respondents agreed to a moderate extent. The majority of the respondents agreed to a great extent and a very great extent at 81 (57.8%) and 40 (28.4%) of the respondents respectively that being involved in the process of land identification for the construction of water facilities influenced sustainability of rural piped water supply projects. This item had a mean of 4.05 which is below the mean of means of 4.15 signifying that community participation in land identification had no influence on the sustainability of rural piped water supply projects.

The second item on community participation in project planning was being involved in decision-making on land acquisition for construction of water facilities. The number of respondents who agreed to a little extent on this statement was 12 (8.8%). Those who agreed to a moderate extent were 10 (6.9%). Half of the respondents at 70 (50.0%) agreed with the statement to a great extent while those that were in agreement extremely with the same statement were 48 (34.3%) of the respondents. The mean for this item was 4.10 which is below the composite mean of 4.15 suggesting that there was no influence on the sustainability of rural piped water supply projects. This finding was reflected one of the key informants from the Ministry of Water Resources, Siaya County, who remarked that:

> *"Community was always mobilized to create awareness on the proposed projects and if way leave was required through land acquisition from the community, then the community was informed and at times compensation is given."*

The third item that respondents were asked about was being involved in determining the type of labor required from the community. The number of respondents who consented to this statement to a little extent and a moderate extent were 12 (8.8%) and 10 (6.9%). The respondents who consented when asked this question to a great extent were 60 (43.1%) while 58 (41.2%) of the respondents were in agreement on the same to a very great extent that being involved in determining the type of labor required from the community influenced the sustainability of rural piped water supply projects. This statement had a mean of 4.17 which is above the composite mean of 4.15 implying it had an influence on the sustainability of rural piped water supply

projects. This study finding was corroborated by results from one of the key informants interviewed by water service providers. The respondent indicated that:

> *"Type of labor expected from the community affected project selection. When the cost of labor is high to the community who bears labor provisions, it could contribute in change of project choice. Otherwise adopting a project without considering the community's ability to contribute labor could affect the project's sustainability initiatives."*

The other indicator of community participation in project planning was participation in labor contribution. Respondents were asked their perceptions regarding this statement and how it influences the sustainability of rural piped water supply projects, 11 (7.8%) of the respondent agreed to the statement to a little extent while 10 (6.9%) of the respondents agreed with the statement to a moderate extent. Most of the respondents agreed with this statement, with 60 (43.1%) and 59 (42.2%) of the respondents agreeing to a great extent and a very great extent respectively. The mean for this item was 4.20 which is above the composite mean of 4.15 implying that community participation had an influence on the sustainability of rural piped water supply projects. This finding is in line with Ngugi (2018) whose findings affirmed that respondents contributed skilled and unskilled labor and this highly affected project sustainability. Concerning labor contribution which the finding indicates influence sustainability of water projects to a great extent, one key informant interviewed from NGO said that:

> *"Resource contribution creates a sense of ownership of the project to the community. Community participating in such contributions could include taking part in construction and as well as provision of the favorable environment during the project's scheduling. Such an environment plus support from the community would facilitate a sustainable project"*

Respondents were asked their opinions on the relationship between being involved in determining the amount of money the community is required to contribute and the sustainability of development projects. Results from the study finding showed that 11 (7.8%) of the respondent concurred with the question asked to a little extent. Respondents who agreed with the same statement moderately were 7 (4.9%) while 65 (46.1%) rated the question to a great extent. The findings further showed that 58 (41.2%) of the respondent interviewed consented to a very great

extent that being involved in determining the amount of money the community is required to contribute influenced the sustainability of projects. A value of 4.21 was calculated from the mean of this statement based on the responses. This value was above the composite mean of 4.15 signifying it had an influence on the sustainability of rural piped water supply projects. This result reflects findings by Wanyera (2016) who did a study on Kiambiu slum project in Nairobi and found that the community members of the slum project participated in financial activities and this had a moderate influence on the sustainability of the project.

The last item under community participation in project planning was participation in monetary contributions. Respondents were asked how their participation in monetary contributions influenced sustainable piped water projects. Results showed that 10 (6.9%) and 7 (4.9%) of the respondents ranked this question to a little extent and moderate extent respectively. Most of those surveyed were in concurrence with the aspect of monetary contribution to a great extent at 74 (52.9%) whereas 49 (35.3%) were to a very great extent when rating the same statement. The mean value for this item was 4.17 which was above the composite mean of 4.15 for this category implying the item had an influence on the sustainability of rural piped water supply projects.

The composite value for all the items in this category was a mean of 4.15 inferring that generally, the respondents consented to these statements to a great extent that they influence the dependent variable. These study findings contradict the findings revealed by Ornit (2019) who had found that there was weak participation of the communities in Siaya County. The study findings further confirm the Empowerment theoretical model, which guided the independent variables as was advanced by Zimmerman (2000) who argued that empowerment enhanced participation of members, led to shared decision-making and action that would contribute to improving the community's quality of life. Furthermore, results from key informants interviewed from the water service providers reflected the findings revealing that:

> *"Involving locals in project planning positively impacted sustainable development projects since this enables community members to identify their specific needs and prioritization in line with project scope thus allowing the community to easily identify with the project's progress."*

4.4.3 Community Participation in Project Implementation and Sustainability of Rural Piped Water Supply Projects

Statements relevant to the variable of community participation in project implementation were asked to respondents. Interviewees rated the extent to which these statements impact sustainability. The results are highlighted as shown below.

Table 4.7: Community Participation in Project Implementation and Sustainability of Rural Piped Water Supply Projects

Statements		Not at all	Little extent	Moderate extent	Great extent	Very great extent	Total	Mean	Standard deviation
I participate in election of water committee members	Freq.	0	12	10	70	48	140	4.10	0.873
	Percent	0.0%	8.8%	6.9%	50.0%	34.3%	100%		
I participate in championing for women inclusion in management positions	Freq.	0	12	11	66	51	140	4.11	0.889
	Percent	0.0%	8.8%	7.8%	47.1%	36.3%	100%		
I participate in sharing O&M costs with other water users	Freq.	0	15	14	66	45	140	4.01	0.928
	Percent	0.0%	10.8%	9.8%	47.1%	32.4%	100%		
I attend training on how to maintain the water system in case of leakages, breakages or repairs at home	Freq.	0	12	12	74	41	140	4.03	0.861
	Percent	0.0%	8.8%	8.8%	52.9%	29.4%	100%		
Composite								**4.06**	**0.888**

Results in this section indicated that for all the items, there was no respondent who disagreed at the extremes, that is, responding not at all. Findings on the first item showed that 70 (50.0%) and 48 (34.3%) of the respondents who were the majority consented that their participation in the election of water committee members influenced sustainable piped water projects to great extent and very great extent respectively. Those surveyed who gave a rating of a little extent were 12 (8.8%). Those who responded to a moderate extent to the same statement were the least at 10 (6.9%). The mean for this statement was 4.10 which is above the composite mean of 4.06 indicating that the statement influenced the sustainability of rural piped water supply projects. This finding is supported by Njogu (2018) whose study findings showed that the majority of the respondents participated in the election of project committee members hence influencing the performance of the project. Findings from one key informants interviewed confirmed that the community participated in elections. The respondent said that:

> *"In regards to the election of representatives, water committee members were elected by the community themselves through Chief's Barazas."*

When asked to what extent the respondents' participation in championing for women inclusion in management positions influenced project sustainability, 66 (47.1%) and 51 (36.3%) agreed with this aspect to a great extent and a very great extent respectively. Those surveyed who rated this aspect on women inclusion to a little extent and moderate extent were 12 (8.8%) and 11 (7.8%) respectively. The number of respondents who agreed with the aspect that participation in championing for women inclusion in management positions impacted sustainability was 83.4% of the respondents. The mean for this item was 4.10 which is above the composite mean of 4.06 an indication that community participation in championing for women inclusion in management positions influenced the sustainability of rural piped water supply projects. This result contradicts a study by Nguyen, Biskupska and Mortensen (2019) who revealed that participation of women was not beneficial due to the fact that even though women attended water management meetings, women did not express their opinions in the meetings, further creating more burden to women. Mommen et al. (2017) carried out a study in rural Vanuatu and found out that the involvement of women was a predictor in water scheme functionality. The critical role of women in water management prompted inclusion of another rider question to enquire on

the number of women who are perceived to be involved in management positions such as in the water management committee positions. The findings are displayed below in table 4.8.

Table 4.8 Perception of Women in management positions

		Much higher	Higher	About the same	Lower	Much lower	Total	Mean	Std. Deviation
Number of women in management positions	Freq.	0	4	12	86	37	140	4.12	0.679
	Percent	0.0%	2.9%	8.8%	61.8%	26.5%	100%		

The mean value for this question was 4.12 as shown, revealing that the respondents generally perceived that the number of women in management positions was lower than that of men. This finding supports studies done by (Sheikh, 2010; Leder, 2017) indicating the lower number of female respondents which implied that women availed fewer opportunities in the implementation of projects, compared to men who had more privileges. The low numbers of women in management positions show disparity in gender which is likely to contribute to water wastage (WASREB, 2016) considering that women who are the primary users of water at home, they are less represented in management positions, therefore left behind while making crucial decisions on water.

Another indicator of community participation in project implementation that respondents were asked was their participation in sharing O&M costs with other water users in the community. A big number of those surveyed rated this question to a great extent and a very great extent at 66 (47.1%) and 45 (32.4%) respectively that it influences project sustainability. On the same statement, 15 (9.8%) of the respondents were in agreement to a moderate extent and 14 (10.8%) concurred to a little extent. Responses for this statement scored a mean of 4.01 which is below the composite mean of 4.06 implying that there was no influence between community participation in sharing O&M costs with other users and sustainability of rural piped water supply projects. This result contradicts the finding by Kativhu et al. (2017) who carried a study in rural Zimbabwe and found that community participation in O&M of water points was crucial as it influenced the sustainability of rural water supply systems.

The last item that was examined under the variable of community participation in project implementation was the attendance of training on how to maintain the water system in case of leakages, breakages or repairs at home. The study results showed that the majority of the respondents gave a rating of this aspect as great extent at 74 (52.9%) and a very great extent at 41 (29.4%) of those surveyed. An equal number of respondents each at 12 (8.8%) rated the aspect of being trained on maintenance to a little extent and moderate extent. The mean for this statement was 4.03 which when compared to the composite mean of 4.06, falls below the mean, signifying that the item had no influence on sustainability of rural piped water projects. The study result reflects observation made by Twinamasiko and Ahimbisibwe (2013) who found that only 12% of respondents supported staff training and concluded that staff training was not an important aspect in the sustainability of water and sanitation projects.

The composite mean for all the items in this section was 4.06 indicating that respondents generally were in agreement with the statements, which are the indicators for community participation in project implementation, that they influence sustainability of rural piped water supply projects. All the items in this category had a standard deviation of 0.888. These findings contradict those from studies done by Sheikh (2010) who found that there was low involvement of locals in planning and implementation of projects, and similarly by Tadesse et al. (2013) who's finding also revealed low participation in rural water supply management in Adama area of Ethiopia.

4.4.4 Community Participation in Monitoring and Evaluation and Sustainability of Rural Piped Water Supply Projects

This study had three objectives under investigation, the third objective was to examine the influence of community participation in monitoring and evaluation on sustainability of rural piped water supply projects in Alego Sub-County. Results from the study are shown in table 4.9.

Table 4.9: Community Participation in Monitoring and Evaluation and Sustainability of Rural Piped Water Supply Projects

Statements		Not at all	Little extent	Moderate extent	Great extent	Very great extent	Total	Mean	Standard deviation
I am involved in scrutiny of performance reports	Freq.	0	36	23	65	16	140	3.44	1.001
	Percent	0.0%	25.5%	16.7%	46.1%	11.8%	100%		
I participate in monitoring of water supply system	Freq.	0	10	10	81	40	140	4.08	0.792
	Percent	0.0%	6.9%	6.9%	57.8%	28.4%	100%		
I am involved in reporting leakages and vandalism to project coordinators	Freq.	0	11	10	74	45	140	4.10	0.839
	Percent	0.0%	7.8%	6.9%	52.9%	32.4%	100%		
I attend M&E meetings organized by water management committee members	Freq.	4	33	26	65	12	140	3.34	1.029
	Percent	2.9%	23.5%	18.6%	46.1%	8.8%	100%		
I participate in evaluating the O&M process	Freq.	4	40	33	49	14	140	3.21	1.056
	Percent	2.9%	28.4%	23.5%	35.3%	9.8%	100%		
I use M&E information for corrective action and improvement	Freq.	0	15	14	66	45	140	4.01	0.928
	Percent	0.0%	10.8%	9.8%	47.1%	32.4%	100%		
Composite								**3.70**	**0.941**

The results showed that 36 (25.5%) of those surveyed supported the first item of being involved in the scrutiny of performance reports as influencing project sustainability only to a little extent. The results of those who responded agreement to a moderate extent were 23 (16.7%) while 65 (46.1%) and 16 (11.8%) of these respondents expressed their rating to the statement in great extent and very great extent respectively. No respondent who responded not at all to the same statement. The item had a standard deviation of 1.001, an indication of a high disparity of responses for the item. The item had a mean of 3.44 which is below the composite mean of 3.70 implying that the item had no influence on the sustainability of rural piped water supply projects. This contradicts a study Wanyera (2016) who found that community participation in assessing project performance influenced to a great extent the sustainability of community-based projects.

Results from the respondents interviewed on the influence of their participation in monitoring of water supply system on the sustainability of rural piped water supply indicate that majority of the respondents supported this statement to a great extent and very great extent with 81 (57.8%) and 40 (28.4%) of the respondents in agreement. There was no respondent who was associated with responding not at all to the statement whereas 10 (6.9%) of the respondents agreed to the statement only to a moderate extent and the same number of respondents also consented to the statement to a little extent. The mean for this item was 4.08 which is above the composite mean of 3.70 signifying that the item had an influence on sustainability of rural piped water supply projects. Similarly, a study finding by Wanyera (2016) also indicated that the beneficiaries were involved in monitoring the use of project funds influenced moderately sustainability of community-based projects in Kiambiu slum project in Nairobi. Key informant from the NGO interviewed agreed that:

> *"The community would participate in the monitoring of water supply for example in case there is a breakdown; the community members would alert the water enterprises."*

The third statement in this category being studied was being involved in reporting leakages and vandalism to project coordinators. A big number of respondents at 74 (52.9%) agreed with this statement to a great extent that it influences project sustainability. This finding supports Francisco et al. (2013) who noted that for any development to be sustained, users were required to report any problem or anomaly on the water supply system to the relevant water committee

members. Those surveyed who were in agreement with this aspect to a very great extent were at 45 (32.4%) while those who rated to a moderate extent were 10 (6.9%) of the respondents. Findings further showed that 11 (7.8%) of those interviewed concurred to a little extent with the statement that it influences the sustainability of rural piped water supply projects. The item had a mean of 4.10 a value which is above the composite mean of 3.70 suggesting that community being involved in reporting leakages and vandalism to project coordinators influenced the sustainability of rural piped water projects. However, despite water users confirming that that being involved in reporting leakages and vandalism to project coordinators influenced the sustainability of water projects to great extent, key informants' results disclosed that there were delays in repairing the broken systems. One respondent interviewed from the NGO again indicated that:

> *"Breakages and leaks from water pipes took longer time to be repaired, thus contributing to wastage and consequently affecting the sustainability of the water supply system.*"

The above observation from the key informants is likely to explain the contributing factors to one of the challenges highlighted by WASREB (2016) which revealed that non-revenue water in Siaya County was 53%.

Another indicator in this section that was investigated was the attendance of M&E meetings organized by water management committee members. It was established that 4 (2.9%) of the respondents responded as not at all agreeing with this statement and 33 (23.5%) of them were in agreement to a little extent. Still, on the same statement, 26 (18.6%) of the respondent supported the statement to a moderate extent. The findings further show that 65 (46.1%) and 12 (8.8%) of the respondents were in agreement to a great extent and a very great extent respectively that their attendance of M&E meetings organized by water management committee members influenced the sustainability of rural piped water projects. The mean rating for this item was 3.34 a value that is below the mean of means of 3.70 implying no influence on the sustainability of rural piped water supply projects. The high standard deviation indicated high disparity meaning respondents were indifferent to attendance of meetings as an influencer to the sustainability of water project supply projects.

The fifth item under investigation in this category as shown in table 4.9 established that 49 (35.3%) of the surveyed concurred to a great extent that their participation in evaluating the O&M process influenced the sustainability of rural piped water supply projects. This was followed by those respondents who concurred to a little extent at 40 (28.4%), then by those whose responses were moderate extent at 33 (23.5%). Whereas 14 (9.8%) of the interviewed rated this aspect to a very great extent while the rest at 4 (2.9%) were not at all in agreement when asked the same question. This item scored a mean of 3.21 which is below the composite of 3.70 indicating no influence on the sustainability of rural piped water supply projects. The standard deviation of the item responses was 1.056 which is high, again showing the high disparity of responses across the 5-point scale. The high disparity of responses showed that respondents were indifferent to the aspect of participation in evaluating the O&M process and how it impacts project sustainability.

The last item was the use of M&E information for corrective action and improvement. Outcomes show that no respondent disagreed with this statement responding not at all. Those who responded as little extent were 15 (10.8%) while 14 (9.8%) of these respondents agreed to a moderate extent in support of the same statement. The majority of the respondent who are 66 (47.1%) and 45 (32.4%) agreed in a great extent and a very great extent respectively that use of M&E information for corrective action and improvement influence piped water sustainability. Results indicate a mean of 4.01 which is above the composite mean of 3.70 implying that this item had an influence on the sustainability of rural piped water supply projects. The study results regarding this item echoes findings in a study done in Kisumu by Miseda (2014) that indicated that community participation in M&E through getting involved in information sharing, utilization of the same and evaluation of project influenced to a great extent sustainability of the Njaa Maruku project.

All the statements in this category produced a mean value of 3.70 implying agreement with the statements to a great extent that they influence project sustainability. All the six items under this category were confirmed by the key informants interviewed and gave feedback concerning M&E of water supply which was summed up as follows:

> *"The community always meet twice or three times a month to evaluate the O&M process. The evaluation was done in terms of finances such as the collected*

revenue. Also, the community reported illegal connections and thefts, in addition to reporting water pipes that had bursts and leaks. This prevented water wastages and contamination when reported on time. Resultantly, contributing to the sustainability of the water projects"

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter contains a summary of findings as outlined in chapter four in regard to the three objectives used in the study. Conclusion of the research findings and recommendations are also presented in addition to areas for further studies.

5.2 Summary of the Findings

The questionnaire with a set of Likert scale questions was administered to water users in Mbaga zone which predominantly is a rural area. Target respondents in the study were active piped water users who also happen to be the household heads, meaning they are the decision-makers in the household. In addition, key informants' feedbacks was triangulated into the study findings.

5.2.1 Sustainability of Rural Piped Water Supply Projects

Statements related to this variable were asked so that respondents would rate their levels of consent. The first item under sustainability was the ability to pay for water charges when due, the result indicates that this statement was rated 3.89 which indicates that respondents were able to pay for water charges. The second item in the scale was increase in households in the last five years having connection to piped water. The mean for this statement according to the findings were 3.97 again an indication that respondents were in agreement. When asked about having a continuous flow of water in their taps, respondents disagreed with this statement while rating it. The mean was 2.37 for the statement. The last indicator of sustainability was regarding the aspect of clean water provision. The results indicated that the mean was 4.00 which indicates an agreement that water flowing in taps was clean. Generally, all the statements in this category which were indicators of sustainability had a combined mean of 3.56 which is interpreted to mean that respondents were in agreement that they are related to the aspect of sustainability of rural piped water supply projects. Thus it is essential to strengthen performance of project so as to achieve its sustainability.

5.2.2 Community Participation in Project Planning and Sustainability of Rural Piped Water Supply Projects

The study established that community participation in project planning influenced to great extent sustainability of rural piped water supply projects. Outcomes from the study showed a composite mean value of 4.15 which implied influence to a great extent. The items investigated in this section were: involvement in the process of land identification for the construction of water facilities (mean=4.05) which is below the composite mean of 4.15 suggesting no influence on water project sustainability; involvement in decision-making on land acquisition for construction of water facilities (mean=4.10) which is below the composite mean of 4.15 indicating that there was no influence on the project sustainability; involvement in determining the type of labor required from the community (mean=4.17) which is above the composite mean of 4.15 suggesting that the item had an influence on sustainability; participation in labor contributions (mean=4.20) which is above the composite mean of 4.15 indicating it had influence on sustainability; involvement in determining the amount of money the community is required to contribute (mean=4.21) which is above the composite mean of 4.15 implying that the item influenced sustainability of rural piped water supply projects and the last item under study in this category was participation in monetary contributions (mean=4.17) which also had an influence on sustainability. The composite mean of 4.15 for this section suggests that there was a great extent of influence on the sustainability of rural piped water supply projects by community participation in project planning. This is interpreted to mean that a community's needs and demands, as well as local knowledge, be taken into consideration in the project planning phase as this positively influences the sustainability of the projects.

5.2.3 Community Participation in Project Implementation and Sustainability of Rural Piped Water Supply Projects

The study determined that community participation in project implementation influenced to a great extent the sustainability of rural piped water supply projects in Alego Sub-County. This is interpreted from the composite mean which had a value of 4.06. Respondents' participation in the election of water committee members and participation in championing for women inclusion in management positions influenced the sustainability of rural piped water to great extent with findings showing means of 4.10 and 4.11 respectively. These means were above the composite mean of 4.06 suggesting that the statements influenced project sustainability. However, when

respondents were asked separately their perception of the number of women who they believed were involved in water management positions, most of the respondents said the number was lower compared to that of men (mean=4.12). Other indicators in this section were respondents' participation in sharing O&M costs with other water users as well as their attendance of training on how to maintain the water system in case of leakages, breakages or repairs at home. For these indicators study revealed a mean of 4.01 and 4.03 respectively, lower than the composite mean of 4.06 indicating that the items had no influence on the project sustainability. The overall mean for all the items in this category was 4.06 which is interpreted in the 5-point Likert scale as having a great extent of influence on the sustainability of rural piped water supply projects. This suggests community participation in project implementation could be realized with improvement in execution of project activities, training of staff for managerial skills as well as repairs. Again, to realize sustainability there is a need for women to be included in management decision making, having in mind that women are the primary users of water at home.

5.2.4 Community Participation in Monitoring and Evaluation and Sustainability of Rural Piped Water Supply Projects

The study examined that community participation in M&E influenced to great extent project sustainability. The composite mean value was 3.70 which is interpreted to mean consent to a great extent. The items under study in this section were: community involvement in scrutiny of performance reports which had a mean of 3.44 which is below the composite mean of 3.70 suggesting no influence on sustainability of rural piped water supply projects; community participation in monitoring of water supply system had a mean of 4.08 which is above the composite mean of 3.70 indicating that the item had influence on project sustainability; community being involved in reporting leakages and vandalism to project coordinators had a mean of 4.10 which is above the mean of means of 3.70 suggesting the item had influence on project sustainability; the item on attendance of M&E meetings organized by water management committee members had a mean of 3.34 a value below the composite mean of 3.70 suggesting no influence on sustainability; community participation in evaluating the O&M process with a mean of 3.21 which is below the composite mean of 3.70 implying no influence on project sustainability; the last item under study in this category was community use of M&E information for corrective action and improvement which had a mean of 4.01 a value that is above the composite mean of 3.70 implying that the item had an influence on project sustainability. Study

results show that for sustainable water supply to be attained, consumers and the community ought to take an active role in monitoring the water systems such as reporting to project coordinators in instances of water leakages or distribution pipe breakages. Besides, attending project meetings where the community members get a chance to scrutinize reports on the performance of the water supply project. The scrutiny helps in improvement and making corrective plans to the water supply systems, equally contributing to sustainability endeavors.

5.3 Conclusion

The study found that community participation in project planning, community participation in project implementation and community participation in M&E all influenced sustainability of rural piped water supply projects to great extent. These study findings confirm those found by Olukotun (2008) and Mansuri and Rao (2013) who acknowledged that community participation leads to greater resource sustainability. The study findings revealed that community participation in project planning had the greatest influence while community participation in M&E had the least influence. For the community to participate in M&E they need to have participated in the project's implementation phase. Similarly, to participate in project implementation the community needs to have participated in the planning phase of the project. This explains why community participation in project planning is having the greatest influence as it allows the community to identify their unique needs in the process of project scheduling. Furthermore, it strengthens the community's knowledge and ownership of the project more so during the implementation of the project. The study concluded that the sustainability of rural piped water supply improves with community participation in the project life cycle. Hence to achieve sustainable development there is a need for inclusivity and participation of local stakeholders in the particular projects.

5.4 Recommendations of the Study

Taking into consideration the study findings and conclusion drawn, recommendations are made below such that enhancement to community development projects could achieve sustainability. The following study recommendations were made:

1. Governments and water service providers need to invest more resources and ensure that water is available and accessible to consumers. This should be in line with SDG goal 6 which recommends that by 2030 member countries of the United Nations, of which

Kenya is a member, need to have ensured availability and sustainable management of water for all. This recommendation has been considered basing on the finding of inconsistency flow of water to consumers.

2. Water users need to improve the mechanisms of sharing O&M costs with the other users in the community. Cost-sharing eases the O&M cost burden that would have otherwise be shouldered by few individuals, that way improving on the O&M of the water projects in case of a breakdown, this would, eventually enhance sustainable project development.
3. Water users and the community to attend M&E meetings organized by water management committee members. This is because findings indicate that the respondents agreed to attend M&E meetings only to a moderate extent. Attending these meetings would help the community have full knowledge of the operations of the company as well as having their concerns addressed by the management through such interactions. On the same, the community would have the chance to scrutinize performance reports of the water projects, again enhancing their participatory evaluation of the concerned project.
4. Local management at the local level needs to be strengthened. The study findings from key informants revealed that managers took advantage of the less educated community members, to further the interests of these local managers. In addition, strengthening of the local management would ensure prompt feedback in case where pipe leaks and bursts are reported. Results from key informants had indicated that many times, it took longer to repair these pipes. Improvement in time taken to make these repairs would eventually result in improvement in service delivery which would positively impact project sustainability.

5.5 Suggestion for Further Studies

Findings from the study suggested that community participation in M&E was of least influence compared to community participation in project planning and project implementation in the sustainability of rural piped water supply projects. The study thus suggests that more studies should be carried on community participation in M&E to explain this phenomenon.

Results from the key informants indicated that there were huge power/energy bills incurred by the water service providers. In order to understand whether technological choice such electric pumps or gravitational force could address the problem of high energy incurred during the

distribution of piped water to consumers, the study recommended that a research activity should be carried out on the impact of technology choice on sustainability of piped water supply in Siaya County.

Based on the study findings, it was recommended that more research need to be done to find out whether demographic factors such as levels of education influence the extent of participation in development projects, more so in rural areas.

Finally, the study recommended that more research needs to be done on water sector regulation to establish its influence on the sustainability of rural water supply projects. This would contribute to having more knowledge on the subject as well as understanding what role government policies and regulation play in the sustainability efforts of development projects.

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APPENDICES

Appendix I: Letter of Transmittal

Justus Omondi Oduor,
Postgraduate student,
University of Nairobi

Mobile phone: 0712115777

Dear Respondent,

RE: DATA COLLECTION

I am a student at the University of Nairobi pursuing Master of Arts in Project Planning and Management.

As a requirement for my Master of Arts in Project Planning and Management course, I am expected to carry out a research study on the *Influence of Community Participation in Project Life Cycle Management on Sustainability of Rural Piped Water Supply Projects in Alego Sub-County, Siaya County*.

The research will entail data collection from water users, and water management committee members. The area of coverage is Mbaga Zone in Alego Sub-County. The information obtained from respondents will be kept anonymous and confidential, and only to be used for scholastic reasons.

Your cooperation is highly valued.

Thank you.

Justus Omondi Oduor
L50/88722/2016

Appendix II: Household Questionnaire

Dear Respondent,

I am a student at the University of Nairobi pursuing Master of Arts in Project Planning and Management. Please spare your time for an interview to help provide answers to the questions in the questionnaire, based on your experience with piped water usage in Alego Sub-County. This research seeks to assess the Influence of Community Participation in Project Life Cycle Management on Sustainability of Rural Piped Water Supply Projects in Alego Sub-County, Siaya County. The information you share will be kept anonymous and confidential, and only to be used for academic reasons. Section A will require your demographic data while the rest of the Sections concern the research topic. Thank you in advance.

Zone Area: _____ Village: _____

Section A: Demographic Information.

1. Gender {*Tick as appropriate*}

Male	
Female	

2. Please clarify your age bracket {*Tick as appropriate*}

20 – 30	
31 – 40	
41 – 50	
Above 50	

3. What is your highest level of education? {*Tick as appropriate*}

No formal education	
Primary	
Secondary	
Tertiary	

Section B: Community Participation in Project Planning

4. This section contains statements which relate to community participation in project planning. To what extent do you agree with the below statements that they influence the sustainability of rural piped water supply projects?

S/No.	Statements	(1)Not at all	(2)Little extent	(3)Moderate extent	(4)Great Extent	(5)Very great extent
4_1	I am involved in the process of land identification for the construction of water facilities					
4_2	I am involved in decision-making on land acquisition for construction of water facilities					
4_3	I am involved in determining the type of labor required from the community					
4_4	I participate in labor contributions					
4_5	I am involved in determining the amount of money the community is required to contribute					
4_6	I participate in monetary contributions					

Section C: Community Participation in Project Implementation

5. This section contains statements which relate to community participation in project implementation. To what extent do you agree with the below statements that they influence the sustainability of rural piped water supply projects?

S/No.	Statements	(1)Not at all	(2)Little extent	(3)Moderate extent	(4)Great extent	(5)Very great extent
5_1	I participate in the election of water committee members					
5_2	I participate in championing for women inclusion in management positions					
5_3	I participate in sharing O&M costs with other water users					
5_4	I attend training on how to maintain the water system in case of leakages, breakages or repairs at home					

6. What is the number of women, compared to men, who are in management roles?

Much higher [ ]
Higher [ ]
About the same [ ]
Lower [ ]
Much lower [ ]

Section D: Community Participation in Monitoring and Evaluation

7. This section contains statements which relate to community participation in M&E. To what extent do you agree with the below statements that they influence the sustainability of rural piped water supply projects?

S/No.	Statements	(1)Not at all	(2)Little extent	(3)Moderate extent	(4)Great extent	(5)Very great extent
7_1	I am involved in scrutiny of performance reports					
7_2	I participate in the monitoring of water supply system					
7_3	I am involved in reporting leakages and vandalism to project coordinators					
7_4	I attend M&E meetings organized by water management committee members					
7_5	I participate in evaluating the O&M process					
7_6	I use M&E information for corrective action and improvement					

Section E: Sustainability of rural piped water supply projects

8. This section contains items on the Sustainability of rural piped water supply.

Using a 5-point scale (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree). To what extent do you agree with the following statements?

S/No.	Statements	1 (SD)	2 (D)	3 (N)	4 (A)	5 (SA)
8_1	I am able to pay for water charges when due					
8_2	Number of households connected to piped water has increased in the last 5 years					
8_3	We have a continuous flow of water in our taps					
8_4	The piped water supplied is clean					

Your assistance is highly valued

Appendix III: Interview Guide for Key Informants

This guide has been developed to collect data on the influence of community participation in project life cycle management on the sustainability of rural piped water supply projects.

1. In the process of project planning, how is the local community involved in land identification and acquisition?
2. Does the type of contributions (i.e. labor, monetary), to be contributed by the local community affect the project schedule? *Explain your answer*
3. What are the benefits of involving the community members in:
    a. Project Planning
    b. Project Implementation
    c. Project M&E
4. How is the local water management committee members selected? Are the local community members involved? If **Yes**, to what extent

5. What are the benefits of having women in water management committee positions?

6. In what way does the community participate in monitoring water supply projects?

7. How does the community participate in evaluating the operation and maintenance (O&M) process of piped water supply projects?

8. Do water users in the rural areas afford the rate of water charged (water bill)? Clarify your answer.

9. Kindly suggest improvements that need to be made to the rural piped water supply to ensure the project is sustainable

Thank you for your kind cooperation

Appendix IV: Research Permit

THIS IS TO CERTIFY THAT:
MR. JUSTUS OMONDI ODUOR
of UNIVERSITY OF NAIROBI, 1119-40600
SIAYA,has been permitted to conduct
research in *Siaya County*

Permit No : NACOSTI/P/19/74502/29883
Date Of Issue : 28th May,2019
Fee Recieved :Ksh 1000

on the topic: *INFLUENCE OF COMMUNITY PARTICIPATION ON SUSTAINABILITY OF RURAL PIPED WATER SUPPLY PROJECTS: A CASE OF ALEGO SUB-COUNTY, SIAYA COUNTY, KENYA*

for the period ending:
27th May,2020

.....
Applicant's Signature

.....
Director General
National Commission for Science, Technology & Innovation

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014.

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Appendix V: Plagiarism Report

INFLUENCE OF COMMUNITY PARTICIPATION IN PROJECT LIFE CYCLE MANAGEMENT ON SUSTAINABILITY OF RURAL PIPED WATER SUPPLY PROJECTS: A CASE OF ALEGO SUB-COUNTY, SIAYA COUNTY, KENYA

ORIGINALITY REPORT

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SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

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