STAKEHOLDER INVOLVEMENT IN THE OPERATION AND MAINTENANCE OF RURAL WATER SUPPLY SYSTEMS IN SALIMA DISTRICT, MALAWI

MSc (WATER RESOURCES MANAGEMENT AND DEVELOPMENT)

THESIS

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MZUZU UNIVERSITY, MALAWI

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A THESIS SUBMITTED TO THE FACULTY OF ENVIRONMENTAL SCIENCES, DEPARTMENT OF WATER AND SANITATION IN FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTER OF SCIENCE DEGREE IN WATER RESOURCES MANAGEMENT AND DEVELOPMENT

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DECLARATION

I Charity Mithi hereby declare that this thesis titled "*Stakeholder Involvement in the Operation and Maintenance of Rural Water Supply, Salima District*" has been written by me and is a record of my research work. All citations, references, and borrowed ideas have been duly acknowledged. This thesis is being submitted in fulfilment of the requirements for the award of the Degree of Master of Science (MSc) in Water Resources Management and Development at Mzuzu University. None of the present work has been submitted previously for any degree or examination at any other University.

Name of Candidate: CHARITY MITHI

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CERTIFICATE OF COMPLETION

The undersigned certify that this thesis is a result of the author's work and that to the best of our knowledge, it has not been submitted for any other academic qualification within the Mzuzu University or elsewhere. The thesis is acceptable in form and content, and that satisfactory knowledge of the field covered by the thesis was demonstrated by the candidate through an oral examination held on: _____.

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ABSTRACT

A stakeholder analysis was conducted to examine the role of stakeholders' involvement in the operation and maintenance (O&M) of boreholes at traditional authority Ndindi in Salima district. Data was collected using a household survey questionnaire, stakeholder interview questionnaire, focus group discussions with water point committees and community leaders, key informants interviews, document review and observation. Data analysis was conducted using content analysis, thematic analysis, and descriptive analysis. The findings demonstrated that the majority of the community members were not involved in decision-making during borehole initiation, choosing water supply technology, deciding alternative borehole locations and setting up a maintenance fund. Stakeholder analysis indicated that the majority of stakeholders (55%, n =11) levels of interest and influence were different. In addition, the level of involvement for most of the stakeholders (6, n =11) was co-working, meaning they can participate and actively get involved in the O&M of boreholes. Furthermore, out of the six key stakeholders in O&M of boreholes, the district council had a big role to play in O&M of boreholes which included WPCs training, coordination, conducting maintenance, spare parts supply chain, borehole monitoring and financing O&M. However, it was established that the district council do not fully perform their roles on the ground just like other key stakeholders. Additionally, the study demonstrated that borehole functionality was high where the level of stakeholders' involvement in the O&M of the borehole was also high. Overall, it was concluded that stakeholder involvement in borehole O&M is weak. To ensure effective stakeholder collaboration and functionality of the boreholes, there is a need to strengthen the involvement of stakeholders in O&M by fully involving communities in decision-making and managing stakeholders' interests and influence. Furthermore, there is a need to develop a functional O&M Framework that clearly defines stakeholders' roles.

DEDICATION

This work is dedicated to my father Mr B.E Mithi whose support and encouragement made me complete this work. The study is further dedicated to my husband Gift Kalichero and my daughter Sasha Kalichero who inspired me to work even harder.

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ACRONYMS AND ABBREVIATIONS

ADC	Area Development Committee
BASEDA	Basic Services Developing Agency
CBM	Community Based Management
CDAs	Community Development Assistants
CSOs	Civil Society Organisations
DCDO	District Community Development Officer
DCT	District Coordination Team
DEC	District Executive Committee
DWDO	District Water Development Officer
DWST	District Water Sanitation Team
FGDs	Focus Group Discussions
HSAs	Health Surveillance Assistants
ICTs	Information and Communication Technologies
INGO	International Non -Governmental Organization
IWRM	Integrated Water Resources Management
KII	Key Informant Interview
MARDEF	Malawi Rural Development Fund

MDGS	Malawi Growth Development Strategy
MoU	Memorandum of Understanding
MoWS	Ministry of Water and Sanitation
MWC&RD	Ministry of Water Cooperatives and Rural Development
NCST	National Council for Science and Technology
NGOs	Non-Governmental Organisations
NPC	National Planning Committee
NSO	National Statistical Office
O&M	Operation and Maintenance
SDGs	Sustainable Development Goals
SPSS	Statistical Package for Social Science
UN	United Nation
UNICEF	United Nations International Children Emergency Fund
VDC	Village Development Committee
WASH	Water, Sanitation and hygiene
WHO	World Health Organisation
WMAs	Water Monitoring Assistants
WPCs	Water Point Committees

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CHAPTER 1: INTRODUCTION

This chapter presents the background of the study, problem statement, and outline of research objectives and research questions. Lastly, this section also explains the significance of this study.

1.1 Background of the Study

Improved water supply and better management of water resources can boost countries' economic growth and contribute greatly to poverty reduction (WHO, 2019). Globally, significant progress has been made in improving access to safe drinking water around the world. Reports indicate that in 2017, about 5.3 billion people were using safely managed drinking water sources but 2.2 billion people worldwide lacked access to safe drinking water (UNICEF & WHO, 2019). In 2020, the coverage of safely managed drinking water services remained lower in rural areas (60%) than in urban areas (86%) (WHO & UNICEF, 2021). In addition, 8 out of 10 people who continue to lack basic drinking water services live in rural areas (WHO & UNICEF, 2021).

It is estimated that about 829,000 people die each year from diarrhoea because of a lack of access to safe water for drinking, hygiene, and sanitation purposes (WHO, 2019). With the adoption of the Sustainable Development Goals (SDGs), which calls for universal and equitable access to safe and affordable drinking water (United Nations, 2018), countries have committed to reducing inequalities in access to safe drinking water and providing high levels of water services in terms of quality, accessibility, and reliability by 2030. Achieving universal access to safe and affordable drinking water by 2030 offers a huge challenge for all countries, not only those in developing countries but also developed countries. For instance, from 2000 to 2015, only one in five countries was on track to achieve universal access to basic water services by 2030 (United Nations, 2018).

To achieve the Sustainable Development Goal (SDG) 6, Malawi is focusing on the construction of boreholes which is the most widely recognised community-based management pump in Sub-Saharan Africa. Coverage of improved water supply sources is at 86% in rural areas of Malawi (NSO, 2017). While the coverage of water supply has increased, the reliability of boreholes remains a challenge due to their non-functionality. One of the reasons for the high rate of non-functionality and partial functionality of boreholes is poor operation and maintenance (O&M) of water supply facilities (Chisenga 2014; Kalin *et al.,* 2019; Truslove *et al.,* 2020). Borehole operation is the day-to-day use of a water facility to deliver clean water according to design (MWC&RD, 2015). Maintenance includes technical activities planned to keep the system in appropriate working condition when the level of work needed to make the system function is within the capacity of the community (WaterAid, 2010).

Malawi Government introduced decentralization approach as a country's plan to achieve its development goals. District Councils have the legal mandate to spearhead rural development, which includes the provision of drinking water (Malawi Government, 2005). In addition, District Council coordinate all development activities, ensuring an equitable service provision of water supply and making sure that existing boreholes remain functional (Soubriere & Cloutier, 2015). However, the District Councils fail to improve the functionality of boreholes because of a lack of human resources, minimal financial capacity, and a lack of a dedicated budget for O&M (Oates & Mwathunga, 2018). Currently, communities are empowered to carry out O&M of their boreholes under Village Water Committees. Nevertheless, the challenges of community-based maintenance still exist (Chowns, 2015)

To improve the livelihoods of people, Malawi launched Vision 2063 and Malawi Growth Development Strategy three (MGDS III). The provision of safely managed water is one of the interventions outlined in Vision 2063 and MGD III. The MDGS III promotes community-based management of rural water supply and institutionalisation of O&M framework at all levels to support community-based O&M of boreholes which requires the involvement of different stakeholders (Malawi Government, 2017). In addition, Vision 2063 aims at ensuring the provision of clean water services at the household and community levels (National Planning Committee, 2020). The Government is assigned to take the lead and bring together stakeholders and communities in promoting the adoption of safe water. This is in line with the Dublin Principle on water and environment number two, which states that water development and management should be based on a participatory approach, involving users, planners, and policymakers at all levels (Nazmul & Jean, 2012, p,175).

A stakeholder is an individual, group, or organization who may affect or be affected directly or indirectly by a decision, activity, or outcome of a project (Freeman & Verzuh, 2005). Stakeholder involvement is defined as a process where individuals, groups, and organisations choose to take an active role in making decisions that affect them (Hauck *et al.,* 2016). Stakeholder involvement is vital in achieving environmental goals more efficiently and effectively while coping with or resolving conflicts, building trust, and learning among stakeholders who are more likely to influence policy goals and implement decisions in the long term (Reed, 2008). On the other hand, the benefit of Stakeholder Involvement is claimed not to be realised (Savage *et al.,* 2010). This is because stakeholders have different values, knowledge, strategies, access to resources, roles, influence, and `interests which in turn affect the exercise of power among themselves resulting in unequal power relations, thereby affecting the provision of services (Wang *et al.*, 2013).

Power relations are strategies for interaction, communication, and use of resources (Howarth, 2010). Unequal power relations among stakeholders provide a risk for effective implementation and involvement in O&M because some stakeholders may not be able to fully participate in decision-making. In addition, some stakeholders may be unable to influence or play their roles and get the benefits of water development programs. For example, different power relations among key stakeholders have led to a centralised approach instead of the decentralised approach of water service provision leading to unreliable quantity and quality of water supply (Adams & Zulu, 2015).

Salima is one of the districts with well-established O&M strategies. For instance, in addition to training water points committees to conduct O&M, the concept of Area mechanics has been established and is implemented to improve the functionality of boreholes through O&M (Inter Aide, 2015). However, there is limited data on the role of stakeholder engagement in O&M (W Chungwa (District Council), 20 January 2019). This study was conducted in the Salima district to examine the role of stakeholder involvement in O&M by analysing community involvement in decision-making and analysing stakeholders' level of influence, interest, level of involvement, and roles of key stakeholders.

1.2 Problem Statement

Concerns have been raised regarding the functionality of boreholes in the rural water supply. For instance, the Performance Expenditure Review Report of the Water Sanitation and Hygiene (WASH) Sector in Malawi, highlights that nationally, water point functionality fell from 77% to 71% between 2016/17 and 2017/18 (UNICEF, 2020). Furthermore, according to rural water point functionality survey results conducted in 55,000 boreholes across the country, 21.6% are partially functional, 22.3% are non-functional and 3.2% have been abandoned (Kalin *et al.,* 2019).

Poor operation and maintenance of boreholes are one of the major causes of functionality issues (Chisenga, 2014). Currently, efforts to improve the functionality of boreholes in rural areas are centered on stakeholder involvement in O&M (Malawi Government, 2017). While studies have been conducted on the factors that affect borehole O&M in rural areas of Malawi (Chowns, 2015; Chowns, 2014; Chisenga, 2014), the role of stakeholder involvement in O&M is not extensively explored. With the absence of data on the role of stakeholders' involvement in O&M, it is difficult to engage and manage stakeholders effectively. Furthermore, the absence of data on stakeholders' involvement in O&M of boreholes has led to inadequate operationalisation and failure to develop the National Operation and Maintenance Framework for Rural Water Supply. This will lead to an increase in the non-functionality of boreholes which will in turn result in failure to meet the Sustainable Development Goals number 6 by 2030 and Vision 63 by 2063. Hence the focus of the study.

1.3 Research Objectives

1.3.1 Main Objective

The main objective of this research was to examine the role of stakeholders' involvement in O&M of boreholes in traditional authority Ndindi of Salima district.

1.3.2 Specific Objective

To achieve this objective the study developed the following specific objectives.

(a) To assess the extent of community involvement in the decision-making regarding boreholes projects in traditional authority Ndindi of Salima district.

(b) To analyse the level of interest, influence, and involvement of stakeholders in boreholes O&M in traditional authority Ndindi of Salima district.

(c) To evaluate the role of key stakeholders in the operation and maintenance of rural water supply in traditional authority Ndindi of Salima district.

1.3.3 Research Questions

(a) Do communities get involved in decision-making regarding borehole projects in their communities?

(b) Do stakeholders have the same level of interest and influence in the provision and O&M services of rural water supply?

(c) Do key stakeholders play a role in the O&M of boreholes in the rural areas of the Salima district?

1.4 Significance of the Study

The study established that community involvement in decision-making is inadequate. District Council together with other WASH partners will use this information to encourage and institutionalise community participation in the decision-making of water development projects. This will in turn instil a sense of ownership, transparency, and accountability as well as the sustainability of boreholes. The study established key stakeholders and their level of involvement in the O&M of boreholes. This will help WASH practitioners to develop a stakeholder engagement plan that will ensure effective and efficient utilization of both human and financial resources in O&M.

The study further analysed the role of key stakeholders in O&M. Study findings showed that the defined stakeholder's roles in O&M on paper do not translate to what is happening on the ground.

Together with other WASH partners, the District Council will use this evidence to redefine the roles of different stakeholders and devise means of addressing factors that limit stakeholders' involvement in O&M for the effective performance of stakeholders' roles. This can be done either through the review of the policy documents or other training manuals. In addition, the study established the roles of key stakeholders in O&M activities. The findings will help The Ministry of Water and Sanitation and other WASH partners to develop an O&M framework.

1.5 Study Limitations

Only 24 focus group discussions with 17 WPC and 7 community leaders were conducted out of 227 boreholes in the study area because of budget constraints. To avoid generalization of the findings, the researcher clustered all borehole committees which were homogenous and out of the clusters 17 water point committees were selected. While community leaders were representatives from different boreholes. Furthermore, stakeholder analysis to determine the level of stakeholder interest, influence, and level of involvement was done using an interview questionnaire that was distributed to the sampled stakeholders because of Covid 19 face to face interaction were restricted. As such it was not possible to probe for more information and ask for clarity which could have affected the generalisation of the finding. However, the questionnaire was framed in a way that it had proper instructions on how to rate stakeholders and there was a provision of space for writing down comments and the reasons behind different options and perspectives. Furthermore, as noted by O'Haire (2011) a questionnaire enabled stakeholders to share their views without concern for the reaction of others. In addition, more stakeholders were recruited from a range of different professions in WASH.

1.6 Thesis Outline

This study was divided into six chapters. Chapter one explains the background of the study, problem statement, research objectives as well as research questions. The chapter further explains the significance of the study and its limitations. Chapter two provides a review of both theoretical and a review of related literature on community involvement in decision making, stakeholders' level of interest, influence, involvement, and stakeholder roles in the water supply sector. It also presents the conceptual framework of the study. Chapter three describes the methodology used to carry out the study. While chapter four presents the findings of the study, chapter five discusses the study findings. Finally, chapter six presents the conclusions and recommendations of the study.

1.7 Summary of the Introduction Chapter

The first chapter of this thesis opens with the background of the study and further described the stakeholder involvement in the O&M of rural water supply. The research problem investigated was that there was no data on the role of stakeholders' involvement in O&M. The main objective of this research was to examine the role of stakeholders' involvement in O&M of boreholes in traditional authority Ndindi of Salima district. The significance of the study is that the results are useful in planning, implementing, and monitoring O&M activities as well as improving stakeholder engagement. The study limitations were the small sample size of WPCs and community leaders for focus group discussion due to budget constraints and the distribution of an interview questionnaire to the sampled stakeholders as such it was impossible to probe for more information. Details of the literature reviewed and the theoretical framework that informed the study will be discussed in the next chapter.

CHAPTER 2: LITERATURE REVIEW

2.1 Theoretical Framework

This section presents the theoretical framework that informed the study. Community involvement in decision-making, stakeholder involvement, and stakeholder analysis were the key concepts that formed the backbone of this study.

2.1.1 Community Involvement in Decision Making

Decision-making is an important area of research in mental psychology. Understanding the process by which individuals or groups make decisions is important to have an insight into the decisions they make. According to Russo and Schoemaker (2016), decision-making is the process whereby an individual, group, or organization reaches conclusions about what future actions to pursue given a set of objectives and limits on the available resources. The decision-making process contains four main phases: framing, intelligence-gathering, choice, and learning from feedback (Russo, 2014). There are several factors that influence decision-making. These factors are past experiences, reasoning biases, age, individual differences, belief in personal relevance, and an increase in commitment (Julliusson *et al.,* 2005).

The involvement of the community in decision-making is considered an essential characteristic of democracy and decentralisation (Kamberi & Bariqi, 2018). Furthermore, the involvement of the community to be part of the decision-making process is crucial for water supply sustainability (Braimah *et al*.2016). This is because the community members are the beneficiaries of development plans and projects. Therefore, it is then important to take their views, choices, needs, and feelings into consideration to achieve sustainability (Mansuri & Rao, 2004).

Community involvement in the decision-making process is characterised by the participation of community members in project design, project installation, management, control over major project decisions, and members' control over the choice of committee members among others (Minui *et al.,* 2017). Involvement in decision-making can take several forms which include manipulative, passive involvement, involvement by consultation, involvement for material incentives, functional involvement, interactive involvement, and self-mobilization. Manipulative involvement is where involvement in decision-making is simply deceit (Clayton & Bass, 2002). In this case, community involvement on the ground does not happen.

Passive involvement is where decision-making has been done and the action has already taken place by the service authorities which include local government or service providers including Non-Governmental Organisations (NGOs) (ed. Mikkelsen, 2005). Involvement by consultation is when communities participate in decision-making regarding water supply by being consulted or by answering questions. However, external agents define problems and information-gathering processes and control the decision-making process (Clayton & Bass, 2002). This means that the views of the community are not considered.

Involvement for material incentives is where people participate in return for food, cash, or other material incentives (Clayton & Bass, 2002). Community members have no interest in continuing to participate when the incentives end. For example, community members may participate by being elected to the Water Point Committees with the interest of benefiting from the water point funds which water users contribute toward operation and maintenance, however, after noticing that being in the water point committee is pure volunteerism most community members resign.

Functional involvement is seen by external agencies to achieve project goals, especially reduced costs because communities participate in decision-making regarding water supply projects by forming groups to meet predetermined project objectives (ed. Mikkelsen, 2005; Clayton & Bass, 2002). Interactive involvement is where communities participate in joint analysis, development of action plans, and formation or strengthening of local institutions (Roodit, 2001; Clayton & Bass, 2002). Participation, in this case, is seen as an entitlement apart from a way to achieve project goals (Clayton & Bass, 2002). In self-mobilization, communities or stakeholders participate in decision-making by taking initiatives independent of external institutions (Roodit, 2001).

The concept of community involvement in decision-making suits the research question and objective number one which is to determine the extent of community involvement in decision-making regarding boreholes. Based on this theory the expected results were that communities are actively involved in decision-making during project initiation, implementation and management of the borehole. In addition, the study adopted the view that Interactive involvement was the form of community participation in decision-making. This means that communities were involved in making all decisions regarding borehole projects in all phases and that their decisions were taken on board. The concept will therefore be used as the reflection through which the result, discussion, and conclusions will be directed and obtained.

2.1.2 The Concept of Stakeholder Involvement

According to Verzuh (2005), a stakeholder is an individual, group, or organization that may affect or be affected directly or indirectly by or perceive itself to be affected by a decision, activity, or outcome of a project. Stakeholders may include project team members, donors, organization members, and beneficiaries.

Stakeholder involvement refers to the participation of interested groups in a planning or decision-making process (Hauck *et al.,* 2016). Stakeholders can be classified as primary and secondary. Primary stakeholders are the ones who have a direct and immediate impact on the decision and their participation is required to sustain the activity (Stephen & Jonathan, 2017). Secondary stakeholders are those that do not have a direct stake or face a direct impact due to decisions regarding O&M service provision (Parboteeah & Cullen, 2018).

Stakeholder involvement is a process that requires identifying, mapping, and prioritising stakeholders to determine the best strategies for effective communication while making the best use of available resources (Reed & Curzon, 2015). Most stakeholders want to participate because they have an interest in the resources. However, stakeholders need to participate because management decisions taken separately by the regulatory agency without social agreement are often difficult to implement. Stakeholders can be involved directly by being actively engaged in the decision-making processes or indirectly through their elected leaders and other representatives (Muriu, 2016).

Stakeholder involvement helps in aligning development priorities with those that reflect beneficiaries' needs and also helps in promoting dialogue between beneficiaries and their development partners. In addition, there is more informed and transparent decision-making, and conflict prevention through the development of consensus and information sharing (Vaessen & Brentführer, 2015).

2.1.3 The Concept of Stakeholder Analysis

Stakeholder analysis is a method for generating knowledge about stakeholders for understanding their behaviour, intentions, and interrelations, and assessing the influence on decision-making or implementation processes (Brugha & Varvasovszky, 2000). Stakeholder analysis is conducted by first identifying, mapping and categorising stakeholders (Reed & Curzon, 2015; Reed, 2009). Stakeholder analysis helps to plan and arrange for meaningful and appropriate involvement of stakeholders in O&M for rural water supply by understanding the group of stakeholders.

2.1.3.1 Theoretical Approaches to Stakeholder Analysis

Three different approaches are used to analyse stakeholders. These include descriptive, normative, and instrumental approaches as shown in Figure 1.

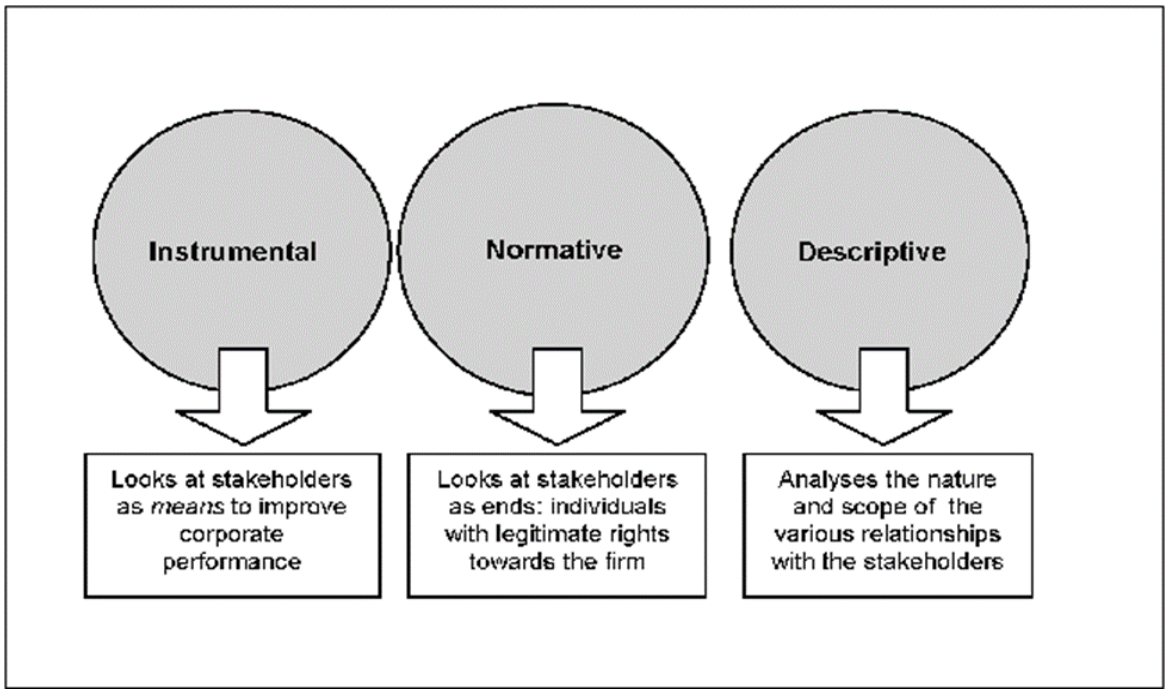


Figure 1*: Three approaches to stakeholder theory*

Source: Adapted from (Donaldson & Preston,1995)

Descriptive Approaches to Stakeholder Mapping

The descriptive approach looks at how stakeholder characteristics influence the decision-making process and focuses on describing the relationship between stakeholders and decision-makers (Reed & Curzon, 2015). This model suggests that stakeholders become significant to decision-makers according to their possession of three attributes, namely power, legitimacy, and urgency (Stanghellini, 2010). Power is the ability of individuals or groups to persuade, induce or compel others into following certain courses of action (Johnsons *et al*., 2011). Legitimacy is defined as the determination of whether stakeholder involvement is appropriate (Stanghellini, 2010). Urgency is defined as the need for immediate action (Cyder & Smith, 2008). The combination of power, legitimacy, and urgency determines the stakeholder's relative importance and level of involvement (Stanghellini, 2010; Collletinne, 2008).

Stakeholders who possess all three attributes (power, legitimacy, and urgency) are classified as definitive stakeholders with co-working as their level of involvement (Wang *et al.*, 2013). This means that stakeholders participate in and contribute actively to the O&M of boreholes. Stakeholders who possess two attributes are expectant stakeholders with co-thinking as their level of involvement (Ahn *et al*., 2019; Wang *et al.*, 2013). These stakeholders have strong interests in the outcome of the O&M of boreholes but lack an important attribute that demands priority response by management (Collentine, 2008). In addition, these stakeholders are sources of expert knowledge for the O&M of boreholes. Stakeholders with only one attribute are latent stakeholders with co-thinking as their level of involvement (Ahn *et al.*, 2019). These stakeholders do not play an active role in the process but should be kept informed about the operation and maintenance of boreholes (Wang *et al.*, 2013; Stanghellini, 2010).

In summary, the descriptive aspect of stakeholder theory considers which stakeholders will be important, at what level will they get involved, and how communities interact with these stakeholders.

Normative Approach to Stakeholder Mapping

The normative approach to stakeholder mapping is concerned with the legitimacy of stakeholder involvement and empowerment in decision-making processes (Reed & Curzon, 2015). For example, Belal (2002) proposes a 'Normative Stakeholder Accountability Model' that considers how accountable decision-makers are towards their stakeholders. The reasoning behind this approach is that if stakeholders are affected by a decision, then it means that the decision may affect the well-being of stakeholders (Berman *et al.,* 1999). In rural water supply, service providers are supposed to be accountable to the Government and beneficiary communities because the decision to invest or support O&M services have an impact on the communities and government.

Instrumental Approach to Stakeholder Mapping

The instrumental approach to stakeholder mapping focuses on understanding how organisations, projects, and policymakers can identify, explain and manage the behaviour of stakeholders and vice versa to achieve desired outcomes (Reed & Curzon, 2015). Theories in this category suggest that certain outcomes are more likely if decision-makers behave in certain ways towards stakeholders (Andriof & Waddock, 2002). For example, if the government decides not to invest in O&M of boreholes either through the provision of capacity building of WPC or rehabilitation of boreholes, the result will be an increase in the non-functionality of boreholes.

For this study, a descriptive approach to stakeholder analysis was adopted. This is because the study wanted to determine the level of stakeholder involvement in O&M of boreholes by looking at the possession of power, legitimacy, and urgency. The study assumed that all stakeholders in O&M have a high level of power, and a sense of urgency and are legit. As such in terms of the level of involvement they are "Co-working".

2.1.3.2 Stakeholder interest - Influence Matrix

The interest–influence matrix is one of the commonly used methods to categorize stakeholders according to their level of interest and influence (Figure 4). The interest–influence matrix is a method for conducting a stakeholder analysis which is usually used as a management tool in project design (Romanelli *et al.*, 2011). According to Enserink et al. (2010), interest refers to stakeholders' degree of dedication and motivation towards a project or an issue. Influence is the ability of individuals or groups to persuade, induce or compel others into following certain courses of action (Johnsonsn *et al.*, 2011).

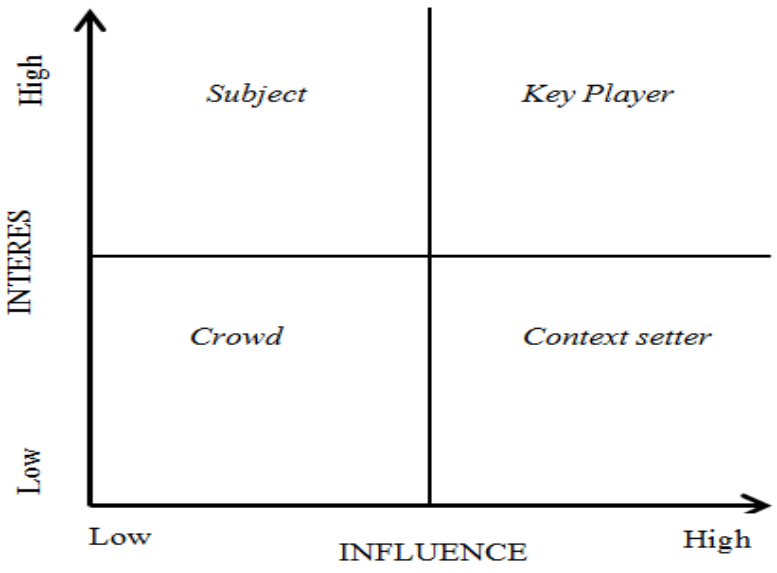


***Figure 2**: The interest and influence Matrix*

Figure 2 shows a matrix adapted from Setiawan & Muhammad (2018:3) consisting of four quadrants each denoting a stakeholder category. According to the matrix, there are four kinds of stakeholders:

a) **Stakeholders with High Interest and High Influence** - They are the most important stakeholder with a high level of interest as well as high influence as such they are referred to as " Key players/stakeholders" (Ahn *et al.,* 2019; Yang *et al.,* 2016; Wang *et al.*, 2013). These stakeholders push for change by taking the lead position and coordinating with various other stakeholders (Lin *et al.,* 2018). Therefore, key stakeholders require very close management.

b) **Stakeholders with High Interest but Low Influence** - These stakeholders need to be kept in the circle by keeping them informed because they can form a powerful partnership by influencing powerful stakeholders like key players and context setters (Wang *et al.*, 2013). Stakeholders with high interest and low influence are referred to as "the subjects" (Anh *et al.*, 2019).

c) **Stakeholders with Low Interest but High Influence** - They are an important group of stakeholders because any change in their degree of interest has a huge impact on the project at hand hence, they are called "the context setters" (Yang *et al.,* 2016; Wang *et al.*, 2013). With an increase in their interest, they can become key players. Therefore, it is necessary that these stakeholders are satisfied because these stakeholders can be helpful by sharing their resources and collaborating with other stakeholders (Lin *et al.*, 2018).

d) **Stakeholders with Low Interest and Low Influence** - They are the least important stakeholder because they possess a low level of interest and have very little power to have significant influence and are referred to them as “the crowd" (Wang *et al.*, 2013. All that is required from such stakeholders is feedback, cooperation, and some assistance when necessary (Lin *et al.*, 2018).

The power-interest matrix model perfectly fits into the research question and objective number two which is to determine the level of interest, influence, and involvement of stakeholders in O&M of boreholes. From this model, we adopt the view that the different stakeholders involved in O&M will have the same level of power and interest. The model will therefore be operationalized as the lens through which the result and conclusions will be guided and obtained.

2.2 Conceptual Framework

This subsection outlines the conceptual framework of the study, an aggregation of concepts that describes the focus of the study. Figure 3 illustrates the relationship between variables in this study.

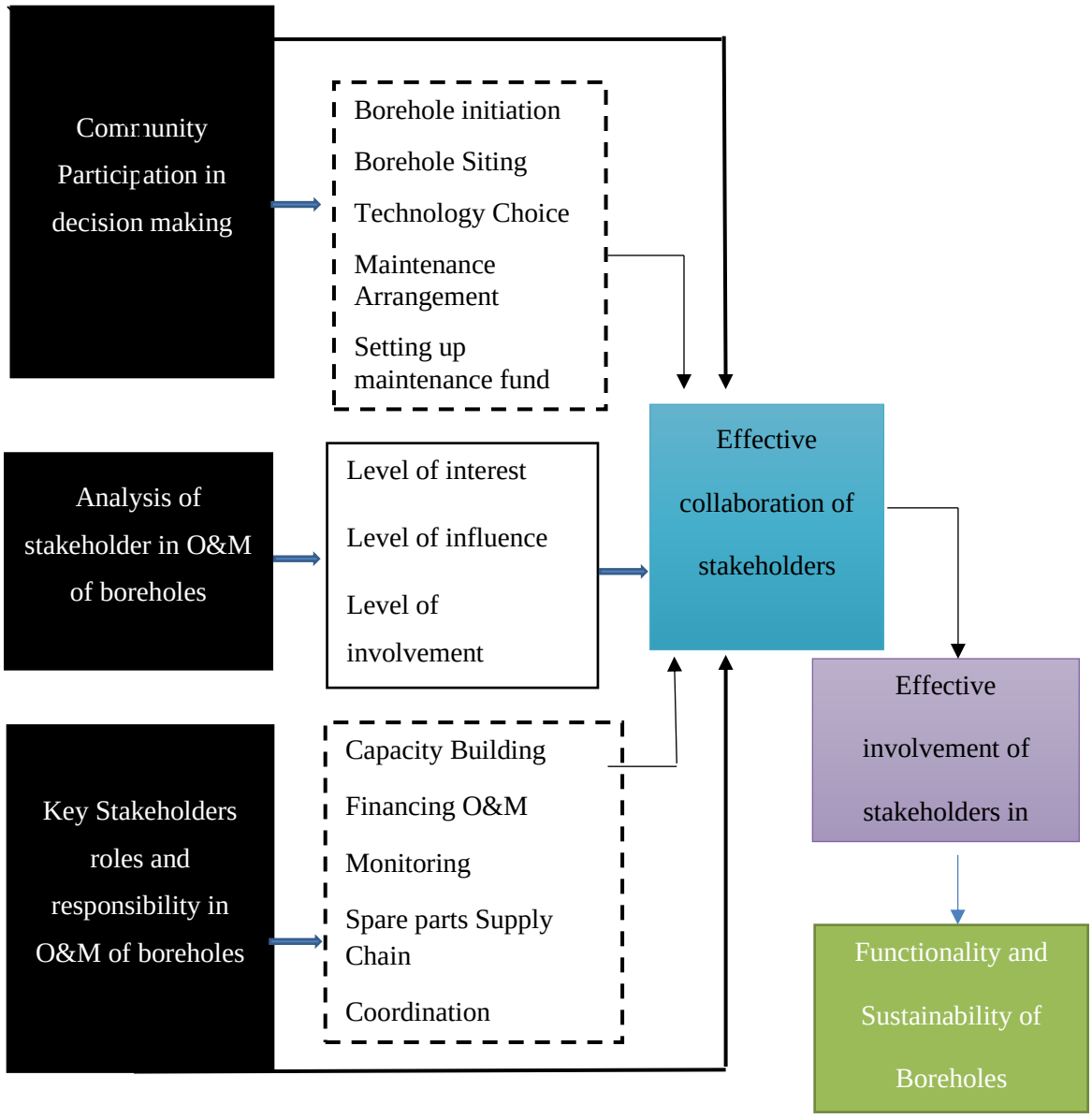


***Figure 3**: Conceptual framework*

Involvement of communities in decision-making in water supply project initiation, siting, choosing technology options, choosing borehole maintenance arrangement, setting up O&M funds and electing WPC is key for achieving effective involvement in O&M which will, in turn, lead to sustainability of water points. Community involvements create a sense of ownership and community empowerment to carry out borehole O&M on their own.

When community members feel that they are involved in the decision making they will easily and effectively collaborate with other stakeholders hence ensuring effective O&M. Determining the level of interest, influence and involvement of different stakeholders in O&M is crucial for effective collaboration of stakeholders in the O&M of boreholes. Knowing different levels of stakeholder's interest, influence, and involvement will help in conflict management and also identify which stakeholders to be actively involved in O&M. Establishing key stakeholders is not enough as there is a need to know the roles played by each key stakeholder in O&M. Understanding stakeholders' roles and challenges that hinder the effective performance of their role will help to ensure effective partnership of stakeholders in O&M. This will also help to ensure that stakeholders perform their O&M roles efficiently and effectively.

2.3 A Review of Related Literature

This chapter presents a review of literature related to the study objectives**.** The literature presented covers articles on community involvement in decision-making, and stakeholder analysis of the level of interest, influence, involvement, and roles of stakeholders in the water supply.

2.3.1 Community Participation in Decision-Making

Involving communities in decision-making regarding their water facilities is expected to be a cost-effective means of ensuring the sustainable provision of rural water supply (Braimah *et al.*, 2016). However, Kilonzo & George (2017) argues that often decisions regarding water supply are made on behalf of the communities. For example, donors decided which project to fund while the national actors decide where the project needs to be implemented because these stakeholders had more power. Stratified random, simple random sampling and purposive sampling were used for study participants. Descriptive and content analysis were used to analyse data.

The findings of Kilonzo & George (2017) collaborate with Adams & Zulu (2015) study which concluded that project providers controlled most decisions which weakened and slackened the self-reliance of the communities. For example, 91.5% of respondents indicated never being informed or invited to a meeting. Additionally, Shields et al., (2021) established that some WPCs agreed on decisions without input from community members, beyond sometimes the chief or headman.

Community involvement during project initiation is crucial for the sustainability of water projects as it creates a sense of ownership. However Various studies (Shields *et al.,* 2021; Nyakwaki & Benard, 2019; Nkenyi *et al.,* 2019; Adams & Zulu, 2015; Gambe, 2013; Mukunga, 2012) show that there was little community involvement in decision-making during this phase. For example, Shields *et al.,* (2021) analysed how the International Non-Governmental Organization (INGO) engages rural communities in their rural water projects and how community members participate in the management and governance of their water supplies. Qualitative data were collected in 18 study communities in Ghana, Kenya, and Zambia through interviews, focus group discussions, and participatory mapping with the community. Findings showed the majority of the communities were not involved during the initiation phase. However, in some cases, communities-initiated water supply projects through the writing of proposals to the INGO or the local government. This is considered a form of the demand-responsive development approach and could lead to a more effective O&M.

Shields *et al.* (2021) findings collaborate with the findings of Mukunga (2012) who adopted both qualitative and quantitative methods to determine the influence of community participation on the performance of Kiserian dam water project. The findings suggest that there was little involvement of the beneficiaries during the project initiation stage of the Kiserian dam water project in Kenya. This study concludes that communities need to be empowered to actively get involved in the

development of the projects. Multi-stage Cluster sampling and purposive sampling techniques were used to select the respondents for the study. Data collection was done using interview schedules, survey questionnaires, focus group discussions, and reference books and analysed using descriptive statistics. The methods of data collection used in this study were used in the current study.

On the contrary, Nyakwaka & Benard (2019) reported that there was high involvement of the community during the project initiation stage of the community water projects in Central Nyakach Sub-County. The study examined the determinants of sustainability of community-operated water projects in Central Nyakachi Sub-County, Kisumu County, Kenya. A descriptive cross-sectional design was employed, and participants were drawn using purposive sampling. Quantitative data were analysed using descriptive statistics while content analysis was done for qualitative data. Similar findings were reported by Tadesse *et al.,* (2013) study which confirmed that the community members participated in initiating the water project.

Furthermore, Nyakwaka & Benard (2019) established that community members had the overall influence on where water projects were to be located. But communities were not involved in decision-making regarding water supply technology. Hence the high cost of repairing the solar-powered water supply system in addition to the absence of plans for routine maintenance and lack of training on how to operate the machines negatively affected the sustainability of a majority of the water projects. As a result, 19 out of 25 water projects failed. Tadesse *et al.,* (2013) reported similar findings of limited community involvement in decision-making regarding the choice of water supply technology. This could be attributed to the fact that most water supply technologies are donor-driven.

Mbah, *et al.,* (2019) noted that most of the respondents did not participate at any stage in the development of the water system. The study was aimed at examining stakeholders' views of the sustainability of public water supply in rural areas of the Muyoka Subdivision in Cameroon. An interview questionnaire was administered to collect data from households' heads and the water point committee. R software and Microsoft Excel were used to analyze data. The drawback of this study is that only one tool was used to collect data which may have affected the validity of the results. To address the draw of Mbah *et al.,* (2019) the present study collected both primary and secondary data using various tools like FGD, document review and key informants' interviews to get wider views on community involvement in decision-making from the study participants.

Gambe (2012) and assessed the level of stakeholder involvement in water supply issues Msasa Park, Harare. Data were collected using a questionnaire and from key informants through in-depth guided interviews. Comparative and content analysis were used to analyse data. In addition, the majority of the participants (36.7%) wanted to see residents being actively involved in the water supply process from the beginning to the end. The author argues that if communities are left out, their willingness to co-operate in water issues will decrease. The author recommended that Harare Water providers should practice good governance especially involving residents and other stakeholders in water supply issues. The study used both quantitative and qualitative research approaches. Data analysis was conducted through comparative and content analysis. Similarly, Mbah *et al.,* (2019) concluded that most of the respondents did not participate at any stage in the development of the water system.

Failure to involve communities in decision-making has an impact on the successful implementation and management of water projects. Leonard, Richard & Emmanuel (2013) conducted a review on Local communities' participation in decision-making processes through planning and budgeting in African countries. The result showed despite that communities were seen to be more involved in the implementation of natural resource management programs, they lacked ownership of the projects because they were not involved in decision-making during planning and budgeting this caused a lack of commitment to the project and at times bad reactions from the communities.

Study Marks *et al.,* (2014 showed that there is a significant connection between community involvement in decision-making and the sustainability of water points. In areas where the community participated in decision-making, the functionality of water points was high as the communities were able to operate and maintain their water points. The findings of Marks *et al.,* (2014) are consistence with Mbah *et al.,* and Kilonzo & George (2017) who concludes that water systems do not function some few months after installation due to the lack of participation of users in the preliminary phases of the initiation of the water scheme.

Many factors hinder community involvement in decision-making. Kilewo & Frumence (2015) conducted a study aimed to find out factors that hinder community participation in developing and implementing the Comprehensive Council Health Plan. The study adopted qualitative research methods and data was collected using in-depth interviews. Findings showed that factors that hindered community participation included lack of awareness among members, poor communication and information sharing, unstipulated roles and responsibilities, lack of capacity management among committee members, and lack of financial resources for implementing activities. In addition to that, Gambe (2012) suggested that the reason communities were not

involved is that despite Water providers calling for community meetings, some community members may have chosen not to attend.

Kilewo & Frumence (2015) suggested that the identified challenges that hinder community involvement in decision-making call for policymakers to revise the decentralisation policy by ensuring that local governance structures have adequate resources as well as independence to participate in planning and managing and developing health facility plans. This study went ahead to establish challenges that hinder community participation.

2.3.2 Stakeholder's Interest, Influence, and Involvement

Stakeholder Involvement in water supply systems is essential for the successful management and improvement of water supply systems. However, there is no agreement on stakeholders, their interests, and levels of importance in rural water supply (Wang *et al.*, 2013). To accomplish effective stakeholder management, there is a need to understand who the major stakeholders are and their level of interest, influence, involvement, and roles in the rural water supply.

Anh *et al*. (2019) conducted a stakeholder analysis to determine the involvement of stakeholders in the urban domestic water supply system in central Vietnam. Stakeholder analysis involved three steps which include identification, classification, and defining the level of involvement of each stakeholder. Identification of stakeholders was done by reviewing secondary data and then the potential list of stakeholders was reviewed through semi-structured interviews. Classification of stakeholders was done using the influence-interest matrix and the Linkert scale. Stakeholder involvement was done using the classification of three levels of involvement of co-working, co-thinking, and co-knowing. Findings revealed that water supply companies, governments, users, and key agencies were key players in domestic water supply because of high interest and influence.

The study suggested that when issuing policies related to water systems it is important to take into consideration the appropriate level of involvement and clearly define the roles and responsibilities of different stakeholders. The study used the mean scores of the level of interest and influence to determine the level of stakeholder involvement in the domestic water supply. The methodology of conducting stakeholder analysis in this study to determine the level of stakeholder involvement, interest and influence was adopted in the present study. However, in this current study to determine the level of involvement the study used the mean scores of power, legitimacy and urgency while in this study level of involvement was determined using the mean scores of power and interest.

Oates & Mwathunga (2018), using the interest and influence matrix analysed stakeholders in the rural water supply of Malawi. The results indicated that Some NGOs, MoWS, District Council, and Politicians were among key stakeholders in rural water supply functionality. These stakeholders had a high interest and influence on the rural water supply. District councils were found to have a high influence on rural water supply activities. Stakeholder mapping according to the level of interest and influence was done using focus group discussions with various stakeholders in the water sector. In addition, the level of stakeholder involvement in the rural water supply sector was not established. In the present study, apart from establishing stakeholders' level of interest and influence, stakeholder level of involvement was also analysed.

Yang *et al.* (2016), conducted an analysis of stakeholders in climate change and water management in China. Analysis was conducted using the interest and influence matrix where stakeholders were classified based on their level of interest and influence. The results revealed that key players were immediate experts who both operate and manage water resources. Furthermore, local communities and NGOs had high interest but low influence while other NGOs had both low influence and interest. The Department of Water was the most influential and highly affected stakeholder.

Politicians were also determined to be important stakeholders in climate change and water management. The study used interviews to map stakeholders' level of interest and influence in Climate change and water management. The level of stakeholder involvement was not established.

Wang *et al.* (2013) addressed the gap in Yang *et al*. (2016) study by determining key stakeholders, their level of interest, influence, and level of involvement in Shebzhen, China. Mean scores of power, legitimacy and urgency were used to determine the level of involvement and influence – interest matrix was used to classify stakeholders. In addition, the Likert scale was used to determine the level of interest and influence of stakeholders. Results conclude that Water companies, Government, Consumers, and Polluting Companies were the most active and important stakeholders in the provision of drinking water supply. However, their interest, influence, and attitude were found to be different. Results further revealed that stakeholders with limited interest and influence such as NGOs were not important and hence needed not to engage with them extensively. While stakeholders with high interest and influence as well as the co-working level of involvement were key stakeholders. For example, Government makes policies and laws, so plays an important role and can affect the operation of the system. The study adopted the same methodology which was used by Anh *et al*. (2019). This study is important because the methodology and the present study will use the same methodology to analyse stakeholder level of interest, influence and involvement in O&M of boreholes.

Previous studies have focused on analysing stakeholder level of interest, influence, and involvement in domestic water supply (Anh *et al*., 2019), rural water supply sector (Oates & Mwathunga, 2018), climate change, and water management (Yang *et al.* (2016) and drinking water supply Wang *et al.* (2013). However, there has been no research on stakeholder mapping of interest, influence, and involvement in O&M of rural water supply specifically boreholes.

Additionally, these studies' data was collected through interviews and focus group discussions. This research collected data on stakeholder level of interest, influence and involvement in O&M of boreholes.

2.3.3 Role of stakeholders in O&M of boreholes

Oates & Mwathunga (2018) established different roles of stakeholders through interviews with various water stakeholders. NGOs were identified as key players in the water service delivery to most parts of the rural communities. Some NGOs were found to focus on the construction of boreholes and rehabilitation. Other NGOs were working to strengthen the capacity of O&M through the establishment of Area mechanics while some conducted borehole functionality monitoring. Furthermore, study findings revealed that despite politicians being key stakeholders, political influence was the major challenge affecting rural water supply. The study further revealed that most politicians prioritise one constituency or community over the others which may be in need. In addition, the provision of support by politicians was found to be a way of gaining political morale to win votes. Area mechanics were said to be key in conducting borehole maintenance and functionality monitoring. The present study adopted capacity building, borehole maintenance and monitoring variables from Oates & Mwathunga's (2018) study which were used to evaluate the role of key stakeholders in O&M.

Braimah *et al.*, (2016) findings of the mixed design study to examine the effectiveness of the local management systems of rural water facilities for sustainable service delivery in Ghana demonstrate that the District Water and Sanitation Team (DWST) were unable to supervise and monitor the activities of local level facility managers and water facilities across. The Ministry failed to monitor the district local government. On the other hand, local governments failed to monitor local communities.

Similar results were reported by Oates & Mwathunga (2018) where the District Council failed to conduct monitoring and supervision. Lack of monitoring and supervision was attributed to a shortage of financial and human resources. Sindani (2016) noted that there are significant gaps in skills, knowledge, and resources on the ground, despite significant investments being made at the national level to establish guidelines for the development of monitoring and evaluation frameworks and tools (Sindani, 2016).

Chemisto & Rivett (2015) study was conducted in Ghana to review sector coordination and Information and Communication Technologies (ICTs) in multi-stakeholder environs of Uganda's rural water sector. Data collection was conducted using an in-depth literature review. It was established that several approaches have been implemented to improve stakeholder coordination, however, coordination challenges were still available. The study findings further revealed that disintegration due to project interest, different projects and actors having different approaches to service delivery have affected the enforcement of the policy guidelines. There was a need to conduct interviews and focus group discussions with various stakeholders in the water sector other than relying on an in-depth literature review only.

Similarly, Soubriere & Cloutier's (2015) study to redesign how local government and development partners which include NGOs collaborate as they provide drinking water to rural communities indicate that there are coordination challenges among development partners and local governments. NGOs were found to work independently without discussing and involving the District Council which is responsible for coordinating all water development activities and ensuring equitable service provision and functionality of existing boreholes. For decades, limited coordination amongst multiple stakeholders is one of the numerous challenges the rural water sector has faced.

This is because of the divisions due to multiple players with different interests and approaches to service delivery in the rural water sector. O'Meally (2011) suggests that the wide range of water service providers adds the complexity of coordinating overall sector targets. The unbudgeted resources like those channelled through NGOs make it difficult to track expenditures and link the outputs to the strategic goals.

Smits *et al.,* (2013) conducted a study on the impact of external support on community-based rural water services in Colombia. Structured interviews and focus group discussions were used to collect data. Data analysis was done using univariate analysis which was followed by multivariate analysis. Study findings revealed that nearly all the water systems communities received external support which was either irregular or unstructured. The results further established that service levels in systems with external support were slightly higher than in systems without such support and those that received more regular support performed better. The findings collaborate with Marks *et al.,* (2014) and Nyakwaki & Bernad's (2019) studies which demonstrated that post-construction external support played a role in the functionality of most boreholes in some cases, external support was provided soon after installation while some reported receiving it on regular basis. This study adopted quantitative methods to analyse the relationships between the characteristics and performance of different support agents. In this present study, both qualitative and quantitative methods were used to collect and analyse data.

2.4 Summary of the Literature Review Chapter

In summary, in this chapter, the theories of community involvement in decision making which informed objective number one were discussed. Forms of community involvement in decision-making have been explained. Furthermore, the chapter discussed the concept of stakeholder analysis which informed objectives number 2 and 3. Approaches to stakeholder analysis which include descriptive, normative and instrumental were explained. In addition, the interest-influence matrix which is used to classify stakeholders' level of interest and influence has been discussed. Furthermore, related literature on community involvement in decision-making, stakeholders' level of interest, influence, involvement, and stakeholders' role in the water supply have been reviewed. The research variables which were used to answer the research questions and the methodology which was used to analyse stakeholders' involvement in O&M of boreholes were adopted from the literature review. From the literature, variables include borehole initiation, borehole location, technology choice, setting up maintenance funds, O&M arrangement, the election of WPC, level of interest, level of influence, level of involvement, capacity building, Financing arrangement, spare parts supply chain, coordination and monitoring were adopted in this present study. In addition, the use of focus group discussion, key informants' interviews, document review and stakeholder analysis using the influence and interest matrix methodology were adopted from the literature. Details of the methodology are presented in the next section.

CHAPTER 3: METHODOLOGY

This chapter describes the research methods that were followed in the study. The chapter provides information on the study area and the study participants. The section further describes the research design that was chosen for this study and the reasons for this choice. Additionally, the instruments that were used for data collection and the procedures that were followed to carry out this study are explained. Finally, the methods used to analyse data are also discussed in this section. The summary of the methodology section is presented in the methodology matrix (Appendix A).

3.1 Study Area

Salima is one of the districts in the Central region. The district covers an area of 2,196 km^2 and has a total of 10 Traditional Authority (NSO, 2019). The study was conducted at Traditional Authority Ndindi which was purposively selected because is one of the Traditional Authority which has the highest number of boreholes constructed by water service providers and was reported to have a high rate of borehole functionality. The study wanted to explore the connection between the high functionality rate of boreholes and stakeholder involvement in the O&M. The convenience sampling method was further used to select Traditional Authority Ndindi which was based on the geographical location.

Traditional authority Ndindi has a population of 47, 795 and 9559 households according to the 2018 Malawi population and housing census report (NSO, 2019). There are 133 villages according to the 2021 health survey and Area Development Committee (ADC) reports. Figure 4 shows the map of the study area. A total of 55 villages which represents 42% were purposively selected on the basis that they had a borehole or boreholes installed in their area (Appendix B).

The main source of drinking water in the area is a borehole. There are a total of 227 boreholes in the study area (Health Surveillance Assistants (HAS's) Reporting database, 2021).

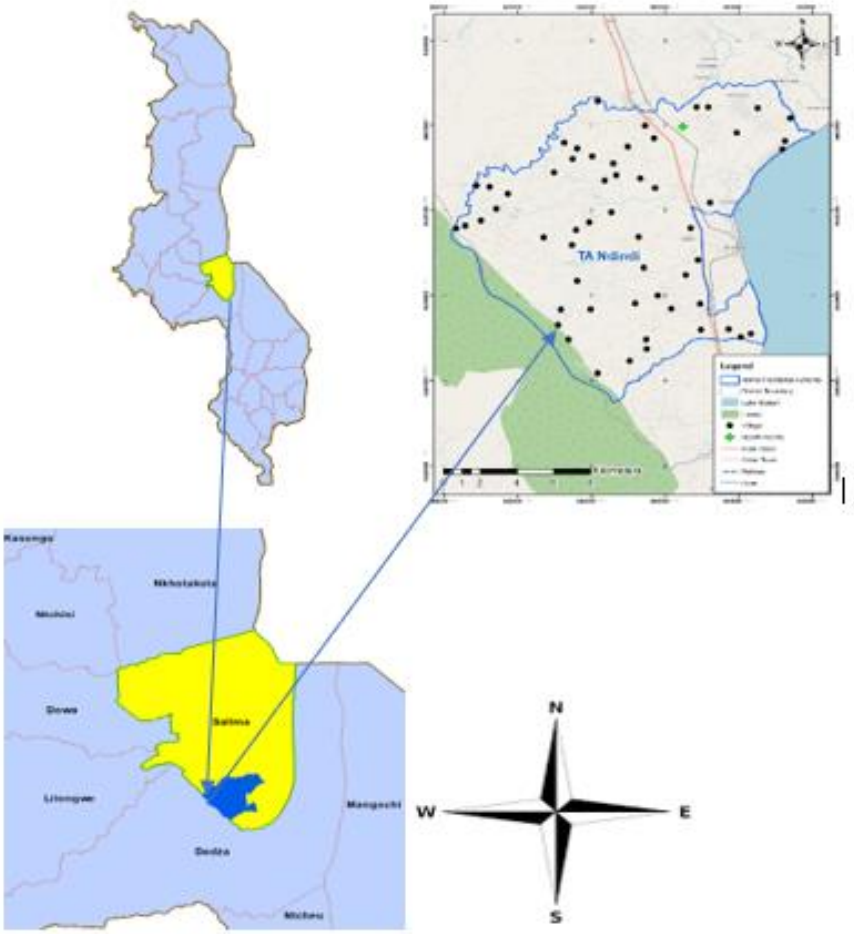


Figure 4: *Map of the Study Area*

3.2 Research Design

The study used the mixed methods research design to collect and analyse data. Mixed methods refer to a methodology of research that uses the systematic mixing of qualitative and quantitative methods within a single study (Wisdom & Creswell, 2013; Shorten & Smith, 2014). Mixed approaches provide a better understanding of research problems and complex phenomena.

Additionally, mixed methods provide a better understanding by triangulating one set of results with another, thereby enhancing the validity of inferences (Azorin, 2016). Furthermore, the study adopted a cross-sectional research approach. A cross-sectional study was adopted because is conducted relatively faster and is inexpensive (Setia, 2016).

3.3 Data Collection Methods and Collection Tools

This section presents the methods which were used to collect data for all objectives. Both primary and secondary data were collected.

3.3.1 Primary data collection

Primary data was collected using focus group discussion (FGD), household survey, stakeholder interview survey, Key Informant Interviews (KII), and observation.

3.3.1.1 Focus Group Discussions (FGDs)

Focus group discussion is frequently used as a qualitative approach to gain an in-depth understanding of social issues (Nyumba *et al.,* 2018). The method aims to collect data from a purposively selected group of people rather than from a statistically representative sample of a bigger population. The FGDs are helpful because there is a high possibility of widely exploring the topic to generate more information related to objectives and are relatively inexpensive (Gundumogula, 2020).

In total 24 focus group discussions were conducted. The Focus groups were Water Point Committees and community leaders. Out of 24 focus group discussions, 17 were conducted with Water Point Committees and 7 were conducted with community leaders. To ease moderation and maximize data capture, each FDG had 5 to 7 participants. Focus group discussions were recorded using a smartphone coupled with taking notes by hand.

Recordings were chosen because they helped the researcher to return to relevant information and also recordings gave the researcher a chance to relisten and discover new themes which were not thought of during the focus group discussion. The researcher made sure that FGDs were conducted in a quiet environment and that the phone was placed in a good position.

Focus group discussions were conducted to collect data on community participation in decision-making and the role of key stakeholders in the O&M of boreholes using a focus group discussion guide (Appendices C).

3.3.1.2 Household Survey

The household survey was conducted to collect data on community involvement in decision-making. The survey questionnaire was administered to community members of traditional authority Ndindi (Appendix D). Given that the total population number was known, Yamane's (1967, p. 86) formula was used to calculate a sample size that could accurately represent the total households in Traditional authority Ndindi. A total of 385 households were sampled for the household survey calculated based on the equation by Yammane (1967, p.86).

$$n = \frac{N}{1+N\ (e)\text{^}2} \qquad \textbf{Equation 1}$$

where *n* is the sample size

e is the level of precision

N is the Population size

A 95% level of confidence is assumed for this equation.

N = 9559

e = 0.05

$$n = \frac{9559}{1 + 9559\,(0.05)^2} = 385 \text{ households}$$

Simple Random sampling was used to select 385 households. All households had an equal chance of being included in the sample. To select a sample, the population size was defined which was 9556. Then a list of all the households was prepared, and then each household was marked with a specific number which acted as an ID. Samples were chosen using a random number generator software to provide 385 randomly generated numbers between 1 to 9559. Simple random sampling was chosen because the techniques provide an unbiased and better estimate of the parameters if the population is homogeneous (Singh & Masuka, 2014).

3.3.1.3 Stakeholder Representatives Interviews

Level of Influence and Interest

The stakeholder interview questionnaire was used to collect data from 50 (n = 50) representatives of stakeholders (Appendix E). The sampled stakeholders included 17 government representatives, 15 NGO representatives, 5 Politicians, 3 Area mechanics, 2 representatives from Civil Society Organisations (CSOs), and 8 representatives from academia who had knowledge and expertise in the rural water supply. These stakeholders were purposively selected based on their knowledge and expertise in rural water supply through the borehole. A five-point Likert scale was used to classify stakeholders' levels of interest and influence. Variables were the level of interest and the level of influence.

The ranking of interest and influence was divided into 5 levels (low, low-medium, medium, medium-high, and high) where level 1 was low interest/influence, and level 5 was high interest/influence. Stakeholders were asked to respond to each statement in terms of their degree of agreement or disagreement. The specific responses to the items were combined so that individuals with the most favourable attitudes had the highest scores while individuals with the least favourable attitudes had the lowest scores.

Level of Involvement

Using the Salience Model Adopted from Stanghelini (2010) again the questionnaire was used to collect data from 50 (n = 50) stakeholders (Appendix E) who were purposively selected based on their knowledge and expertise in rural water supply through the borehole. The sampled stakeholders included 17 government representatives, 15 representatives from NGOs, 5 Politicians, 3 Area mechanics, 2 representatives from CSOs, and 8 representatives from academia. A five-point scale Likert scale was used to classify stakeholders based on the level of power, legitimacy, and urgency. The ranking of power, legitimacy, and urgency was divided into 5 levels (low, low-medium, medium, medium-high, and high) where level 1 was very little power/urgency/legitimacy, and level 5 is very great power/urgency/legitimacy.

3.3.1.4 Key Informants' Interviews

Interviews with Key Stakeholders

Interviews were conducted with 40 stakeholders which include representatives from the Ministry of Water & Sanitation, Health Surveillance assistants (HSAs), Area mechanics, Water Monitoring Assistants (WMAs), District Water and Development Officer, Community Development assistants (CDAs), Councilors, Area mechanics, representatives from NGOs and Spare parts suppliers.

These stakeholders were purposively selected based on their knowledge, experience in the water sector, specifically rural water supply and their familiarity with the water policy documents. Interviews were conducted in person and online. Online participants were selected based on their inability to attend in-person interviews which were mainly because of Covid 19.

In the study, interviews were used to collect information to determine the role of key stakeholders in the O&M of boreholes. Key informants' interviews were conducted because the information comes directly from knowledgeable people and provides qualitative and rich detail about the researched problem (Cossham & Johansson, 2019). An interview question guide was used to interview stakeholders (Appendix F).

Interviews recording were conducted using a smartphone coupled with taking notes by hand here and there In-person interviews were conducted in a quiet environment which helped to ensure the quality of the recordings. Online interviews were done using a phone call. Phone call Interviews were recorded directly on the phone.

Stakeholder Identification

The potential list of stakeholders in O&M was generated from literature and policy documents. The list was reviewed through interviews with the District Water Development Officer (DWDO) and representatives from the NGOs who were purposively selected because they possessed information, expertise, knowledge, and ideas about rural water supply. The aim was to come up with a list of stakeholders which was used to analyse stakeholders' level of interest, influence, involvement, and determination of key stakeholders in O&M. An interview guide was used to conduct interviews (Appendix G).

During interviews, only those stakeholders who were the most likely to affect or be affected by the functions of O&M of boreholes given their interest, resources and influence were selected from the potential list that was developed from the policy documents and reviewed literature. During the interview, the final list of stakeholders in the involvement in O&M in rural water supply for Salima district was identified and classified as primary or secondary stakeholders. Primary stakeholders are the ones who have a direct and immediate impact on the decision regarding the involvement in O&M. Secondary stakeholders are those that do not have a direct stake or face a direct impact due to decisions making regarding O&M service provision. The Ministry of Water and Sanitation, District Council, Muslim Association, NGOs, and Politicians were classified as secondary stakeholders. Water Point Committees, Area mechanics, community leaders, Health Surveillance Assistants, Spare parts suppliers, and water users were classified as primary stakeholders.

3.3.1.5 Observations

The observation was conducted using the observation checklist to collect data on the functionality and physical condition of the sampled boreholes (Appendix H). One hundred and forty-four boreholes were sampled for observation from a total of 227 boreholes. The sample size was determined according to Yamane's (1967) survey table of samples that recommends a sample size of 144 respondents for a population of 225, at 95% confidence with a 5.0% margin of error. Convenience sampling was used to select the sampled boreholes for observation based on geographical proximity, accessibility, and time. Convenience sampling is a type of nonprobability sampling where members of the target population that meet certain practical criteria, such as easy accessibility, geographical proximity, availability at a given time, or the willingness to participate are included in the study (Etikan, 2016).

3.3.2 Secondary Data Collection

3.3.2.1 Document Review

Document review is a systematic procedure for reviewing or evaluating documents both printed and electronic material the researcher interprets to give voice and meaning (Bowen, 2009). The purpose of the document review was to identify a potential list of stakeholders in the involvement in O & M of boreholes**.** Documents reviewed were policy documents which include National Water Policy (Malawi Government, 2005) and Water Resources Act no 2 (Malawi Government, 2013). In addition to the reviewed literature on stakeholder level of interest influence and involvement. Furthermore, a document review was conducted to collect information on the sampled boreholes. The information which was collected includes the year of installation and donor or implementing agency.

3.4 Data Analysis

This section discusses different methods which were used to analyse data for each specific objective. Qualitative and quantitative data were analyzed.

3.4.1 Level of Community Involvement in Decision Making

To answer the specific objective number one, data collected during the household survey and FDGs were analysed using descriptive statistics, thematic analysis, and content analysis.

3.4.1.1 Household Survey Questionnaire Data

Data collected for this objective was analyzed using descriptive analysis using SPSS version 25. Descriptive statistics which were used include percentages, frequencies, mean and standard deviation. The analysed data was presented in Tables, Figures, and written statements.

3.4.1.2 Focus group Discussion

Thematic analysis and content analysis were used to analyse data from FGDs. The recordings from the FGDs were transcribed. Data transcription was done 100%. Verbatim transcription was conducted with cues on nonverbal behaviour. This was done to establish the reliability, dependability, and trustworthiness of the study as suggested by (Stucky, 2016). The transcribed data had no names or any identifying information to avoid a breach of confidentiality. Data transcription took about 2 to 3 hours. The researcher employed two research assistants who assisted with data transcription.

Secondly, familiarisation with the transcribed data by listening to recordings and reading and re-reading the data was done. At this stage, the quality of transcribed data was checked against the original recordings and documents. This was an important stage because not all data was gathered and transcribed by the researcher. After data familiarization, preliminary codes were developed. Coding was done manually. For each of the focus group discussion data, codes were developed using codes in the margin. The fourth stage involved theme development. Themes development was conducted by re-coding the data to develop more well-defined categories.

For thematic analysis, after coding, supporting extracts from the transcribed data were collated into the codes. Themes were then developed by sorting different codes into potential themes. The themes developed were reviewed and revised to ensure that each theme had enough distinct data to support them. Similar themes were merged and the themes that did not have enough data were removed.

For content analysis, the content was selected based on the research questions. Then the units of meanings that were coded and the set of categories for coding were defined. Coding involved organizing the units of meaning into previously defined categories. Then coding was done by recording all data according to the defined categories manually to determine the frequency (the number of times a particular code occurs). Then the coded data were examined to determine patterns and conclusions were drawn based on the research questions.

3.4.2 Stakeholder level of Interest, Influence, and Involvement in O&M of Boreholes

This section summarises the analysis which was conducted to analyse the collected data on the level of stakeholder's interest, influence, and involvement in borehole O&M.

3.4.2.1 Stakeholders Interview Questionnaire Data (Classification of Stakeholders Based on Level of Interest and Influence)

The levels of ranking scores of stakeholder interest and influence collected from the interview questionnaire of 50 (n = 50) representative stakeholders were analysed using SPSS software version 25.0 to calculate the mean scores. For easy analysis and interpretation of the results, the mean scores were rounded to whole numbers where;

1 = low influence/Interest.

2 = medium-low influence/ Interest.

3 = medium influence/ Interest.

4 = medium-high influence/ Interest.

5 = high influence/ Interest.

3.4.2.2 Stakeholder Classification (Determination of Key Stakeholders)

Based on the results of the mean scores of the level of interest and influence, stakeholders were classified using the influence and interest matrix into 4 categories as follows.

a) Key Stakeholders (Players) - Stakeholders with mean scores of interest and influence above 3 (Stakeholders with high interest and influence).
b) Context setters- Stakeholders with mean scores of interests below 3 and influence above 3 (stakeholders with high influence and low interest)
c) Subjects- Stakeholders with mean scores of interests above 3 and influence below 3 (Stakeholders with high interest and low influence)
d) Crowds- Stakeholders with mean scores of interests and influence below 3 (Stakeholders with low interest and low influence).

3.4.2.3 Stakeholders Interview Questionnaire based on Stakeholder's Level of Involvement

The levels of ranking scores of powers, legitimacy, and urgency collected from the interview questionnaire of 50 (n = 50) representative stakeholders were analysed using SPSS software version 25 to calculate the mean scores as guided by Stanghelini (2010) and Wang *et al.* (2013).

The mean scores were converted to whole numbers for easy analysis. The stakeholder's level of involvement was classified based on the analysed mean scores of the three attributes (power, legitimacy, and urgency) into 3 categories

a) Co-working – Stakeholders with the mean scores of all 3 attributes above 3.
b) Co- thinking – Stakeholders with the mean scores of 2 attributes above 3.
c) Co-Knowing- Stakeholders with the mean scores of 1 of the three attributes above 3.

3.4.3 Stakeholders' Role in O&M of Borehole

This section explains how data collected on the role of key stakeholders in O&M of boreholes during interviews with key informants and FDGs were analysed.

3.4.3.1 Focus group Discussion and Key Informants Interviews

Thematic analysis and content analysis were used to analyse data from KIIs with stakeholders and FGDs. the recordings from the FGDs and KIIs were transcribed. Data transcription was done 100 %. Verbatim transcription was conducted with cues on nonverbal behaviour. The transcribed data had no names or any identifying information to avoid a breach of confidentiality. Data transcription took about 1:30 to 3 hours. Focus group discussions took more time to transcribe as compared to interviews because of a large volume of data.

Secondly, the researcher familiarized herself with the transcribed data. At this stage, the quality of transcribed data was checked against the original recordings and documents. This was an important stage because not all data was gathered and transcribed by the researcher. After data familiarization, preliminary codes were developed. Coding was done manually. For each of the transcribed interviews and focus group discussion data, codes were developed using codes in the margin. The fourth stage involved theme development. Themes development involved re-coding to develop more well-defined categories. For thematic analysis, after coding, supporting extracts from the transcribed data were collated into the codes. Themes were then developed by sorting different codes into potential themes. The themes developed were reviewed and revised to ensure that each theme had enough distinct data to support them. Similar themes were merged and the themes that did not have enough data were removed.

For content analysis, the content was selected based on the research questions. Then the units of meanings that were coded and the set of categories for coding were defined. Coding involved organizing the units of meaning into previously defined categories. Then coding was done by recording all data according to the defined categories manually to determine the frequency (the number of times a particular code occurs). Then the coded data were examined to determine patterns and conclusions were drawn based on the research questions.

3.5 Ethical Consideration

Ethical approval was sought from the National Commission for Science and Technology (NCST), Protocol NO. P.10/19/436 (Appendix I) and permission was sought from Salima District Council (Appendix J). All participants signed a Consent Letter as an acceptance to take part in the research (Appendix K). The purpose of these letters was to assure participants that their participation in the research is voluntary and that they were free to withdraw from it at any point and for any reason. The participants were fully informed about the objectives of the study and were reassured that their answers will be treated as confidential and used only for this research. Furthermore, before recording interviews and focus group discussions, permission was sought from the participants. Due to Covid 19 pandemic, some interviews were conducted online using a phone call as participants preferred online other than in-person interviews as a safety precaution measure.

3.6 Summary of the Methodology Chapter

This chapter described the research methods that were followed in the study. The study was conducted in traditional authority Ndindi of Salima district. The research adopted a mixed research design. Simple random sampling, purposive and convenience sampling were used to determine the sample size. Both primary and secondary data were collected. Primary data was collected using focus group discussion, stakeholders interview survey, key informants' interviews, observation, and household survey. Secondary data was conducted using a document review. Quantitative data was analysed using descriptive analysis. While qualitative data was analysed using content and thematic analysis. Details of the results are described in the next chapter.

CHAPTER 4: RESULTS

This chapter presents the findings of the research covering all objectives. First, community involvement in decision-making during the development, implementation, and management of boreholes in rural areas of Salima district results are presented. Secondly, the identified stakeholders' levels of influence, interest, and involvement in O&M are presented. Lastly, this chapter presents the finding on the role of stakeholders in the O&M of boreholes.

4.1 Community Involvement in Decision Making

This section presents results on community involvement in decision-making regarding borehole initiation, borehole location, technology option, borehole maintenance arrangement, setting up maintenance funds, and the election of WPC. The findings were collected from the household survey and focus group discussions.

4.1.1 Social-demographic Characteristics of Respondents

The study sought to find out the social demographic information of the household survey respondents. The information provided data that is essential for the determination of whether the individuals in the study represented a sample of the target population for generalisation purposes. Social-demo data collected were age, sex, level of education, household size, the main source of income, period of stay in the study area, and average monthly income.

***Table 1**: Social- demographic Characteristics of Household Survey Respondents*

Variable	Frequency (*n* = 385)	Percentage (%)
Gender		
Male	126	32.7
Female	259	67.3
Age		
Below 30 years	120	21.1
31 - 40 years	104	27.0
41 – 50 years	110	28.6
More than 50years	51	13.2
Level of education		
No education	105	27.2
Primary	229	59.5
Secondary	49	12.7
Tertiary	2	0.5
Household size		
3 and less	104	27.0
4-6 members	216	56.1
7 and more	65	16.9
5		
Period of stay		
1year below	31	8.1
2 - 5 years	20	5.1
6 – 10 years	31	8.1
More than 10years	303	78.7
The main source of income		
Farming	206	53.4
Casual Labor	100	26.0
Employment		
Business	16	4.2
	63	16.4
Monthly income (MK)		
Do not Know	109	28.3
Below K10,000	128	33.2
10,001 to 20,000	83	21.6
Above 20,000	65	16.9

Table 2 presents the social-demo data. The majority of the respondents (67%, *n* = 385) were females. Participants' ages ranged from 11 to above 50 years with most of the respondents (28.6%, *n* = 385) ranging from 41 to 50 years. The majority of the participants (59%, *n* = 385) had reached the primary school level of education. The average household size was 5 and the majority of the respondents (78.7%, *n* = 385) had stayed in the study area for over 10 years. The participant's predominant source of income was farming (206, *n* = 385). Of the 385, 109 had no idea of their monthly household average income.

4.1.2 Borehole Initiation

Table 2 presents findings on who the major decision-makers were at the point of borehole project initiation. Most of the respondents (36.1%, *n* = 385) indicated that the government was the main decision-maker during borehole initiation (Table 4).

***Table 2**: Response to Decision Making during Borehole Initiation*

Main Decision Maker	**Frequency (*n* = 385)**	**Percent (%)**
Community	116	30.1
NGO	43	11.1
Government	139	36.1
Muslim	63	16.4
Politicians	11	2.9
Traditional Leaders	13	3.4

From the focus group discussions with WPCs and community leaders, the results revealed that in some cases communities were not involved in project initiation during the planning phase while in some they were involved. Out of the 17 WPCs that participated during the FGD only 7 mentioned that they were involved in the initiation phase while the remaining 10 committees mentioned that the borehole came without them initiating.

For example, a chairman from one borehole committee stated that*:*

We just saw cars in our area and then they told us that we want to drill a borehole, so you need to contribute bricks and sand. People mobilized the materials they requested. (FGD, Village Headman)

Furthermore, results from secondary data show that community members were not involved in initiating most borehole projects which were installed by the government in the early 2000s (53%, $n = 72$) and the boreholes which were installed by the Muslim Association (96%, $n = 27$).

4.1.3 Borehole Location

Findings from the household survey indicated that the majority of the respondents (79.3 %, $n = 385$) were involved in deciding the location of the borehole. Furthermore, qualitative data from focus group discussions also indicate that communities were involved in deciding the location of their borehole regardless of whether they initiated the project or not. Some of the main criteria for choosing the borehole location mentioned during the focus group discussion were the number of households and proximity to the point of use.

Furthermore, results of FGDs established that 7 WPC out of 17 indicated that the proposed borehole location changed. The main reasons cited were the presence of the rock underneath, poor soil which caused the hole during drilling to collapse, and the presence of contaminants sources like close to school toilets. It was further revealed that when the proposed borehole location changes community members were not given another chance to decide on the new borehole location.

4.1.4 Technology Option

Household survey findings suggest that 98.4% (n = 385) of the respondents indicated that were not involved in deciding the water supply technology option. Focus group discussion results with WPC and Community leaders also affirm that communities were not given a chance to decide on the technology option for water supply.

4.1.5 Borehole Maintenance Arrangement

The study wanted to find out if communities were involved in deciding who to conduct borehole maintenance considering there are several O&M approaches. Some of the approaches include training WPC to carry out borehole maintenance and establishing area mechanics to conduct borehole repair and maintenance.

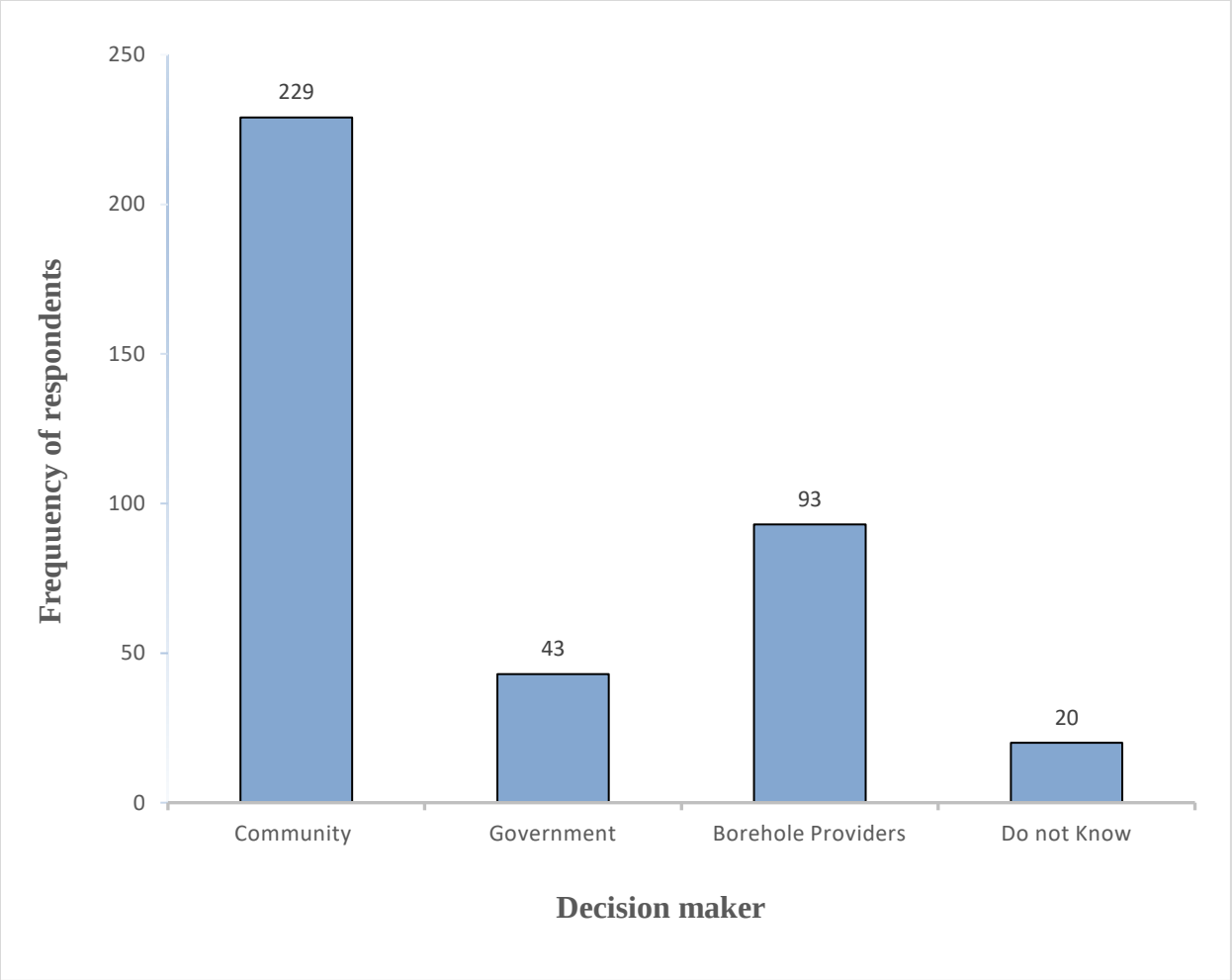


***Figure 5**: Decision Maker regarding Borehole Repair and Maintenance Arrangement*

The result of the household survey (Figure 5) demonstrates that the majority of the respondents (229, *n* = 385) indicated that Community members were involved in deciding borehole maintenance arrangements.

Qualitative data from focus group discussions with WPC and Community leaders established that Community members through WPC were given a chance to decide who to carry out borehole repair and maintenance. The majority of the WPC (14, *n* = 17) mentioned that borehole repair and

maintenance are done by Water Point Committees and Area mechanics. Where WPCs are responsible for minor maintenance whilst Area mechanics are responsible for major maintenance.

Some borehole committees mentioned that they sign a maintenance agreement contract with area mechanics which is per annum, or half a year. In this arrangement, area mechanics visit the borehole 4 times despite having a breakdown or not. Other WPCs explained that they simply invite the area mechanics when the borehole is broken, and they cannot repair the borehole on their own. So, they pay him after he has finished fixing the borehole.

4.1.6 Setting up Borehole Maintenance Funds

The study wanted to find out if community members being responsible for funding O&M were involved in setting up maintenance funds (water contribution),

***Table 3**: Responsible Groups for Setting up Maintenance Fund*

Decisional Maker	**Frequency (*n* = 385)**	**Per cent** (%)
Community members	19	4.9
Water Point Committees	200	51.9
Community Leaders	164	42.6
Government	2	0.5
Other borehole-providing agencies (non-governmental organizations, Muslim Association, etc.)	0	0

Household survey results showed that the majority of the respondents (79%, *n* = 385) indicated that community members were not involved in setting up maintenance funds but rather WPC made the decision on behalf of the community members. Findings agree with focus group discussions with WPC and Community Leaders where participants mentioned that community members were not involved in deciding the amount each household should contribute towards maintenance funds. The Community leaders were also mentioned to at times have assisted committees in deciding how much each household should contribute toward borehole O&M and payment arrangement. On the other hand, one WPC indicated that the decision of the amount to contribute and payment arrangement is in the hand of the borehole committee's chairman.

4.1.7 Setting up Water Point Committees

The study sought to find out if the community members were involved in the establishment of the Water Point Committees.

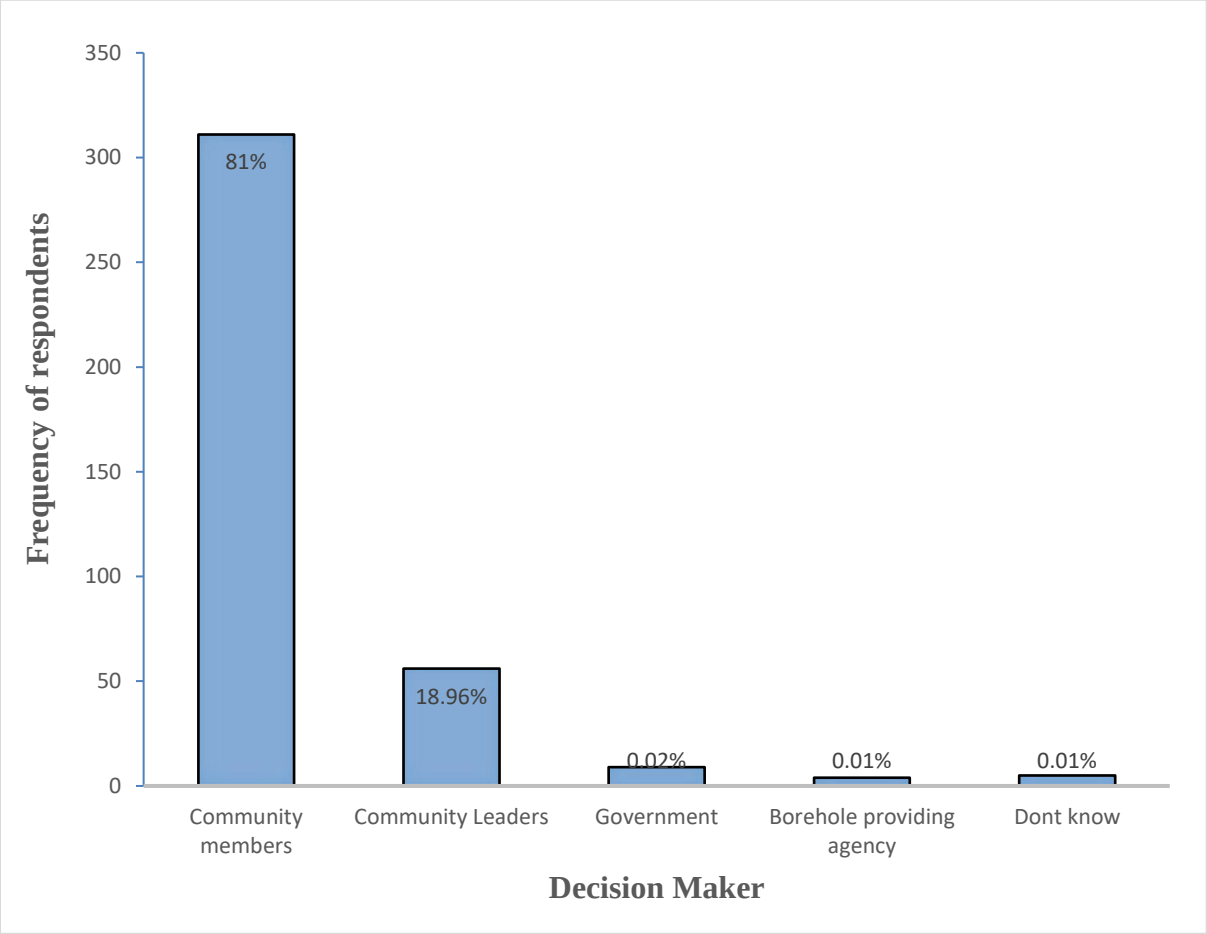


Figure 6: *Responsible Groups for Electing Water Point Committee*

Household survey results established that the majority of the respondents (81%, *n* = 385) indicated that communities were involved in deciding who should be in the Water Point Committees through voting (Figure 6).

Qualitative results for both focus group discussions with the Community leaders and WPC also indicated that the committees were elected democratically through voting by community members except for one WPC which mentioned that the committee was elected by Mosque leaders because the borehole is at the mosque.

Furthermore, FGDs results revealed that communities decided on how long the elected committees should serve. On average it was established that the committee members are supposed to serve for three years but this was not the case in most boreholes. Committee members served for more than three years while others resign on their own even before their term-end. This was reported to be the case because of the WPC's pure volunteerism hence most people are not interested to be in the WPC for a long period of not being in the WPC in the first place.

4.2 Stakeholder's Interest and Influence in Operation and Maintenance of Boreholes

This section presents research findings on stakeholder level of interest, influence, determined key stakeholders, and level of involvement in O&M of boreholes in rural areas.

4.2.1 Stakeholder Level of Interest and Influence in O&M

Analysis of stakeholders was conducted to determine the level of interest and influence in the O&M of boreholes.

***Table 4**: Results of Level of Interest and Influence*

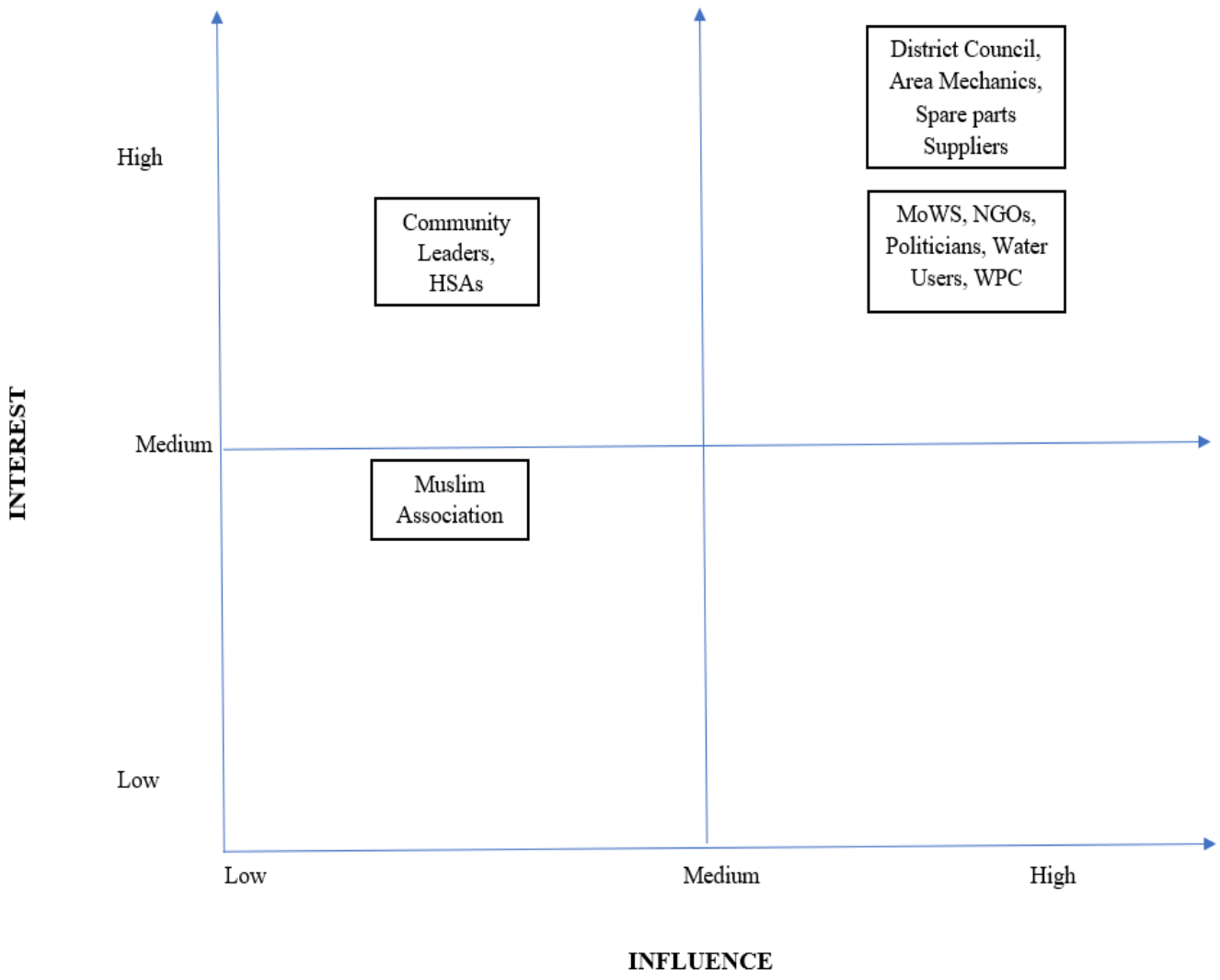
Stakeholder	Level of interest		Level of influence	
	Mean	Std. Deviation	Mean	Std. Deviation
Ministry of Water & Sanitation	4	1	4	1
District Council	5	1	4	1
Non-governmental organisation	4	1	4	1
Politicians	4	1	4	2
Muslim Association	3	2	2	2
Area mechanics	5	1	4	1
Water users	4	2	4	2
Water point committee	4	1	4	1
Community Leaders	4	1	2	1
Health Surveillance	4	2	2	1
Spare parts suppliers	5	0	4	1

Key: 1= Low, 2 = low medium, 3= Medium, 4= medium-high and 5 = High

Results from the stakeholder interview survey in Table 7, demonstrate that the majority of the stakeholders (91%, n = 11) had a high level of interest in O&M. The District Council, Area mechanics, and Spare parts suppliers had the highest level of interest (mean = 5). The majority of the stakeholders (73%, n = 11) had a high level of influence on the O&M of boreholes. Furthermore, the majority of the stakeholder's (55%, n = 11) levels of influence and interest were different.

4.2.2 Stakeholder Classification

After analyzing the mean scores for the stakeholder's level of interest and influence, the results were used to position stakeholders on the interest – Influence matrix which was used to classify stakeholders into 'Key players' (high interest and influence over O&M), 'Context setters' (high influence, low interest), 'Subjects' (high interest, low influence), and 'Crowd' (low interest, little influence).



Key: HSAs – Health surveillance Assistance**; WPC -** Water Point Committees**; NGOs –** Non-governmental organizations; **MoWS** – Ministry of Water and Sanitation

Figure 7*: Results of Stakeholder Interest- Influence Matrix*

Based on the interest and influence matrix (Figure 7), the majority of the stakeholders (8, *n* =11) which include the Ministry of Water and Sanitation, District Council, Area mechanics, NGOs, Spare parts suppliers, Water Users, Water Point Committees and Politicians were classified as Key stakeholders in O&M of boreholes.

4.2.3 Level of Stakeholder Involvement

The level of involvement for the identified stakeholders was determined based on the mean scores of powers (influence), legitimacy, and urgency.

***Table 5**: Mean Scores of Power, Legitimacy, and Urgency plus the level of Involvement*

Stakeholder	Legitimacy	Power	Urgency	Level of Involvement
Area Mechanics	5	4	5	Co-working
Spare parts Suppliers	5	4	5	Co-working
Water Users	4	4	4	Co-working
Non-governmental organisation	4	4	4	Co-working
Ministry of Water & Sanitation	4	4	4	Co-working
District Council	5	4	4	Co-working
Water Point committees	4	4	3	Co-thinking
Politicians	4	4	3	Co-thinking
Community Leaders	4	2	4	Co thinking
Health Surveillance Assistance	4	2	4	Co-thinking
Muslim Association	1	4	3	Co-knowing

Study findings established that majority of the stakeholders (6, *n*=11) which include the Ministry of Water and Sanitation, NGOs, Water users, Area Mechanics, District Council and Spare parts suppliers' mean scores of legitimacy, power, and urgency were above 3 hence were classified as co-working in terms of the level of involvement denoting that they are stakeholders who can participate and contributes actively to O&M of boreholes (Table **5).**

4.3 Stakeholder's role in the Operation and Maintenance of boreholes

The roles of key stakeholders which were identified from the results of stakeholder analysis using the influence and interest matrix in objective number 2 were established through Interviews and FGDs. The identified key stakeholders include the Ministry of Water and Sanitation, District Council, NGOs, Area mechanics, Politicians, and Spare parts suppliers. Water Users and WPC were excluded from the list of the assessed stakeholders despite being categorised as key stakeholders because they were the direct beneficiaries of borehole O &M as they are primary stakeholders.

Stakeholders' roles in O&M of boreholes were categorised into 5 main roles which include capacity building, monitoring, financing O&M, spare parts supply chain, coordination, and borehole maintenance. Capacity Building includes the provision of any kind of training to WPC including refresher training for smooth operation and maintenance of boreholes. Monitoring included monitoring boreholes functionality and performance of WPC. Financing O&M included the provision of funds for O&M, assisting WPC in raising maintenance funds, and provision of external support in terms of finances for O&M.

The spare parts supply chain includes selling spare parts, provision of spare parts to WPC, and linking WPC to spare part suppliers or dealers. Coordination includes coordinating all O&M activities. Borehole maintenance included conducting borehole routine maintenance, preventive maintenance, and borehole rehabilitation. Conducting routine maintenance can be done directly by the concerned stakeholder or indirectly by hiring people to maintain.

4.3.1 Results of Stakeholder's Role in O&M from Interviews

Interviews with key stakeholders were conducted to collect data on their role in the O&M of boreholes.

***Table 6**: Identified Roles of Key Stakeholders in O&M*

Stakeholder	**Roles and Responsibilities**					
	Capacity building	Monitoring	Financing	Spare parts supply	Coordination	Borehole maintenance
MoWS	√	N/A	√		√	N/A
District Council	√	√	√	√	√	√
Area Mechanics	N/A	√	N/A	√	N/A	√
Politicians	N/A	N/A	√	N/A	N/A	N/A
Spare parts Suppliers	N/A	N/A	N/A	√	N/A	N/A
NGOs	√	√	√	√	N/A	√

Key: √ means Yes**; NA** means not applicable**; NGOs-**Nongovernmental organization**; MoWS-** Ministry of Water and Sanitation**.**

The results of the interviews with key stakeholders established that District Council and NGOs play a huge role in the operation and maintenance of the boreholes (Table 8). However, findings from key informants' Interviews established that NGOs role in O&M was concentrated during the project cycle. After the borehole is handed over to the community, the majority of the NGOs transferred their responsibilities to the District Council.

Interview results further established that there were some NGOs which were able to conduct O&M activities during the borehole post-construction phase. These NGOs include Inter aide and BASEDA who were responsible for establishing and implementing the area mechanics approach to borehole maintenance. Furthermore, the interviews with key stakeholders revealed several challenges which hinder the performance of their role in O&M. Some of the challenges included lack of financial and human resources, political interference, and poor coordination among stakeholders.

One of the Key Informants from the District Council commented that;

Extension workers play a major role in the O&M of boreholes as they are the ground officers, however, limited staff especially the WMAs, and funding issues have always hindered the successful implementation of O&M activities. (District Council KIP 6)

4.3.2 Results of Stakeholder's Role in O&M from Focus Group Discussions

FGDs with WPC and community leaders were conducted after interviews with key stakeholders to determine the role played by key stakeholders on the ground and determine gaps.

a. Capacity Building & Borehole Monitoring

The findings from FGDs indicated that the majority of the WPC (12, n = 17) received training. The District Council extension workers and NGOs were said to be responsible for providing most of the WPC's training conducted in the study area. However, there was no WPC who reported to have received refresher training. In terms of monitoring the functionality of boreholes and WPCs, the results from the focus group discussions showed that out of the 17 WPCs only 3 indicated that the Area mechanics were able to monitor their borehole functionality after the boreholes were handed over to the community while none mentioned District Council and NGOs.

Observation results of the 56 sampled boreholes showed that 92% of the boreholes were at the time of the study. Functionality was described as the borehole physically working and producing some water at the time of the survey visit. In terms of the physical condition of the borehole, the majority of the boreholes (70%, *n* =50) were not in good condition except for the newly constructed ones. The main issues of physical condition were the hardening of the borehole handle, and the handle made a lot of noise when operating. In addition, most aprons were not in a good state, and soak pits were completely not available or if available they were not in good condition.

b. Financing O&M

Results exposed that all the sampled WPCs (100%, *n* =17), who participated in FGDs have not received support from the Ministry of Water and Sanitation and District council. During FGDs some of the WPCs mentioned that the District Council explained to WPCs that it is the responsibility of the community to finance O&M. On the other hand, the majority of the WPC (71%, *n* = 17) during FGD mentioned having received financial support from politicians. In addition, all seven-focus group discussions with the Community leaders indicated that most boreholes receive support from politicians.

Two of the FGD participants from two different agreed to have received support from the Politician who was a member of parliament for their area;

We have been fixing breakdowns on our own but sometimes when there is a big problem, we ask for help from the MP, and most of the functional boreholes it's because of the Member of Parliament. (Chairman, FDGP)

The Politicians may intervene but also, we have a Constituent Development Fund (CDF) at the DC's office we use it at times for example the borehole that is here was fixed with the CDF the time it was broken. (*Group Village Headman, FGDP)*

c. Coordination of O&M activities

The focus group discussions demonstrate that the WPC are the ones who coordinate O&M activities for their boreholes. This was reported in all the focus group discussions with the WPCs (n = 17) and Community leaders (n = 7). It was also noted that there are at times when WPCs work hand in hand with the community leaders.

d. Spare parts Supply Chain and Borehole maintenance

Results of the focus group discussion revealed that the majority of the WPC (76%, n = 17) indicated that they have access to spare parts suppliers who own shops in town, and they usually buy frequently replaced spare parts in advance before borehole breakdown. Area mechanics and District Council extension workers and NGOs were mentioned to have linked most of the WPC with Spare parts suppliers and also encouraged WPC to buy spare parts from identified Spare parts shop owners because they are durable, and prices are fair. Lastly, FGDs with WPC showed that the majority of the WPC (14, n = 17) use area mechanics to conduct routine borehole maintenance.

However, most focus group discussion participants expressed their dissatisfaction with the Area mechanic arrangement. The reasons given were that the use of area mechanics is a waste of money especially when there is no breakdown since they pay in advance, and that area mechanics are expensive. According to one of the borehole committee members;

Area mechanics are paid K14, 000 annually which is too expensive as the committee can use that money to buy spare parts. Sometimes we pay him, but he does not show up, on the other hand, the people need to be using the borehole so please report this to Mr Chunga!!!! (FDG, Borehole Treasure)

Secondly, there are only three area mechanics in the whole traditional authority hence they are not able to attend to breakdowns in good time. Furthermore, nonfunctional boreholes are due to failure by the committee to pay the area mechanics the required service fee. One of the focus group discussion participants explained;

You know what! We only have 3 area mechanics who are responsible for the whole T/A. Therefore, he is always busy to reach everywhere at a good time because he is busy, that's why we want to be trained. (FDG, Borehole Secretary)

4.4 Level of stakeholder's involvement and functionality of boreholes

The study further qualitatively assessed if there was a link between the level of key stakeholder involvement and borehole functionality. Functionality assessment was done by employing a simple binary approach to define water point functionality based on whether the source is 'working' or 'not working at the time of the visit. Stakeholder level of involvement was divided into 3 categories depending on the number of O&M roles played by the key stakeholders in the sampled boreholes. Boreholes where different or same stakeholders played more than three roles out of the six, their level of involvement was considered to be high. Three roles medium and below three roles, the level of stakeholder involvement was considered as low.

***Table 7**: Link Between Stakeholder Involvement and Borehole Functionality*

Level of Stakeholder Involvement	Number of Boreholes	Number of Functional boreholes	Percent	Number of non-functional boreholes	Percent (%)
High	67	54	81	13	19
Medium	43	32	74	11	26
Low	34	14	41	20	59

The result from observation suggests that borehole functionality was high (n = 67, 81%) in boreholes where stakeholders' involvement in O&M of boreholes was high (Table 7). In terms of the physical condition of the borehole, the majority of the boreholes (70%, n =144) were not in good condition except for the newly constructed ones. The main issues of physical condition were the hardening of the borehole handle, and the handle made a lot of noise when operating. In addition, most aprons were not in a good state, and soak pits were completely not available or if available they were not in good condition.

4.5 Summary of the Results Chapter

Results of the first objective indicate that community members were not fully involved in making decisions during borehole project initiation, deciding technology options, determining alternating borehole locations, and setting up maintenance funds. However, community members were involved in deciding the location of the borehole, maintenance arrangement and setting up WPC.

Results for objective two suggest that majority of the stakeholders have that that the majority of stakeholders' levels of interest and influence were different. In addition, the level of involvement for most of the stakeholders was co-working. This means that these stakeholders are actively involved in the O&M of boreholes.

Lastly, objective number three results established that results showed that WPCs refresher training was not conducted. Monitoring borehole functionality and coordination was found to be a challenge. Furthermore, results suggest that majority of the WPC uses area mechanics to carry out borehole maintenance. However, the majority of the WPCs were not satisfied with the area mechanics who are responsible for conducting borehole major maintenance. The study further demonstrates that the majority of the WPCs received financial support from politicians for borehole major maintenance. Lastly, the functionality of boreholes was high in boreholes where the level of stakeholder involvement was high. The results are discussed in the next chapter.

CHAPTER 5: DISCUSSION

The chapter discusses findings on community involvement in decision-making during the planning, implementation, and management phase of boreholes, stakeholders' level of interest, influence, involvement, and the role of stakeholders in the provision of rural water supply. Discussion is based on the understanding of the researcher, other related studies, and theories.

5.1 Community Involvement in Decision Making during Planning, Implementation, and Management of the Borehole Project

The extent of community involvement in decision-making regarding borehole implementation was determined. Study results show that the involvement of the community members in decision-making during planning, implementation and management of boreholes was limited in the study area. Where community involvement in decision-making is low, projects fail as collaborated by the study by Mbah *et al.* (2019); Nyakwaka & Benard (2019); Kilonzo & George (2017); Marks *et al.* (2014) who found that where community members were not involved in decision making water projects were unsustainable. The findings suggest that there is a significant positive relationship between community involvement in decision-making and the lack of project sustainability.

Community involvement right from project initiation influences projects performance and empowerment. Mukunga (2012) reported that there was little involvement of the beneficiaries during the project initiation stage of the Kiserian dam water project in Kenya. Similar findings were revealed in this study where the majority of the community members were not involved in decision-making during borehole project initiation.

The limited involvement of communities in decision-making during project initiation has often resulted in minimal community participation during execution and further restricts project performance because community members lack ownership (Leonard, Richard & Emmanuel, 2013). The lack of community ownership of rural water supply projects has been a major threat to operation and maintenance (Mohammed, 2017). This suggests that where community members are involved in initiating the borehole project, O&M is not a challenge because of the community's sense of ownership.

The changing of community proposed borehole location has an effect on O&M of boreholes in the sense that it might increase the distance from point of use hence few people will be using it. In addition, there is potential for borehole management and ownership conflict especially when the new location falls into the other village. The findings suggest that the determination of the best location for boreholes requires consideration of the technical, environmental, social, financial, and institutional issues. However, most communities only consider the social issues which look at community preferences, women's needs, land ownership, and proximity to the point of use as was the case with the study area. Consequently, the change of the proposed borehole location may have a great impact on O&M if the new proposed location is simply imposed on them. Therefore, participatory decision-making methods can be used to determine another borehole location.

Findings on community involvement in deciding the technology option for water supply were consistence with Sakamba (2017) findings which revealed that communities were not given a chance to decide on water supply technologies options that would suit their needs rather donors and agencies made choices on their behalf. The involvement of the community in deciding the water supply technology is imperative for the operation and maintenance of boreholes (Chisenga, 2015).

In Malawi, the provision of water supply technology is mainly supply-driven or donor-driven. The water technology is selected with no community involvement. There are several potential problems of lack of community involvement in decision-making regarding water supply technology that could weaken the sustainability of water projects due to the failure of the communities to conduct O&M. For example, Nyakwaki & Benard (2019) established that the high cost of repairing the solar-powered water supply negatively affected the sustainability of a majority of the water projects (19, n = 25) because the WPC were unable to maintain the systems.

The study further established that, when setting up maintenance funds, water users were not involved instead decisions were made by WPC. The findings are similar to the findings by Shields *et al*. (2021) which showed that some WPCs came to a consensus on decisions without input from community members. Water users are responsible for financing O&M. One of the common challenges that affect O&M is the failure of the WPC to raise funds for O&M (Chowns, 2015). Therefore, a lack of involving community members when setting up maintenance funds will reduce the willingness to contribute money towards borehole O&M. The findings suggest that despite WPC being trained to determine maintenance funds, there is a need for them to consult water users through community mobilization meeting so that the amount charged should be accepted by the community.

Based on the theory of community involvement in decision making, the expected and desired form of community involvement in decision making was Interactive involvement. This form of involvement is where communities participate in joint analysis and development of action plans throughout all the phases of borehole implementation from planning to the management phase (Clayton & Bass, 2002; Roodit, 2001). However, the most dominant form of community involvement in decision-making was passive involvement.

This means that the involvement of communities in decision-making regarding borehole implementation was not done, but rather most decisions were done, and the action took place by the service authorities which include the District Council, service providers which include NGOs, or WPC without the involvement of Water users. In addition, the expected results were that communities are actively involved in decision-making during project initiation, implementation and management of the borehole. However, study findings showed that communities were not involved in all decision-making.

Kilewo & Frumence (2015) identified factors that cause failure to involve the community in decision making which include lack of awareness among community members, poor communication and information sharing, and unspecified roles and responsibilities. In addition, Gambe (3013) suggested that sometimes communities are not involved in decision-making because of the failure of the community members to attend meetings when invited. Hence there is a need to address challenges that affect community involvement in decision-making and community empowerment to ensure full and active involvement of communities in decision-making in all phases of the borehole project.

5.2 Stakeholder's Level of Interest, Influence, and Involvement in O&M of Boreholes

Stakeholder levels of interest, influence, and involvement were analysed. The findings of the study indicate that stakeholders had different levels of interest, influence, and involvement in the O&M of boreholes. The study findings collaborate with the findings of Ahn *et al.* (2019) and Wang *et al.*, (2013) who also found that stakeholders' levels of interest, influence, and involvement were different. This means that potential conflict may arise which may negatively affect the O&M of boreholes if their interests and influence are not managed carefully.

The stakeholder mapping according to the power-interest matrix offered a very useful insight. The matrix gave a hint of who key stakeholders are in O&M. The results are contrary to the expected findings of different stakeholders having the same level of influence, interest and involvement in O&M. However, the study findings collaborate with the findings of Ahn *et al.* (2019) and Wang *et al.*, (2013) who also found that stakeholders' levels of interest, influence, and involvement were different in the water supply. This means that potential conflict may arise which may negatively affect the O&M of boreholes if their' interests and influence are not managed carefully.

The stakeholder mapping according to the interest-influence matrix offered a very useful insight. The matrix gave a hint of who key stakeholders are in O&M. Based on the interest and influence matrix the Ministry of Water and Sanitation, District Council, NGOs, Area mechanics, Water Point Committees, Spare parts suppliers, Water users, and Politicians are key stakeholders who should be managed and actively involved in O&M of boreholes. This is because these stakeholders have a high interest and high influence on the O&M of boreholes as such they can positively or negatively affect O&M (Anh *et al.*, 2019; Wang *et al*., 2013). Consequently, the Ministry of Water and Sanitation, District Council, NGOs, Area mechanics, Water Point Committees, Spare parts suppliers, Water users, and Politicians should be managed and actively involved in the O&M of boreholes. Stakeholders with high interest but little influence in O&M of boreholes can form good partnerships by influencing stakeholders with high interest and influence or stakeholders with low interest but high influence (Anh *et al.*, 2019). Therefore, Community leaders and HSAs should be kept in the circle by keeping them informed. In addition, it is important to keep a good relationship with stakeholders with a high level of interest but low influence for them to maintain their interest in the O&M of boreholes (Wang *et al.*, 2013).

The finding on the level of stakeholder involvement in O&M collaborates with the findings of Anh *et al.* (2019) who found that the majority of the stakeholders in drinking water supply their level of involvement was Co-working. This is because these stakeholders possess high power, legitimacy, and a sense of urgency. The findings suggest that the majority of the stakeholders can participate and contribute actively to the O&M of the borehole. Thus, the MoWS, NGOs, area mechanics, and spare parts suppliers are stakeholders who should actively be involved in the O&M of boreholes The lack of sense of urgency by the district council can be explained by the limited human resources and lack of funds to carry out the O&M of boreholes. While for politicians, their support in O&M is concentrated and speedy when close to election time because their support is used as a campaign to win elections. However, the District council and Politicians should be consulted to gain full information and opinion which will help to improve the efficiency of O&M as highlighted by Yang *et al.* (2019).

5.3 Different Stakeholders' Role in Rural Water Supply

Analysis of the role of key stakeholders in O& M of boreholes showed that despite the District Council being given the mandate to coordinate all O&M activities following the decentralisation policy (Lockhood & Kang, 2012), the District Council was not able to perform most of their O&M roles. This was attributed to political interference in the provision of O&M and limited human resources. Furthermore, the District Council under the Water Department does not have a budget line for O&M of water supply facilities. The findings are inconsistence with Oates & Mwathunga (2018), Soublire & Cloutier (2015& Chowns (2015). This means that District Councils cannot effectively perform their role without support from other stakeholders. The results suggest that the O&M framework that highlights the roles of different stakeholders with proper O&M guidelines and financing arrangements for O&M is not available.

One surprising finding is that politicians were found to play a significant role in O&M through the provision of financial support for borehole maintenance. External support for O&M has proved to improve the functionality of boreholes (Chowns, 2015; Smit *et al.,* 2013). However, practically, most of the financial support towards O&M as in the construction of new boreholes is attributed to the quest to gain fame to win an election as noted by Oates & Mwathunga (2018). In addition, Politicians mostly provide support to communities without proper coordination with other key stakeholders like the District Council which may not be a long-lasting solution to O&M challenges experienced in most communities. Nevertheless, the findings mean that politicians can play a significant role in O&M if their interests can be aligned with the common goal of ensuring the sustainable supply of safe water to rural communities other than winning elections.

Although Government stakeholders and NGOs were reported to be responsible for the provision of Community Based Maintenance (CBM) training, once-off training is not enough for the WPC to operate and maintain boreholes constantly. According to Kativhu *et al*. (2022), WPC training involves refresher training for those who would have been trained before and introductory training for new committee members. On the other hand, the results of this study established that all sampled WPCs did not receive refresher training. In addition, the first training was not enough for them to O&M boreholes effectively. This is because WPC members may have forgotten what they learnt during the first training because results showed that most WPCs had stayed in the WPC longer than 3 years. The findings are in tandem with Nyakwaki & Benard (2019) who established that WPC was unable to conduct operations and maintenance because of the adequate training they received.

Lack of refresher training may be associated with limited funding by the district council which are responsible for borehole project during the post-construction phase. Chowns (2017) recommends moving away from the committee model and instead investing in training a smaller number of Area Mechanics and financing their work directly, via contracts with District Water Offices which may even be cost savings, since there will be no water point committee training. However, WPC management and administrative training are still crucial as area mechanics are only responsible for borehole monitoring and maintenance. Therefore, there is a need for stakeholders to incorporate refresher training in their plans and budgets. In addition, as suggested by Ferrero et al., (2019), there is a need to conduct WPCs capacity evaluation to determine the need for refresher training.

Results show that borehole monitoring is not conducted despite being mentioned as the responsibility of the District Council and area mechanics. This is inconsistent with the findings of Oates & Mwathunga (2018) who reported that borehole monitoring was not conducted in most rural areas. Financial constraints and lack of human resources were the main reasons found for the lack of effective monitoring of boreholes. Similar challenges were reported by Soubliere & Cloutier (2015) and Oates & Mwathunga. Effective borehole monitoring is key for successful O&M of boreholes which leads to the functionality of boreholes. Where there is a lack of borehole monitoring, water points fail. MacAllister *et al.,* (2020) established that monitoring led to a rapid increase in the functionality of handpumps because it helped to facilitate more responsive and proactive maintenance. In addition, monitoring data can also be used to inform future O&M interventions. Therefore, there is a need for government, agencies, and other relevant stakeholders to invest in and provide strong borehole monitoring programmes even during the post-construction phase.

It is worth noting that the majority of the WPC indicated that they were not satisfied with the area mechanics arrangement because they are expensive and do not respond to the breakdown in good time. The findings collaborate with the findings of Marks *et al.* (2014) who found that despite the area mechanics being responsible for the major technical task, a substantial share of committees reported difficulties getting area mechanics to come to the community when needed. This is a clear indication that few area mechanics are responsible for a large area and hence may not be available when needed because they are attending to other boreholes.

The findings further suggest that WPC were not involved during the identification and training of area mechanics. As such most WPC claimed that the use of area mechanics to conduct borehole maintenance is expensive especially when area mechanics fail to conduct maintenance because the borehole did not break down after WPCs pay the service fee which is paid in advance at the beginning of the year. However, area mechanics are supposed to still conduct borehole monitoring and preventive maintenance which most of them fail to carry out. The study also noted that the functionality of the borehole in the study area was high where the level of stakeholder involvement in O&M was also high. However, the physical condition of most boreholes was not good. This means that majority of the WPCs are more interested in having the water flow at the borehole and overlook the physical condition of the boreholes which is also key for O&M. This may eventually lead to the non-functionality of the boreholes over time. Hence, the functionality should go beyond simply having water flowing at the borehole, but the physical condition of the borehole should be incorporated.

The high functionality rate in the study area could be associated with the training of WPCs, the provision of O&M support by the politicians, the presence of area mechanics who perform borehole maintenance and the presence of spare parts supply chain which were found to be the main roles stakeholder played in most boreholes. The findings collaborate with the findings of Kativhu *et al*., (2018); Chowns (2015); Smits *et al*. (2013) and the study confirmed that post-construction support and presence of area mechanics, capacity building and availability of borehole spare parts increased the functionality and performance of boreholes.

5.4 Summary of the Discussion Chapter

The study was based on the theories of community involvement in decision-making and stakeholder analysis. For the first objective, the expected result was that communities are fully involved in decision making which leads to effective collaboration and functionality of boreholes. However, the study findings established that community members were not involved in making all the decisions. The expected results for the second objective were that all stakeholders have the same level of interest and influence in O&M. The study findings revealed that stakeholders had different levels of interest and influence. In addition, their level of involvement was also different depending on the possession of power, legitimacy and urgency. The third objective expected results were that the sampled stakeholders have clearly defined roles and responsibilities in O&M and that they can perform on the ground. Study findings suggest that stakeholders' roles and responsibilities are well defined. However, most stakeholders do not fully perform their roles on the ground.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study aimed at analysing stakeholder involvement in O&M of boreholes in rural areas. This was done by determining the extent of stakeholder involvement in decision-making regarding boreholes throughout the project cycle, determining different stakeholder's level of interest, influence, involvement, and roles of different stakeholders in borehole O&M. Focus group discussion, key informant interviews, household survey, stakeholder's interview questionaries, and observation were used to collect data. Data were analysed using descriptive analysis, content analysis, and thematic analysis.

Based on the findings it can be concluded that the involvement of the community in decision-making was inadequate. There was little community involvement in decision-making during borehole project initiation, deciding the water supply technology option, deciding alternative borehole location and setting up the O&M fund. This study further concludes that communities were not empowered to actively participate in decision-making. Lack of community empowerment results in low participation in decision making resulting in boreholes that are not sustainable in the long term. Therefore, participation must take place in all stages of borehole projects from initiation, planning, implementation, and management phase.

From the findings of the stakeholder analysis, it can be concluded that stakeholders had different levels of interest, influence, and involvement in O&M. However, the majority of the stakeholders' interest and influence levels ranged from medium-high to high. The stakeholders with high influence and interest are key stakeholders hence they should be actively involved in making decisions. In addition, these stakeholders have a strong ability to facilitate the implementation of

O&M activities and cause others to act because of their high influence. Lastly, most stakeholders are not actively involved in O&M because their level of involvement was co-thinking. Stakeholders with co-thinking as the level of involvement have solid interests in the outcome of the O&M. Therefore, before engaging stakeholders in O&M, there is a need to effectively manage their interest and influence to align themselves to the project aims and also ensure that they are actively involved in O&M activities.

The study concludes that most key stakeholders do not fully play their role in the O&M of boreholes despite having clearly defined O&M roles. The study established that WPC does not receive refresher training, the district council fails to coordinate O&M activities, and borehole monitoring is not conducted. It can be concluded that there is no well-defined O&M framework that defines the roles of different stakeholders with clear guidelines for O&M implementation, best O&M approaches, and financing arrangements of O&M. Overall the results demonstrate that there is weak involvement of stakeholders in O&M of boreholes which have led to the ineffective collaboration of stakeholders. This has resulted in low functionality and sustainability of the boreholes results of this study are an important first step toward developing mechanisms for effective stakeholder engagement in the delivery of rural water supply services. Furthermore, this study is the first attempt to analyse stakeholders involved in the O&M of boreholes using stakeholder analysis methods. There is a need to successfully establish and implement a system for effective and efficient involvement of stakeholders throughout the water supply system. In addition, the study tried to determine the role stakeholders play in O&M on the ground by analysing the identified roles of each stakeholder and analyse the performance of their roles through WPC and Community Leaders.

6.2 Recommendations

Based on the results and conclusion the following are the recommendations for this study.

(a) Before borehole drilling, all water service providers should sign a Memorandum of Understanding (MoU) with the community members and District Council which should guarantee community participation in decision-making in all borehole project phases.

(b) Water service providers should consult community members when selecting an alternative borehole location and water supply technology.

(c) Before the implementation of any water supply projects and O&M programs, stakeholder analysis should be conducted to identify key stakeholders and manage their expectations and interests.

(d) The District Council together with other WASH stakeholders should collaborate with politicians in providing support for O&M. Furthermore, when communities ask for support from MP, the need assessment must be conducted by the community members together with District Council water technocrats and extensional workers so that the support provided should not have any attachment of political agenda.

(e) Water point training must shift from single training actions to a capacity-building program approach. The program should be continuous, and demand-driven to respond constantly to the emerging needs of the rural water sector.

(f) The identification and establishment of area mechanics should be done in consultation with community members for them to understand and adopt the concept.

(g) To improve the functionality and sustainability of boreholes the government under the MoWS and District Council in partnership with other key stakeholders should develop an O&M framework that highlights the roles of different stakeholders with legal and policy

framework, best O&M approaches, and financing arrangement of O&M. In addition, all water stakeholders operating in the rural water supply sector should comply with the developed framework.

Hypothetically, this study has contributed to the increase of the available literature that explains the role of stakeholder involvement in the O&M of boreholes. Once published, this literature will be available to every interested party. Further study should be conducted to analyse the benefits and challenges of stakeholder involvement in O&M and identify criteria for evaluating the effectiveness of stakeholder involvement in rural water supply sustainability. In addition, stakeholder analysis should combine focus group discussion and survey interview questionnaires. Lastly, an evaluation of the role of stakeholders in O&M should be conducted by increasing the sample size of WPC and boreholes. It should be noted that the interests and influence of stakeholders typically change over time because stakeholders may form alliances to either promote or defeat the outcomes of O&M of boreholes. Therefore, the impact of such change should be considered. Hence, further studies can be conducted to identify potential areas for stakeholder alliances.

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APPENDICES: ADDITIONAL INFORMATION TO THE STUDY

Appendix A: Methodology Matrix

Table 8: Methodology Matrix

Objective	**Sampling Methods**	**Sample Size**	**Data Collection Method**	**Data Analysis**
To determine the extent of community involvement in the decision-making of boreholes in the Salima District.	Random Sampling Purposive Sampling	385 Households 95 People (17 WPC & 7 groups of Community Leaders)	Household Survey Focus Group Discussion	Descriptive Statistics Thematic and Content analysis
To determine the level of interest, influence, and involvement of stakeholders in boreholes O&M in the Salima District.	Purposive Sampling	50 Stakeholders	Stakeholder Survey	Descriptive Statistics (Mean)

Objective	**Sampling Methods**	**Sample Size**	**Data Collection Method**	**Data Analysis**
To evaluate the role of key stakeholders in the operation and maintenance of rural water supply in the Salima District.	Purposive Sampling Purposive and convenience Sampling Purposive Sampling	95 People (17 WPC & 9 groups of CLs) 144 Boreholes 40	Focus Group Discussion Observation Key Informants Interview	Thematic and Content analysis Descriptive Statistics Content analysis And Descriptive statistics

Appendix B: List of Sampled Villages (*n* = 54)

Ndevu	Mawala	Ndindi	Chigo	Mlambe
Ngwena	Phonda	Chiphuka	Msampha	Tambala
Matewere	Lifizi	Chimonga	Agwirize	Chazima
Kalowa	Mwanza	Mzenene	Khuthe	Makande
Kandulu	Lisala	Kumtupa	Chichiri	Mphiri
Kwidzi	Mkwenembera	Kalambala	Waya	Mtapike
Chemuka	Chilimani	kuntumbuka	Amosi	Mazengere
Kuchipoka	Phaka	Kainga	Chisamba	
Mpundu	Mgware	Kamtumbiza	Chaponda	
Sani Maganga	Chilembe	Alice	Akwacha	
Lisanja	Mtungundula	Milala	Mtapika	
Kamtolozi	Chilembe	Magumbwa	Mpala Ngwazi	

Appendix C: Focus Group Discussion Guide

Facilitator's welcome, introduction, and instructions to participants

Welcome and thank you for volunteering to take part in this focus group. You have been asked to participate as your point of view is very important. I realize you are busy, and I appreciate your time.

Introduction: This focus group discussion is designed to understand your general knowledge and memory on whether you were involved in decision making during planning, borehole construction, and after construction and also on the role of stakeholders in the rural water supply.

The focus group discussion will take no more than one and a half hours. May I tape the discussion to facilitate its recollection?

Anonymity: Despite being recorded I would like to assure you that the discussion will be anonymous. The audios will be kept safely in the folder until they are transcribed word for word, and then they will be deleted. The transcribed notes of the focus group will contain no information that would allow individual subjects to be linked to specific statements. You should try to answer and comment as accurately and truthfully as possible. I and the other focus group participants would appreciate it if you would refrain from discussing the comments of other group members outside the focus group. If there are any questions or discussions that you do not wish to answer or participate in, you do not have to do so; however please try to answer and be as involved as possible.

Community Involvement in decision Making

The main objective of this section is to collect information about the decision-making related to borehole development, implementation, and management.

1. Were you (community) consulted in all aspects of the borehole development and implementation?
2. Describe the consultation process?
3. Was the community involved in decision making regarding the following:

- Borehole initiating
- location of the borehole
- Technology type
- Maintenance arrangement of boreholes
- Setting up a maintenance fund
- Setting up WPC

4. Describe the decision-making process?
5. Which group of people were involved in making the decision in question 3 above?
6. In your view how does the above aspect of decision-making in question 3 affects the operation and maintenance of boreholes in Salima?

The role of stakeholders in O&M

- Have ever received any support from Stakeholders
- What role do key stakeholders play in O&M (District Council, Ministry, NGOs, Area mechanics, Politicians, Spareparts Suppliers)
- What kind of support did you receive?
- What challenges are you currently facing that affect O&M

Conclusion

- Thank you for participating. This has been a very successful discussion
- Your opinions will be a valuable asset to the study
- We hope you have found the discussion interesting
- If there is anything you are unhappy with or wish to complain about, please contact the persons that have been highlighted for such on the consent form that you have signed.
- I would like to remind you that any comments featured in this report will be anonymous

Appendix D: Household Survey Questionnaire Form

Introduction

Interviewer:……..Village:……..……

Time:……Date:……

PART 1 – HOUSEHOLD DETAILS

Q1. Gender of the respondent

(a) Male (b) Female

Q2. How many people live in this house?

(a) 1 person (b) 2 persons (c) 3 persons (d) 4 persons (e) 5 persons

(f) 6 persons (g) 7 persons (h) More than 7 persons

Q3. How many of your household members belong to these age categories?

Age Brackets (Years) No

(a) Day 1 – 10 (b) 11 – 20 (c) 21 – 30 (d) 31 – 40 (e) 41 – 50

(f) Above 50

Q4. What is the respondent's highest level of education?

(a) No formal education (b) Primary level (c) Secondary level (e) Diploma level

(f) University level

Q5. How many years have you been living in this area?

(a) Less than one year (b) 1year (c) 2 – 5 years (d) 6 – 10 years

(e) Above 10 years

Q6. What is the household's main source of income?

(a) Farming (b) Casual Labour (c) Employment (d) Trading /small business

€ Other specify……

Q7. What is the household monthly income?

(a) Mk 5,000 and below (b) Mk 5,001 – 10,000 (c) Mk 10,001 – 15,000 (d) Mk 15,001 – 20,000 (e) Mk 20,001 – 25,001 (f) Mk Over 25,001

(h) Don't know

Part 2. Community Participation in Decision Making

Q8. Who initiated the installation of this borehole?

(a) Community (b) An outside organization (c) Government (d) Don't Know

(e) Others Specify……

Q9. Who installed?

(a) Community (b) District Govt / DWO (MADREF) (c) National Govt / MOIWD

(d) NGO (e) Muslim Society (f) Do not know (i) Other specify……

Q10 Were the community involved in deciding the borehole location?

(a) Yes (b) No (c) Don't Know

Q11. If yes, what factors did you consider when choosing the location of the boreholes

Q 12. Was the community involved in deciding the technology to be installed?

(a) Yes (b) No (c) Don't know

Q 13 a. Are you satisfied with the borehole?

(a) Yes (b) No

Q 14 b. If yes, why…….

(a) It is easy to maintain (b) Spare parts are readily available (c) Source of safe water

(e) All of the above

Q 15 c. If no, why?.....

Q16. Was the community involved in deciding the operation and maintenance arrangements of the borehole?

(a) Yes (b) No (c) Do not Know

Q 17. Was the community involved in deciding the financing arrangement of O&M?

(a) Yes (b) No (c) Do not Know

Q 18. What is the payment arrangement?

(a) Per container (b) Per month (c) Per years (d) When there is a need for maintenance (e) Other specify…….

Q19. Were you involved in deciding the payment arrangement of boreholes?

(a) Yes (b) No

Q 20. Who decided the amount be paid?

(a) Community Members (b) Waterpoint Committees (c) Community Leaders (d) Government (e) Borehole providers (f) Others specify……

Q 21. Who chose the water committee members?

(a) Community leaders (b) Community members (c) Government

(d) Non-Governmental organisation (e) Do not Know (f) Others specify……

Q 22. How long does the committee serve when elected?

(a) 1 year (b) 2 years (c) 3years (d) 4- 5 years (e) Forever

End of Questions

Thank You for Your Participation

Appendix E: Interview Questionnaire for Conducting Stakeholder Analysis

Survey Questionnaire for analyzing stakeholder interest, influence, and stakeholder involvement in O&M of boreholes.

Date of taking the Survey Job Description : Name of the Institution Email Telephone	

Based on your experience with rural water supply, rank the stakeholder on a scale of 1 (lowest) to 5 (highest) based on their level of interest, influence (power), Urgency, and legitimacy in the operation and maintenance of rural water supply.

The ranking is divided on a scale of 5 as follows

1. Low
2. low-medium
3. medium
4. medium-high

5. high

Note:

Influence - The power that stakeholder possesses (e.g. resource power, knowledge, or experts)

Interest - The stake that stakeholders have or those who are affected by the outcome.

Urgency- Need for immediate attention.

Legitimacy- Determination of whether stakeholder involvement is appropriate.

Stakeholder	**1**	**2**	**3**	**4**	**5**	**Comment**
MoWS						
District Council						
NGOs						
Muslim Association						
Politicians						
Water Users						
Spare parts Suppliers						
Community Leaders						
Area Mechanics						
HSAs						
WPC						

Thank You for your participation!!!

Appendix F: Interview Guide for the Key informants (Stakeholders)

The role of stakeholders in O&M

1. What role do you play in O&M? (**Cross check with the list of the predefined O&M roles below**)
    a. Capacity Building includes the provision of any kind of training to WPC including refresher training for smooth operation and maintenance of boreholes. In addition, the provision of training to stakeholders.
    b. Monitoring includes all monitoring supports provided to WPC which includes monitoring boreholes functionality, WPC, and area mechanics.
    c. Financing O &M includes the provision of funds for O &M, assisting WPC in raising maintenance funds, and provision of external support in terms of finances for O&M.
    d. The spare parts supply chain includes selling spare parts, provision of spare parts to WPC, and linking WPC to spare part suppliers or dealers.
    e. Coordination includes coordinating stakeholders and all O&M activities.
    f. Routine maintenance of boreholes includes conducting borehole routine maintenance, preventive maintenance, and borehole rehabilitation. Conducting routine maintenance can be done directly by the concerned stakeholder or indirectly by hiring people to maintain.
2. What steps were taken/ are you taking to ensure that you fully perform your role??

3. Do you think Waterpoint Committees have been empowered enough to carry out Operation and Maintenance through your support?
4. Describe the working relationship you have with water point committees?
5. Are there any challenges that hinder the performance of your roles? What aspects do you think need to be addressed to improve your performance in O&M activities?

Appendix G: Interview Guide Questionnaire for Stakeholder Identification

The following questions were asked during interviews with the DWDO and NGO representative for identifying stakeholders in the involvement in O&M in rural water supply interviews.

1. Who will be affected?
2. Will the impacts be local, national, or international?
3. Who has the power to influence the outcome?
4. Who are the potential allies and opponents?
5. What coalitions might build around this issue?
6. Are there people whose voices or interests in the issue may not be heard?
7. Who will be responsible for managing the outcome?
8. Who can facilitate or impede the outcome through their participation, non-participation, or opposition?
9. Who can contribute financial or technical resources?

Appendix H: Water points observation checklist

#	Village Name	Name of BH	Donor	Installation Date	Functionality Status	Borehole Physical Condition
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
***n* =144**						

Appendix I: National Council for Science & Technology (NCST) Ethical Clearance Letter

NATIONAL COMMISSION FOR SCIENCE & TECHNOLOGY
Lingadzi House
Robert Mugabe Crescent
P/Bag B303
City Centre
Lilongwe
Tel: +265 1 771 550
+265 1 774 189
+265 1 774 869
Fax: +265 1772 431
Email:directorgeneral@ncst.mw
Website:http://www.ncst.mw

NATIONAL COMMITTEE ON RESEARCH IN THE SOCIAL SCIENCES AND HUMANITIES

Ref No: NCST/RTT/2/6 **29th November 2019**

Ms Charity Mithi,

Principal Investigator,

Water Missions Malawi,

P.O. Box 31871,

Lilongwe.

Email: charimithi@gmail.com

Dear Ms Mithi,

RESEARCH ETHICS AND REGULATORY APPROVAL AND PERMIT FOR PROTOCOL NO. P.10/19/436: THE ROLE OF POWER RELATIONS ON EFFECTIVE OPERATION AND MAINTENANCE OF RURAL WATER SUPPLY: CASE OF SALIMA

Having satisfied all the relevant ethical and regulatory requirements, I am pleased to inform you that the above referred research protocol has officially been approved. You are now permitted to proceed with its implementation. Should there be any amendments to the approved protocol in the course of implementing it, you shall be required to seek approval of such amendments before implementation of the same.

This approval is valid for one year from the date of issuance of this approval. If the study goes beyond one year, an annual approval for continuation shall be required to be sought from the National Committee on Research in the Social Sciences and Humanities (NCRSH) in a format that is available at the Secretariat. Once the study is finalised, you are required to furnish the Committee and the

Committee Address:
Secretariat, National Committee on Research in the Social Sciences and Humanities, National Commission for Science and Technology, Lingadzi House, City Centre, P/Bag B303, Capital City, Lilongwe3, Malawi. Telephone Nos: +265 771 550/774 869; E-mail address: ncrsh@ncst.mw

Commission with a final report of the study. The committee reserves the right to carry out compliance inspection of this approved protocol at any time as may be deemed by it. As such, you are expected to properly maintain all study documents including consent forms.

Wishing you a successful implementation of your study.

Yours Sincerely,

Yalonda .I. Mwanza
NCRSH ADMINISTRATOR
HEALTH, SOCIAL SCIENCES AND HUMANITIES DIVISION

For: CHAIRMAN OF NCRSH

Appendix J: Letter of Approval from Salima District Council

All correspondences should be addressed to:

The District Water Development Officer
Salima District Council
Private Bag 15,
Salima.
Mobile: 0999661149/0884253535

DATE: 30/09/2019

To: Charity Mithi
Water Missions International
BOX 31871
Capital City
Lilongwe 3

Dear Charity,

LETTER OF APPROVAL TO CHARITY MITHI TO CONDUCT RESEARCH ON OPERATION AND MAINTENANCE ISSUES IN TA NDINDI OF SALIMA DISTRICT

I write on the above to allow you to do your research in Salima in the said Traditional Authority. As a district we are rocked with so many water management issues that have a big bearing on sustainability of water systems or water points. TA Ndindi has not been spared on this and researchers like you are most welcome to help us to unearth the root causes of the issues. It is our wish that the findings and recommendations of your research are going to alleviate some of the water management issues not only in TA Ndindi but also in the entire district of Salima.

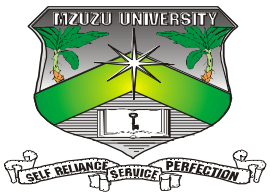
We look forward to forward to your coming and be assured of maximum support during your entire period of research.

Yours faithfully,

Salima Water Development Office
Department of Irrigation and Water Development
30 SEP 2019
PO Box 60
Salima

Waki Martin Chungwa
District Water Development Officer

Appendix K: Consent Letter to Take Part in the Research



Faculty of Environmental Sciences

Department of Water Resources Management and Development

Mzuzu University

P/Bag 201, Mzuzu 2, Malawi

Informed Consent Form for Research on the role of power relations in the operation and maintenance of rural water supply

Introduction

I am a student at Mzuzu University. I am researching the role of power relations in the operation and maintenance of rural water supply**.** This consent form may contain words that you do not understand. Please ask me to stop as we go through the information, and I will take the time to explain. If you have questions later, you can ask them of me or another researcher.

Purpose of the research

This research aims to examine the nature and role of power relations in the operation and maintenance of boreholes in Salima district, traditional authority Ndindi.

Type of Research Intervention

This research will involve your participation as an individual. You will be interviewed on your general knowledge of rural water supply and sustainability (O&M).

Participant Selection

You are invited to take part in this research because you have knowledge and experience in the provision of water supply in rural areas and can give the right information regarding the research area**.**

Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. If you choose not to participate nothing will change. You may skip any question and move on to the next question.

Duration

The research takes place for 6 months.

Risks

You do not have to answer any question or take part in the discussion/interview/survey if you feel the question(s) are too personal or if talking about them makes you uncomfortable.)

Reimbursements

You will not be provided with an incentive to take part in the research.

Sharing the Results

The knowledge that we get from this research will be shared with you and your organization before it is made widely available to the public. Following, we will publish the results so other interested people may learn from the research.

Who to Contact?

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact:

1. Dr. Victor Katsulo, Mzuzu University, Department of water resources, P/Bag 201, Mzuzu 2, Cell: +265888343494.

2. NCRSH Secretariat, National Commission for Science and Technology, P.O. Box 30745, Capital City Lilongwe 3, Malawi, Cell: +265 771550 or +265 1774869.

Do you have any questions?

Part II: Certificate of Consent

I have been invited to participate in research about the role of power relations in the operation and maintenance of rural water supply.

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked to have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Print Name of Participant_____

Signature of Participant _____

Date _____

Day/month/year

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands the research project. I confirm the participant was allowed to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Signature of Researcher /person taking the consent_____

Date _____ Day/month/year