



**ASSESSING COMMUNITY INVOLVEMENT FOR SUSTAINABLE WATER SUPPLY  
MANAGEMENT IN RURAL AREAS: A CASE STUDY OF GAIRO DISTRICT  
COUNCIL, TANZANIA**

**BY**

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## **DEDICATION**

I dedicate this work to my parents Mr. and Mrs. Richard Mduma. Thank you for your support. I also dedicate to all my mentors who have been supporting me throughout my education and beyond.

## DECLARATION

I, Gidion Richard Mduma, declare that this thesis is my own original work and it has not been presented and will not be presented by me to any other university for similar or any other degree award. I also declare that all information and sources of material used for this thesis have been fully cited and referenced in accordance with the academic rules and ethics.

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## ADVISOR APPROVAL SHEET

This is to certify that the thesis entitled “**Community involvement for sustainable water supply management in rural areas: A case study of Gairo District Council, Tanzania**” submitted in partial fulfillment of the requirements for the degree of **Master of Science in Water Policy**, the Graduate Program of the Pan Africa **Institute for Water and Energy Sciences (incl. Climate Change)**, and has been carried out by **Gidion Richard Mduma** Id. No **PAUWES/2022/MWP09**, under my supervision. Therefore, I recommend that the student has fulfilled the requirements and hence hereby can submit the thesis to the Water Program for defense.

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## EXAMINERS' APPROVAL SHEET

This topic: Community involvement for sustainable water supply management in rural areas: A case study of Gairo District Council, Tanzania

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## ACRONYMS

CVT	Civic Voluntarism Theory
CBWSOs	Community-Based Water Supply Organizations
CVI	Content Validity Index
EMA	Environmental Management Act
FGDs	Focus Group Discussion
NAWAPO	National Water Policy
PAUWES	Pan Africa Institute for Water and Energy Sciences
RUWASA	Rural Water Supply and Sanitation Agency
SPSS	Statistical Package for Social Sciences
WRMA	Water Resources Management Act
IWRM	Integrated Water Resources Management
WASH	Water, Sanitation and Hygiene

## ABSTRACT

Globally, community participation and sustainability of rural water supply projects have been major concerns. This study looked at the assessment of community involvement for sustainable water supply management in Gairo district council, Tanzania. Specifically, the study aimed to assess the levels of community involvement in water supply projects in different phases, identify social-economic, policy, environmental, and management factors that affect sustainable water supply management, and determine the effect of community involvement on the sustainability of water supply management. Primary and secondary data were collected from the study area by considering various project management factors. Primary data was collected through questionnaires, interviews, focus group discussions (FGDs), and observations. A total of 30 questionnaires were prepared and distributed to targeted community members and project staff in Gairo District. A total of 13 questions were also prepared for group discussion purpose. In the district, 50 project staff and 150 beneficiaries from each village were purposefully selected. The collected data was analyzed using the Statistical Package for Social Sciences (SPSS) to visualize the result in various expression forms (frequencies, percentages, correlations, and significant values). Correlation and significant values were performed to assess social, environmental, economic and management factors that affect sustainable water supply project management. The results indicate that age, education level, cost of water, quality of water, distance to water sources, and specialized training had a negative influence on the probability of households participating in water supply projects. However, the study identified policy, environmental, and management factors that affect positively sustainable water supply project management. The study indicated that 40.7% of respondents reported the regulatory framework as a policy problem. The study indicated 48.7% of respondents reported climate change impact as the main environmental problem. Adapting water supply projects to climate change considerations is crucial for their long-term viability. Lastly, the study indicated that 50.7% of respondents reported operation and maintenance as the main management water project-related problems. Overall, based on the findings of the study, it can be concluded that community involvement in Gairo District water supply management is crucial for sustainability and long-term benefits. The researcher recommends that community members have to be actively involved in decision-making at all stages of water supply project to ensure sustainability.

**Keywords:** Community Involvement, Gairo District, Monitoring and Evaluation, Sustainability, Water Project

# CHAPTER ONE: INTRODUCTION

## 1.1 BACKGROUND INFORMATION

Water resources are globally recognized as crucial for socio-economic development and ecosystem preservation (Hasan et al., 2020). It needs management that aims to optimize natural water flows, including surface water and groundwater, to meet competing needs. Climate change adds complexity, with some regions experiencing increased water availability while others face scarcity (Ricciardi et al., 2022). Well-managed water resources are vital for growth, poverty reduction, and equity. Access to safe drinking water and sanitation services is fundamental for human well-being and community development, particularly in rural areas (Almeida et al., 2022). Despite efforts to ensure water availability and access, sustainability of such projects faces significant challenges due to inadequate of community involvement, limited resources, inadequate infrastructure, and socio-economic disparities (Candido et al., 2022). According to Abubakar (2019), water issues in rural areas have become a stressful situation that makes it among the top challenges facing rural communities globally in recent years. More than one billion people, especially the majority of whom live in rural areas, do not have access to safe drinking water.

According to Martínez-Santos (2017), 25 billion people 65% of the rural communities worldwide have limited access to functional drinking water supplies within their homes, while only 35% of rural water supply systems are able to operate. Therefore, community involvement in rural water supply services is considered one of the options for achieving the sustainability of water supply projects. Marks et al. (2014) reported that community involvement is one of the important conditions essential for the implementation of projects and largely contributes to the sustainability of water supply by resolving problems related to willingness and ability to pay user fees and take good care of the water points, hence ensuring the sustainability of water. However, despite all the efforts to ensure sustainable water supply systems, it is proving difficult in many parts of the world (Herslund & Mguni, 2019).

In sub-Saharan Africa, an estimated 250 million people lack clean drinking water, and 81% of the rural population lacks sanitation facilities (Abubakar, 2019). According to Herslund and Mguni (2019), the challenge facing water supply projects in Sub-Saharan Africa is limited by community involvement to increase water service maintenance, and it is estimated that 70% of households and

water supply projects in Sub-Saharan Africa are not efficient at any given time (Martínez-Santos, 2017).

Women and children bear the burden of water collection, enduring long and risky journeys that hinder education, work, and family care. Access to clean water empowers women, creates opportunities, and enables children to receive education, benefiting communities as a whole (Hamlet et al., 2021).

The study conducted by Candido et al. (2022) shows that many households are suffering from gaps caused by a lack of water project sustainability, and only 55% of the water projects remain functional at any given time after successful implementation. This is affected to a large extent by inadequate community involvement in terms of decision-making, provision of resources, and lack of initiating actions, which results in poor sanitation and water-borne diseases (Marks et al., 2014).

In Tanzania, water supply historically favored urban areas and colonial settlements. To address this bias, a Rural Water Supply Programme from 1971 to 1991 aimed to provide safe and accessible water within a 400-meter distance from households (Adams et al., 2019). Since the 1990s, water project management has shifted to decentralized and participatory approaches, supported by national policies and acts emphasizing community involvement (Seijger, 2023).

Recent legislation, such as the Water Supply and Sanitation Regulatory Act of 2019, aims to improve regulation and oversight (Hofmann, 2022). While sustainable Development Goal (SDG-6) requires universal and equitable access to safe and affordable drinking water for all by 2030, this appears difficult to implement, especially in Tanzania's rural areas. According to Hofmann (2022), in 2021 Tanzania targets having 80% of its rural population have access to adequate, clean, and safe water. However, only 51% (22 million people) of the rural population reportedly has access to adequate, clean, and safe water.

According to Candido et al. (2022), the sustainability of rural water supply projects in rural Tanzania remains a major challenge. He also proposed effective community involvement and the separation of power and roles among various stakeholders in water supply projects to ensure long-term sustainability. Herslund and Mguni (2019) indicated that current access to clean water per

person in Gairo District Council is 17.5 liters per day per person, which is below the WHO recommended minimum water volume (50 to 100 liters per person per day) to ensure that most basic needs are met and few health concerns arise (WHO, 2019).

Previous studies suggested that sustainable availability of water depends, among others, on responsible consumption (SDG-12), proper management of water projects (SDG-6), and the participation of gender/communities (SDG-5) and promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels (SDG-16), which are crucial in ensuring water supply sustainability (Sweya et al., 2021). Community involvement has emerged as a key approach to enhance the sustainability and impact of water supply projects, requiring inclusive planning, equitable access to information, and involvement of all stakeholders (Huttunen et al., 2022).

## **1.2 STATEMENT OF THE PROBLEM**

A sufficient, safe, acceptable, affordable, and easily accessible water supply is essential for any community, including Gairo settlements. However, lack of water project sustainability has become one of the greatest challenges facing the Tanzanian community currently, with Gairo rural communities being the worst hit. According to Huttunen et al. (2022), community involvement in the implementation of water supply projects plays a crucial role in empowering communities, fostering collective action, and increasing ownership of water supplies. Seijger (2023) also further emphasized the importance of community involvement for sustainable water services. Community-based water supply organizations were established to ensure safe and clean water availability and proper sanitation in the community. Herslund and Mguni (2019) have reported that the community's involvement in project implementation is still inadequate.

Despite the substantial investments and efforts made by the Tanzanian government and donors in implementing water supply projects in Gairo district council, there are concerns regarding the long-term sustainability of these initiatives. Further information regarding community involvement in project sustainability in the Gairo district council remains unclear. The general perception is that the district authority's inability to adequately involve the community in all stages of water project development threatens to undermine the sustainability of water supply projects at Gairo district council.

Previous studies have focused on the participation, effectiveness, sustainability and technical capabilities of community in running water supply projects (Gwamaka, 2017; Huttunen *et al.*, 2022; Seijger, 2023). There are scanty of information on studying the community involvement and sustainability of water supply project management (Herrera, 2019; Herslund and Mguni, 2019; Wamsler *et al.*, 2020; Ren *et al.*, 2020). Even those which have focused on sustainability of water supply project management in Tanzania urban areas, community's involvement in rural areas project management were not conducted in Gairo district council. The proposed study aimed to explore the relationships between community involvement and sustainability of water supply project management established in Gairo district council.

### **1.3 OBJECTIVE OF THE STUDY**

#### **1.3.1 GENERAL OBJECTIVE**

The overall objective of this study was to assess community involvement for sustainable water supply management in Gairo district council, Tanzania.

#### **1.3.2 SPECIFIC OBJECTIVES**

- i. To assess the levels of community involvement in water supply projects in different project phases
- ii. Identifying socio-economic, policy, environmental and management factors that affect sustainable water supply project management in rural areas
- iii. To determine the effect of community involvement on the sustainability of water supply projects

### **1.4 RESEARCH QUESTIONS**

- i. At what levels does the community participate in water supply projects in different project phases?
- ii. What are the different socio-economic, policy, environmental and management factors that affect sustainable water supply project management in rural areas?
- iii. What are the effects of community involvement on the sustainability of water supply projects?

### **1.5 HYPOTHESIS**

- i. Null Hypothesis (H<sub>0</sub>): There is no significant relationship between community involvement and sustainable water supply project management in rural areas.

- ii. Alternative Hypothesis (H1): Community involvement has a significant positive impact on sustainable water supply project management in rural areas.

## **2 CHAPTER TWO: LITERATURE REVIEW**

### **2.1 IMPORTANT OF WATER FOR LIFE**

According to experts, water is ranked second only to oxygen as essential for life (Ren *et al.*, 2020). Since more than half of the body weight is made of water, we couldn't life survival for more than a few days without water is fetal (UNESCO, 2021). Water is very important for the body, as it is used in every cell of the body, travels throughout the body carrying nutrients, oxygen, and wastes to and from cells and organs, keeps the body cool as part of the body's temperature-regulating system, cushions joints and protects tissues and organs from shock and damage, acts as a lubricant for joints, the mouth and digestive system in saliva, and in your nose, throat, eyes, and stomach as part of mucus, aids in digestion and absorption of food, as well as in the removal of waste from the body, and also helps people to maintain a healthy weight (Jenkins et al., 2020).

Water is very important for domestic activities such as cooking, dishing, washing, cleaning, and so on. It is very important for economic or production activities such as farming and irrigation activities, industrial uses, fishing, and transportation activities.

#### **Agricultural**

Water is extremely important to agriculture because it keeps crops growing and ensures agricultural productivity. It functions as a vital irrigation resource, allowing farmers to supply plants with the moisture they require for germination, growth, and development. Sufficient water availability encourages cell development, photosynthesis, and nutrient uptake, which raises yields and enhances crop quality.

Additionally, water reduces excessive heat stress on plants by controlling temperature through evapotranspiration. Water is also essential for sustaining the fertility and health of the soil, reducing soil erosion, and promoting the effective application of fertilizers. All communities around the world depend on the availability and effective use of water resources to support a resilient and sustainable agricultural system that guarantees food security.

## **Industrial**

Water plays various different roles, making it essential to industrial processes. It is an essential part of heating and cooling systems, guaranteeing the best possible operation of equipment and guarding against damage. Furthermore, water is an essential component of several industries' manufacturing processes, assisting to dissolve, mix, and purify raw materials.

By preserving cleanliness and hygiene requirements, its application in sanitation procedures protects the items' quality and safety. In the production of electricity, water is also essential, especially in hydroelectric plants, which provide a clean, renewable energy source. Water is also necessary for treating wastewater, reducing environmental damage, and guaranteeing regulatory compliance. In general, the availability, quality, and careful management of water are essential to maintaining effective and long-lasting industrial activities.

## **Ecosystem**

Ecosystems rely on water to function and be healthy. It is vital to life, facilitates to regulate numerous ecological processes, and preserves the delicate balance of nature. Water is also a vital medium for the transport of nutrients, which allows essential elements for transportation between and within organisms.

It offers habitats to a variety of aquatic species, acting as a breeding ground, refuge, and food source. It also controls temperature, supporting thermal stability in ecosystems and affecting patterns of climate. Water sustains wetlands and forests and powers the complex web of interactions between plants, animals, and microorganisms, among other functions, making it an indispensable tool for protecting biodiversity and the health of our planet.

## **2.2 WATER SCARCITY FACTORS**

Nearly 1.2 billion people, according to recent studies, do not have access to safe drinking water (Mumtaz et al., 2017). Water shortages can also result in a number of ailments, ranging from food poisoning to cholera. It is often caused by two major factors: rising freshwater usage and the depletion of viable freshwater supplies (Zulfiqar, 2020).

Furthermore, there are two sorts of scarcity: physical scarcity and economic scarcity. When a natural water supply is inadequate to fulfill the demands of a specific location, a physical water shortage occurs (Akram et al., 2016). Some of the major physical and economic causes of water scarcity are discussed below.

### **2.2.1 PHYSICAL WATER SCARCITY**

A crucial factor influencing total water scarcity is physical water scarcity. subsequently occurs when a region's supply of freshwater has trouble keeping up with demand. Natural elements including insufficient surface water resources, insufficient rainfall, geographical factors, population growth, insufficient water management, pollution and contamination, and arid or semi-arid climates are the main causes of this scarcity.

There is not enough water available to support the demands of the population, industry, agriculture, and ecosystems in locations where there is a physical scarcity of water. Communities consequently experience a difficult time getting access to clean, safe water for irrigation, drinking, and sanitary needs. In order to guarantee sustainable water availability in impacted areas, physical water scarcity emphasizes the pressing need for effective water management, conservation measures, and the creation of alternative water sources (Hussain et al., 2015).

### **2.2.2 ECONOMIC WATER SCARCITY**

Water scarcity globally is largely caused by economic constraints on water resources. When there is a shortage of the infrastructure, financial resources, or technology needed to access and use the available water sources, economic water scarcity develops as opposed to physical water scarcity. It is frequently linked to areas that encounter difficulties funding programs aimed at developing water resources, keeping up water infrastructure, or putting effective water management techniques into effect.

Several issues, such as poverty, insufficient governance, restricted capital availability, and ineffective water pricing strategies, can lead to economic water shortage. Water might exist in these places, but it would be too expensive for people, communities, and businesses to access and use. This results in a degraded health state for many people who are unable to meet their basic water needs (Mumtaz et al., 2017).

## **2.3 SUSTAINABLE WATER RESOURCE MANAGEMENT**

### **-Community involvement**

Local communities in various areas of Tanzania have developed coping strategies to ensure the conservation of water resources. However, some of the traditional strategies have been eroded by modernization factors and population pressure to the extent that they affect water quantity and quality. Human activities that are conducted near water resources affect water resource management, river ecology, and the quality of water through pollution and silt sedimentation (Herslund and Mguni, 2019).

Local communities and other stakeholders' involvement in water projects is crucial as it brings transparency, acceptability, support, and ensures the sustainability of the process. The involvement of local communities in water projects does not only ensure democracy but also ensures acceptability, support, and sustainability of the respective projects (Huttunen et al., 2022).

### **The Essence of Community Engagement in Sustainable water resource management**

#### **1. Local Knowledge and Insights**

Communities possess invaluable local knowledge about water sources, consumption patterns, and environmental dynamics. Engaging with residents taps into this wisdom, fostering a deeper understanding of water needs and challenges specific to the area.

#### **2. Ownership and Responsibility**

When communities actively participate in water management decisions, they develop a sense of ownership and responsibility. This shared stewardship fosters a culture of conservation, encouraging individuals to adopt water-efficient practices and preserve resources for future generations.

#### **3. Inclusivity and Equity**

Community engagement ensures that water management strategies are inclusive, catering to the needs of diverse socio-economic groups. By addressing the concerns of vulnerable communities, it promotes equitable access to clean water, bridging social disparities, and enhancing overall community well-being.

#### **4. Innovation and Creativity**

Communities often bring innovative solutions to the table, drawing from their lived experiences. Engaging with residents encourages creativity, leading to the development of locally relevant water conservation initiatives, educational campaigns, and sustainable practices.

### **-National water supply project**

In this context, sustainable water resource management can be addressed through the following:

#### **Strengthen Water Governance and Cooperation**

Water governance is a set of political, social, economic, and administrative systems that can influence water use, development, and management. Water governance occurs on multiple scales: local, national, regional, and global. In Somalia, there is a need to create these systems to enable the establishment of a functioning water governance system, including water law, vision, and policy, strategy, and staff capacity in Integrated Water Resources Management (IWRM). In this regard, the capacity to prioritize, manage, and deliver ongoing or proposed investment opportunities is limited and faces many challenges (Marks et al., 2014).

Water can promote cooperation among different organizations and institutions at national, regional, and international levels. However, roles and responsibilities need to be identified and set at the federal/state, inter-ministerial, and municipality levels. A mechanism is required to coordinate initiatives and projects and to work together with the donor communities.

The water governance cycle has four components. Policies and strategies are based on principles; implementation is driven by actions; monitoring is guided by indicators; and the evaluation component suggests new instruments and improvements that can promote the change.

To ensure equity and maximize water resource benefits that include economic, social, and environmental benefits, the government of Tanzania should focus on the following:

- (1) Enhancing local cooperation and engagement,
- (2) Reducing poverty,
- (3) Increasing the access to WASH services,
- (4) Investing in human capabilities,
- (5) Promoting environmentally friendly technology, and
- (6) Preparing for resilience and climate change challenges.

#### **Build Resilience and Promote Sustainable Development**

This group discussed principles related to climate change adaptation, efficient jobs, increased water availability, enhanced water resilience, and enhanced access to water resources. The group identified some objectives and actions regarding developing climate-smart agriculture, developing agriculture and livestock sectors that would enhance the national economy, managing and maintaining basic water structures, promoting job opportunities, promoting renewables, promoting water conservation and groundwater recharge measures, and promoting community management of water resources to reduce risk and promote resilience.

To address climatic threats and promote sustainable development, the following should be taken into account:

- Build resilience into water governance: planning for resilience involves finding the best available water resources as strategic to supporting vulnerable communities, focusing on reducing the risks associated with droughts and floods;
- Raise end user resilience and awareness: Protecting water resource quality and quantity requires attention and cooperation between suppliers and end users. Therefore, raising public and governmental awareness is a must. Moreover, water resources should be protected and treated at the point of abstraction, then monitored at selected points of use.
- Improve environmental performance by reducing the environmental impact of the water sector through the efficient use of water and land resources; applying the polluter pays principle and taxes; enhancing energy-efficient technology; and improving cooperation by involving stakeholders.
- Promote sustainable practices at private, local, and national levels.
- Manage the cycle of storm-flood-drought.

#### **Enhance Integrated Water Resources Management**

This group highlighted that the linkages between water, peace, and development should be very carefully considered, as these sectors contribute to economic growth and social equity; that development partners' projects must be realigned into government water sector priorities; that existing public-private partnership models in the country must be assessed and used in the development of the strategy; that there is a need to collate and update data on national water resources and demand; and that a short-term list of solutions should be prepared for emergency situations countrywide to help mitigate crisis situations, especially around droughts and floods.

In general, integrated water resources management (IWRM) seeks to manage water resources in a comprehensive and holistic way. IWRM is based on three principles: social equity, economic efficiency, and environmental sustainability (Herrera, 2019).

IWRM aims at maximizing economic and social welfare in an equitable manner without compromising sustainability. It involves all water partners and stakeholders in managing and solving water-related issues (Marks et al., 2014). Therefore, enhancing the IWRM approach requires

- Transparent and participatory decision-making procedures that set priorities based on socio-economic and ecological objectives;
- Coordinated development and management of water, environment, land, and related resources;
- Improved appropriate legal, institutional, and financial arrangements.

Implementing the IWRM approach within the Tanzania context can be based on

- Ensuring social equity in terms of gender, needs, and access to water;
- Fostering economic growth to achieve economic water efficiency;
- Protecting and sustaining water resources for the sake of all current and future users;
- Ensuring equitable water allocation among all users, including the environment;
- Engaging the private and public sectors in any water project or activity;
- Raising public awareness; and
- Performing capacity building programs.

## **2.4 COMMUNITY INVOLVEMENT AND MANAGEMENT**

Community involvement and management are now widely recognized as critical aspects of creating an enabling environment for sustainable rural water supply project management. According to Huttunen et al. (2022), community involvement is defined as an active process whereby beneficiaries influence the direction and execution of development projects rather than merely receiving a share of project benefits. The definition emphasizes the involvement of beneficiaries as a group and recognizes the project as a process of generating goods and services rather than a product of goods and services. Community involvement creates an enabling environment for sustainability by allowing users not only to select the level of services for which they are willing to pay but also to make choices and commit resources in support of the choices made by the community (Herrera, 2019).

According to Marks et al. (2014), the concept of community involvement means that communities are actively involved in project development activities through making appropriate labor, time, and financial contributions to both the initial and long-term operation and management of the projects. As noted by Herrera (2019), community involvement alone does not guarantee sustainability. Whereas community involvement emphasizes beneficiary participation in the decision-making process, community management refers to the capabilities and willingness of communities to take charge, influence, and determine the nature of the project.

Community involvement and management create both desires and capabilities within communities to influence and control the goods and services to be produced by the project during its life cycle. Previous studies [Herrera, 2019; Herslund and Mguni, 2019; Huttunen et al., 2022; Marks et al., 2014] showed that key indicators of community participation and management can be summarized as follows:

- Participation in decision-making. All aspects related to project development and implementation have to be based on community preferences. The community has to communicate their needs and decide what is best for them. Issues such as project design, community contributions, external assistance, and user fees or tariffs have to be decided upon by the community or beneficiaries of the project. For water supply project management, the involvement of women in all stages of decision-making is of paramount importance. Women constitute the major group of beneficiaries of water supply project management. Thus, they need to be involved as equal partners and not as a special group of beneficiaries.
- Informed choice. Communities must be informed of the available options and associated costs. Informed choice helps communities make decisions concerning their capabilities to manage the project.
- Community contribution. Communities should willingly contribute to the development and operation of the project if they feel that they own it. Contributions such as monetary investment, material equipment, labor, and general involvement in project-related committees and meetings should be voluntary. Coercive contributions create hostility toward the project.

- Representation. Water managers should represent the diversity within the community. They should be elected democratically, representing all community members. Women's representation as an important group should be clear.
- Responsibility. The community should be ready to take on the ownership and attendant obligations of the project. They should understand that the project belongs to them and that its survival or collapse depends on community investments (i.e., in terms of human, physical, and financial capital). The roles of each stakeholder should be clearly defined in order to avoid confusion in management or creating false expectations among community members.
- Authority. The community has a legitimate right to make decisions regarding the project on behalf of the users. Interference from the donor or government should be minimal and occur only when requested by the community or when intervention is in the interests of the beneficiaries.
- Control. The community is able to carry out major decisions and determine the outcome of those decisions. Donors or government agents can be involved in decision-making through consultation.

However, these indicators may not be exhaustive and may mean different things to different authors, but they represent the fundamentals of community involvement and management for demand-responsive water supply project management. The indicators provide the basis for community satisfaction and community empowerment. They create a sense of community ownership, self-reliance, and advancement within communities, and they strengthen community organizational and management skills, mobilize resources from all stakeholders, and help in determining the long-run sustainability of the project.

## **2.5 THEORETICAL FRAMEWORK**

Theories are a useful starting point for differentiating degrees and kinds of participation including their outcome. Providing a series of ideal types along which forms of participation may be ranged, most theories carry with them implicit normative assumptions which place these forms of participation along an axis of 'good' to 'bad'. Many of the theories and 'ladders' of participation that have been postulated focus on the intentionality, and associated approach, of those who initiate participation in projects.

This particular study adopted the theory of civic voluntary. This theory accepts every level of participation as it caters for all members of the community. People are involved in decision making, governing and how resources are to be allocated. Other theories such as Arnstein's ladder of participation theory, and Burns et al., (1994)'s ladder of citizen empowerment theory is also reviewed and the civic voluntary theory is found to be the most applicable theory in community participation.

### **2.5.1 CIVIC VOLUNTARY THEORY**

In the civic voluntarism theory (CVT), resources are paramount in influencing individual participation in activities, although the individuals' psychological attitudes and mobilization play an important role in explaining participation as well. The civic attitudes are rather more important although it is true to say that resources are the dominant factors in explaining participation (Verba, Schlozman & Brady, 1995).

The CVT has been applied to the task of providing a cross-national explanation of participation allowing the researchers to examine difference in participation engendered by different institutions and cultural settings. The research stressed the distinction between individual and group resources in promoting participation, arguing that organization is the weapon of the weak.

In other words, groups bound together by ideological ties are able to overcome the lack of individual resources of their members which promotes the participation of their members in activities. The theory has been widely cited and replicated, and it is probably the most important theory of participation in the literature today.

This theory is relevant to this study because it highlights the highest level of community participation whereby by the people have to be involved in decision making, how they want to be governed and how the resources are to be allocated. More importantly, it brings out a sense of personal responsibility individuals should feel to uphold their obligations as part of the community.

### **2.5.2 ARNSTEIN'S LADDER OF PARTICIPATION THEORY**

Perhaps the seminal theoretical work on the subject of community participation was by Arnstein who pioneered the ladder of participation theory (cited in Burns, Hambleton & Hoggett, 1994). As Sherry Arnstein argued, 'there is a critical difference between going through the empty ritual of participation and having the real power needed to affect the outcome of the process' (Burns, Hambleton & Hoggett, 1994).

Originally developed in the late 1960s, it retains considerable contemporary relevance. 'Citizen Control' appears at the top of the ladder, with a category of 'non-participation' at the bottom, in which therapy and manipulation are placed. Arnstein's point of departure is the stakeholder on the receiving end of projects or program. She draws a distinction between 'stakeholder power', which includes stakeholder control, delegated power and partnership, and 'tokenism', in which she includes consultation, informing and placation.

The particular importance of Arnstein's work stems from the explicit recognition that there are different levels of participation, from manipulation or therapy of stakeholders, through to consultation, and to what we might view as genuine participation. These levels at which stakeholders participate, influence the outcome of participation. She argued that at the low-level participation, the outcome participation is likely not to be effectively achieved while at the high-level participation, the outcome participation is likely to be effectively achieved.

There are limitations of Arnstein's framework. Each of the steps represents a very broad category, within which there are likely to be a wide range of experiences. For example, at the level of 'informing' there could be significant differences in the type and quality of the information being conveyed. Realistically therefore, levels of participation are likely to reflect a more complex continuum than a simple series of steps.

### **2.5.3 BURNS ET AL., (1994)'S LADDER OF CITIZEN EMPOWERMENT THEORY**

Since Arnstein, increasingly complex theories of participation have been advanced and new terminology added. In particular, there has been a shift towards understanding participation in terms of the empowerment of individuals and communities. This has stemmed from the growing prominence of the idea of the citizen as consumer, where choice among alternatives is seen as a

means of access to power. Under this model, people are expected to be responsible for themselves and should, therefore, be active in activities

In this context, Burns et al., (1994) modified Arnstein's ladder of participation and proposed a ladder of citizen power (Connor, 2007). This is more elaborate than Arnstein's ladder, with a further, more qualitative breakdown of some of the different levels. For example, a distinction is drawn between 'cynical' and 'genuine' consultation, and between 'entrusted' and 'independent' citizen control. The concept linking stakeholder's participation to performance are however similar to Arnstein's ladder of participation theory.

### **Community involvement and project water sustainability**

It is believed that the rolling back of participatory approaches in water service management ensured sustainability. Many studies have suggested that where there is no community involvement in water project management, the performance of water projects is low, resulting in less sustainability. Between 20 - 50 % of all water projects in the world do not perform as designed (Wamsler et al., 2020). A large number of water supply projects failed just because of inadequate financial management (Ren et al., 2020). Another failure because of a lack of routine repair (Marks et al., 2014).

According to Sweya et al. (2021), sustainability implies the ability to recover from technical breakdowns of water projects. He defines sustainability as "whether or not something continues to work overtime." Thus, sustainability pertains to multiple aspects of water project supply. It includes some dimensions such as institutional, social, technical, environmental, and financial. The majority of water supply projects in Sub-Saharan Africa remain elusive in terms of sustainability, hence the need for a conceptual framework to capture the inter-linkages that relate to sustainability (Armanios, 2012).

In any development project, clearly defined indicators are essential for accurately and realistically measuring and evaluating results. For water supply projects, a series of indicators have been identified to measure conditions relating to sustainability and the effective use and replicability of the projects. Although there is no common agreement on a definition of sustainability, the principal

idea contained in the various definitions is that any project is designed to produce a continuous flow of outputs, goods, benefits, or services throughout its intended economic life cycle.

Effective use and replicability mean that water facilities are operating optimally and consistently, and the process of implementing them can be repeated successfully in other regions (Martínez-Santos, 2017). In this study, sustainability is broadly defined as including effective use and replicability; that is, effective use and replicability constitute part of the sustainability indicators. Previous studies [Martínez-Santos, 2017; Ren et al., 2020; Sweya et al. ,2021] showed that key indicators of sustainability can be divided into seven components, as follows:

- Reliability of the systems. For communal systems, the availability of spare parts and local skills to operate and maintain facilities play a critical role in ensuring that the system remains functional.
- Human capacity development. Specialized training of project managers and operators is needed to build local capacity for operation and management. Since women in most cultures have a greater role than men in managing domestic water supplies, their involvement is important.
- Local institutional capacity. Sustaining the efforts and results of participatory programs require relatively autonomous community and agency organizations. An appropriate management structure enables project managers to be flexible when taking necessary remedial measures.
- Cost-sharing for operation and management. Apart from expressing what they want, users should contribute the resources needed for the project to be sustainable. The system may fail because the resources required for operation and management are too high for the community to provide.
- Collaboration among organizations. A sustainable water and sanitation system can only be planned and implemented through interagency collaboration involving some combination of the community, government, non-government organizations, the private sector, research institutes, and other organizations. Interagency collaboration is needed both in the planning and implementation of activities.
- Effective use. The water facilities have to be used optimally and consistently to maximize benefits and minimize negative consequences over an extended period of time. Unless water facilities are effectively used, there will be no positive impact on the community,

and the motive for installation will be questionable. Effective use is attained through involving the community in planning, implementation, and management. Consistent use refers to the use of facilities throughout their life cycle, taking into account the pattern of use, including seasonal cycles.

- **Replicability with local adaptation.** This is the capacity to duplicate the processes and benefits of a set of development activities in new locations after their effectiveness has been demonstrated in one area. In other words, the experience gained can be useful for developing sustainable water facilities in other areas.

The major objective of participatory evaluation is to establish whether the project is delivering anticipated goods and services in a sustainable manner and to assess the contribution of different levels of community involvement and management to the sustainability of the project. The aim is to identify positive factors that can be enhanced and to overcome identified or current weaknesses in order to strengthen the project. At the project level, scoring techniques are commonly used to quantify these indicators of community involvement, management, and sustainability.

As observed by Marks et al. (2014), such qualitative tools are for informational purposes, to help determine the status of a project and suggest directions for change, rather than to measure the degree of sustainability attained. Other quantitative techniques or economic tools are needed to generate information that is understandable to all stakeholders. Such tools do not only indicate direction for change but also quantify the effectiveness of the project rules used in development, implementation, and management.

Following the inter-linkages for water project progress, it has been established that beneficiary involvement in any water project is the most important factor that leads to the effectiveness of a project (Herslund & Mguni, 2019). Lack of sense of ownership results in neglect or abandonment of maintenance services and the repair of some pumps (Marks et al., 2014). Another thing is the on-going use of traditional sources of water, the poor system of collecting water tariffs, the poor cost recovery, and the distance from improved sources of water; all these undermine the sustainability of water projects.

Therefore, it is very obvious that, without proper management and community involvement, water projects are unlikely to be sustainable, even at a point where spare parts and repair technicians are available.

### **Management of national water supply project**

The management of national water supply projects in Tanzania involves a comprehensive and organized approach to ensure the provision of clean and safe water to communities. Projects are relatively large, and the planning, design, and construction are under the supervision of donors and the government (Rural Water Supply and Sanitation Agency).

The RUWASA is a government executive agency that was established under the Water Supply and Sanitation Act, 2019. The agency is working under the Ministry of Water, and it was inaugurated in July 2019. These agencies are responsible for resource mobilization, project execution, coordination, operations, and monitoring and evaluation. On completion, the projects are commissioned by the community to be administered through trained organizations commonly known as community-based water supply organizations (CBWSOs).

The CBWSOs are established under the Water Supply and Sanitation Act of 2019. CBWSOs are established through the local government framework of village councils following the adoption of the Water Sector Development Strategy (Komakech et al., 2020). However, as has been noticed, the big challenge facing these projects is their sustainability after being commissioned.

Experience has shown that national water supply projects do not perform according to plan, and the government's aim of providing water to the people is not met (Carolus et al., 2018). Sometimes, just after commissioning the projects to the project management and the beneficiary/community, most projects fail to operate. Therefore, the study wanted to explore the inefficiency factors of the water supply projects in service delivery, especially those under CBWSOs.

The study selected three water supply projects and focused on the institutional setup, community involvement in planning, examining the structures of existing community organizations that have been given the mandate of supervising the operation of the project, designing and implementing the project, and expenditure patterns. Gairo Water Supply Projects were selected for this study as they feature most of the problems mentioned and are seen as a good representative of other national

water supply projects. At the end, the study came up with findings that showed the reasons for the poor performance of national water supply projects and suggest solutions that rescued the projects.

### **Lack of community involvement in water supply project**

Lack of community involvement has led to poor operation and maintenance of the water supply projects. This is mainly because of inappropriate technology, incorrect location of supply systems, lack of affordability, and lack of social acceptability because of the “poor” or “wrong” taste of the new water supply or the presence of minerals (Ren et al., 2020).

In some cases, an inadequate survey led to sitting systems where mineral content has been detrimental to other development in children (Wamsler et al., 2020). However, it is evident that communities could control and manage their systems and make them work efficiently. The proposition is for communities to take greater responsibility for the financial outlay for the development of the projects, and recovering the costs incurred in the operation of the project is crucial (Komakech et al., 2020).

### **Community based water supply organizations**

Many studies on the importance of community-based water organizations in water project management have been conducted, according to Herrera (2019). Studies by Herslund and Mguni (2019) on water management have shown that there is a strong need for water projects to be managed participative. Community involvement in the management of water projects is an innovative approach that, when properly implemented, has the potential to enable sustainability.

Some of these studies conducted by Marks et al. (2014) showed that the community participation approach to managing several projects was applied for the sake of speeding development. For example, in Yemen, the World Bank conducted a study in 2004 that showed that FAO implemented hundreds of projects over 23 years ago using participatory approaches, including a number of large-scale rural development projects. Yemen was considered an example of community involvement in water management in the 1990s during the construction of small dams with donor support. It developed training activities to build their own management and technical capabilities. In Kenya, experience showed that about 30% of 10 million rural dwellers have access to improved water served by community-managed water supply projects, many of which were developed by self-help groups (Eckerberg et al., 2015).

Despite the appraisal given to the usefulness of community involvement in the realization of project sustainability, the studies accessed from an empirical literature review have shown the importance of community involvement in improved water service delivery. However, none of them show the extent to which the roles played by the community in these projects have led to their sustainability.

Therefore, these studies focused specifically on matters concerning community involvement in the management of water supply projects, or CBWSOs. The discussion was based on the existing link between roles performed by the community that affect sustainability as applied indicators and attributes used in the literature review to measure the extent of CBWSOs successful managed water supply projects in the study area, the challenges behind them, the way forward, and the suggested structures needed in managing water projects (Fraser et al., 2006).

### **The legal framework for management of water sector in Tanzania**

In Tanzania, the Water Sector is governed by two sets of laws: Water resources and Water Supply and Sanitation Services. The Water Resources Management Act (WRMA) No. 11 of 2009 and the Water Supply and Sanitation Act No. 5 of 2019 were enacted recently to repeal and replace Water Users Associations Cap 331 and Waterworks Act Cap 272, respectively (Candido et al., 2022).

The two pieces of water legislation are implemented in parallel with other related pieces of legislation in the country, such as Environmental Management Act (EMA) No. 20 of 2004, Land Act No. 4 of 1999, and EWURA Act No. 11 of 2001. The Water Resources Management Act (WRMA) No. 11 of 2009 came into operation on August 1, 2009, via GN No. 235, published on July 10, 2009 (Seijger, 2023).

The objective of WRMA is to ensure that the nation's water resources are protected, used, developed, conserved, managed, and controlled to meet the basic human needs of present and future generations. The issues it addresses include: institutional and legal framework; principles for water resources management; prevention and control of water pollution; establishment of National Water Boards; management of catchments and sub-catchments; and offenses and penalties in relation to water resources management. Sweya et al. (2021) introduced that WRMA was enacted as a result of the 2002 National Water Policy (NAWAPO), which emphasizes the

principle of involvement of water user organizations and the private sector so as to attain equitable, efficient, and sustainable water resource management.

According to the WRMA and NAWAPO, every Tanzanian has a stake and a duty to safeguard and protect water resources. The right to use water from any water source is vested with the Minister for Water, and the preference for water allocation is given in order of priority to: domestic uses; environmental reserves; and socio-economic activities depending on the availability of water (Adams et al., 2019).

### 3 CHAPTER THREE: RESEARCH METHODOLOGY

#### 3.1 OVERVIEW

This chapter elaborates on the research design that the study used, the area of the study, sampling procedures and sample size, sources of data, methods of data collection, data analysis and presentation plan, ethical considerations, validity, and reliability.

#### 3.2 DESCRIPTIONS OF THE STUDY AREA

The study area, Gairo District Council, is geographically located in the Morogoro Region, Tanzania, as shown in Figure 1. It is located at the latitude of  $-6.1391^{\circ}\text{S}$  and longitude of  $36.8708^{\circ}\text{E}$ .

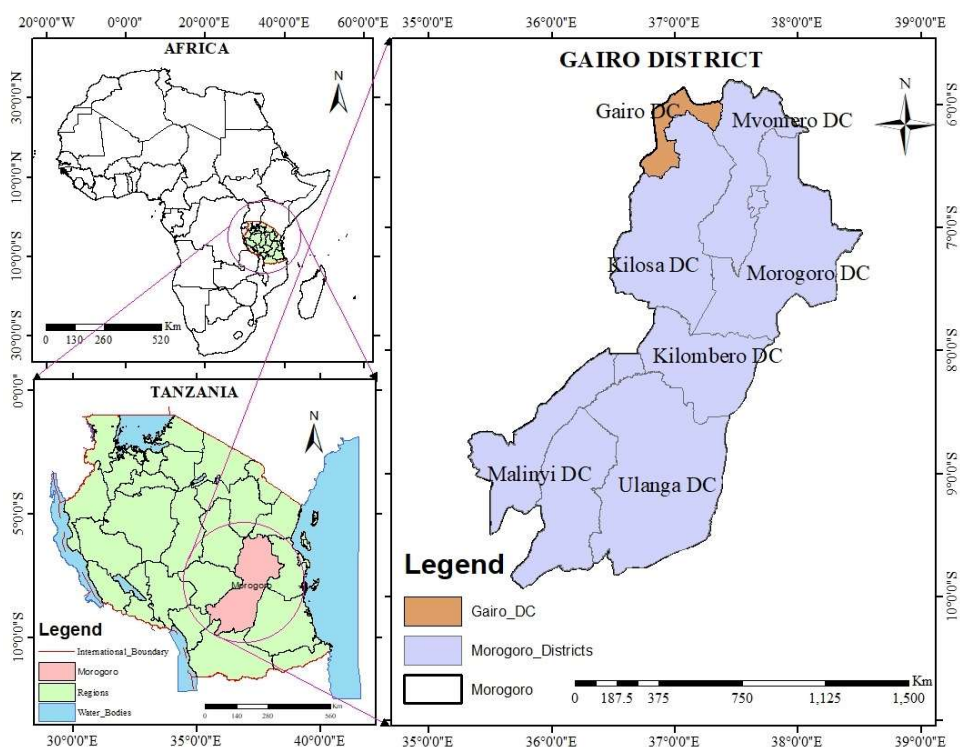


Figure 1. Location map of Gairo district council

Gairo District Council lies about 330 km west of Dar es Salaam, the capital city of Tanzania, 132 km east of Dodoma, and 132 km west of Morogoro Municipal. It is one of the nine district councils of the Morogoro region. It covers an area of 1,851.35 square kilometers.

The district constitutes different agro-ecological zones. The climatic condition of the Council varies depending on the agro-ecological zones. The highest parts get annual rainfall up to 1200 mm and are characterized by moderately fertile, well-drained soil comprising sandy (clay) loam

soil. The flood plains get an average rainfall of 600 mm with poorly drained black clay and loam soils, which are suitable for maize cultivation. Normally, short rains start in October to December, and long rains start in February and continue until May. The annual temperature is typically between 25°C and 30°C. The topography of the district is flood plains and steppe around Gairo, which reaches 1100 meter above sea level (masl). The highest parts of the district are found in the Ukaguru and Unguu Mountains, which reach an elevation of 2200 masl.

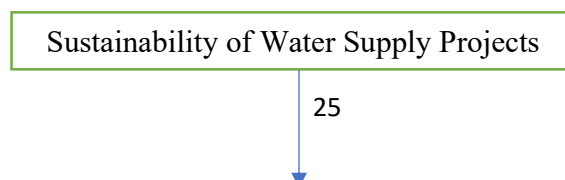
This choice was made to study in this area is due to considering projects in the area have been operational for nearly ten years under the CBWSO, providing a suitable timeframe for examining community participation in ensuring sustainable water projects. Prior to the project, the population (community) relied on polluted and unreliable water sources such as traditional wells, springs, ditches, streams, shallow wells, and surface catchments that often ran dry during the dry seasons (Wamsler et al., 2020).

According to the 2012 Population and Housing Census Statistics (PHCS, 2012), the council had a population of 193,011 people, of whom 96,206 are males and 99,805 are females, with an average annual growth rate of 2.6%. However, according to the population projection released by the National Bureau of Statistics for the year 2023, the Council has 258,205 inhabitants (125,509 are males and 132,697 are females).

In this study, the target population was stratified into the following groups: Community-based water supply organization members, Gairo water supply project management team, ward councilors, village government leaders, opinion leaders, and community members or beneficiaries.

### **3.3 STUDY DESIGN**

A cross-sectional research design was used in this study because it allows data to be collected at one point in time and was used to investigate the relationships between community involvement and the sustainability of water supply project management in rural areas. This design was used to generate quantitative and qualitative data about community involvement in relation to the sustainability of water supply projects in rural areas. This design was useful because of time limitations and resource constraints. The overall conceptual framework of the study is shown in Figure 2.



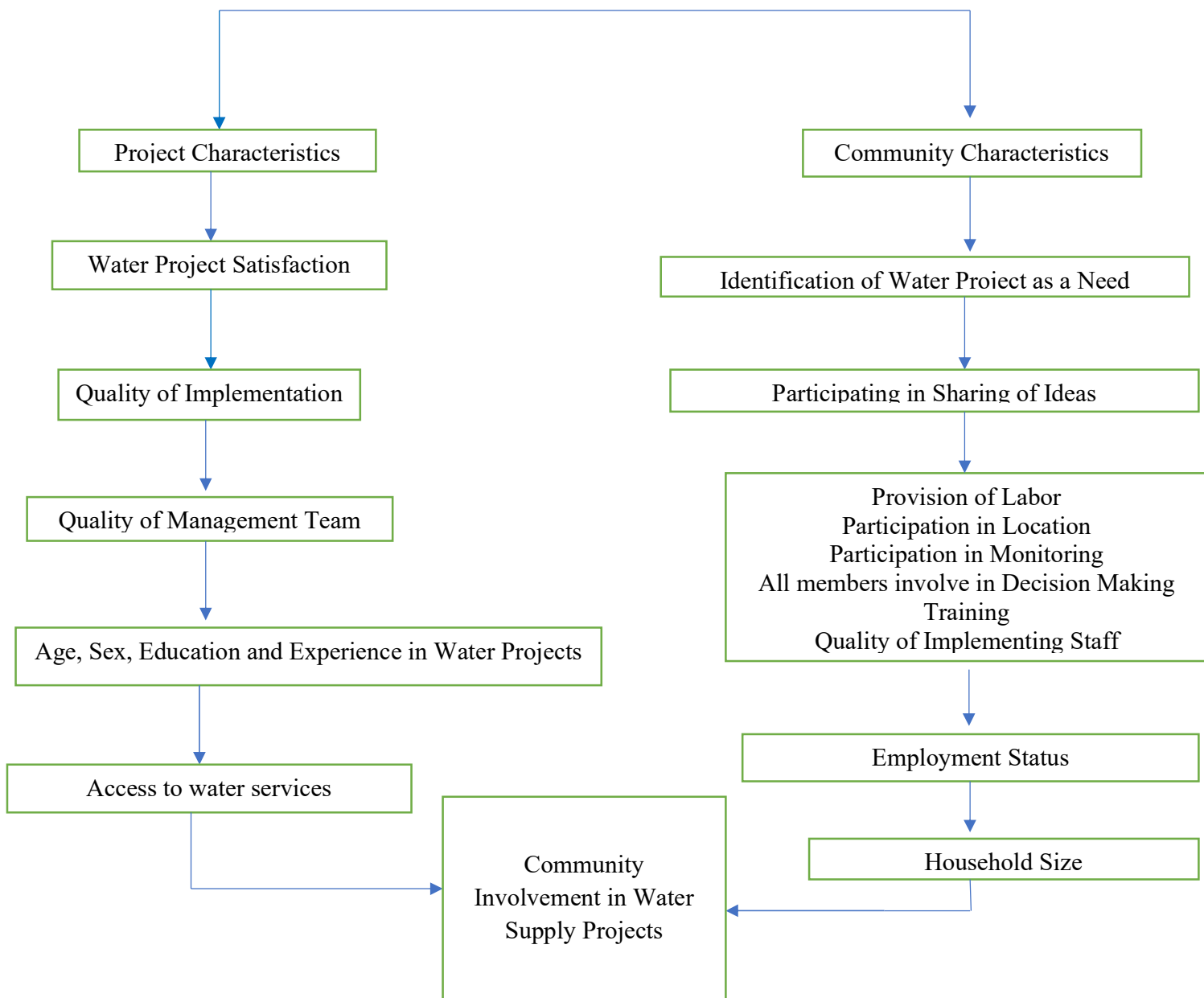


Figure 2. Conceptual framework for the relationship between project outcome and participation

From Figure 2 the first eight independent variables relate to participation while the last two are non-participation variables. Ideally, three project phases which are planning, implementation and maintenance are identified. The nine exogenous variables considered in Figure 2 fall in the aforementioned three phases. Participation at the planning phase takes the form of coming up with the original project idea and designing the project. At the implementation stage, the community

participates in the redesign and implementation of the project while at the maintenance stage; the community is involved in the maintenance of the project.

The general approach followed was intended to explain why a particular project outcome was successful or unsuccessful. The focus of the study was on the community involvement in sustainable water supply project management and how the participation affects project outcomes in rural areas.

In conceptualizing the model, the study treated project outcome majorly as a discrete variable with two major outcomes; that is if the project is satisfying the water needs of the communities or not while depending on background variables such as age, sex, education, experience in water projects, access to water services, employment status, and household size.

### 3.4 STUDY POPULATION

The study population included three wards (Rubeho, Chakwale and Chigela), from which three villages (Rubeho, Kimashale and Ihenje village) were selected. Given the population of beneficiaries is too big in each of the villages with some villages having over 1000 project beneficiaries (Pre-survey, 2023), this study used the accessible population. Therefore, the study targeted 50 project staff and community 150 beneficiaries from each village, which makes the total population 200 respondents.

### 3.5 SAMPLE SIZE AND SAMPLING TECHNIQUES

#### 3.5.1 SAMPLE SIZE

The sample size comprised 200 respondents in the study area. The sample size was distributed as follows: members of CBWSOs, the Gairo water supply project management team, village government leaders, ward councilors, and community/beneficiary members (Table 1). The sample size obtained by using the revised Solvin formula (Eq. 1)

$$n = \frac{N}{1 + Ne^2} \tag{1}$$

Where n = sample size, N = the population size and e = level of precision/degree of error

**Table 1. Sample size for this study**

Ward	Village	Population size
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		Total	Sample
Rubeho	Rubeho	1000	100
Chakwale	Kimashale	400	40
Chigela	Ihenje	600	60

### 3.5.2 SAMPLING TECHNIQUES

The study employed purposive and simple random sampling. Within the district, three wards were purposefully selected out of the 18 wards in the district because three wards have big water projects where those others wards depend on them. Three villages were also purposefully chosen at random within each ward based on their water status.

The simple random method was used to select staff at project support staff and beneficiaries. Simple sampling was used to give an equal chance of project support staff and beneficiaries to be selected given that number is expected to be big and not all project support staff and beneficiaries were selected. Purposive sampling was used to select project staffs because they had more knowledge about the project issues.

### 3.6 DATA COLLECTION METHODS

Data were collected through primary and secondary sources. Primary data were collected by employed questionnaires, FGDs, observation, and interviews, while on the other side, documentary review and reports were used to collect secondary data (Appendix 1-4).

#### 3.6.1 QUESTIONNAIRES

Data were collected using a semi-structured and an unstructured questionnaire, which were divided into two parts. The first part of the questionnaire was answered by the public, and the second part by the officials.

A total of 30 questions were prepared and administered to the target group. The questions were in different categories: personal details, knowledge about the existence of water facilities, usage of the projects, management system or groups of the water projects, sustainability of the projects, funding and management of the funds for maintenance and capacity building, and training.

### **3.6.2 FOCUS GROUP DISCUSSIONS**

A FGD was conducted with users of water from the selected villages of the Gairo water supply project to gather information relating to the way they were involved in improving water supply systems in the Gairo water supply project (Appendix 5).

A FGD was also conducted with four groups of water users who were found at public water taps. Groups of water ranged from 4 to 6. The discussions were moderated by the researcher, who was also took notes.

The FGD was used to obtain the knowledge, perspectives, and attitudes of people on issues related to water project management and to seek explanations for behaviors in a way that would be less easily accessible in responses to direct questions as compared to a one-on-one discussion.

### **3.6.3 INTERVIEWS**

This study deployed structured, semi-structured, and unstructured kinds of interviews. A semi-structured interview was arranged and used to interrogate the Gairo water supply management team. A structured interview, which uses questionnaires based on predetermined, standardized, or identical questions.

An unstructured interview, which is informal as there is no predetermined list of questions to work through, was applied to the villagers or community.

### **3.6.4 OBSERVATION**

The study carried out field observations and site visits with the guidance of the local leaders, the Gairo water supply project management team, and district officials. During observation, photographs and checklists were considered critically at the field.

### **3.6.5 SECONDARY DATA**

The study reviewed the related documents on water, community involvement, and sustainability from the Gairo water supply project management team, district planning offices, and ministry of water in Tanzania. Secondary data related to water also collected from websites.

### **3.7 DATA ANALYSIS**

#### **3.7.1 QUANTITATIVE DATA ANALYSIS**

Upon completion of data collection, questionnaires were checked for errors and data were entered in Statistical Package for Social Scientists (SPSS V.21) software for it to be cleaned. After cleaning, data were coded where responses were put in categories and numbers to allow for analysis. Quantitative techniques of data analysis were used and presented in percentages, means, frequencies and standard deviations. During analysis both descriptive and inferential statistics which included frequency tables and cross tabulation were executed.

In identifying the socio-economic factors affecting community involvement in water supply projects, binary logit model was used to identify the effect of explanatory variables. The dependent variable was community participation, which is a binary variable. Since the dependent variable in regression is binary, the analysis was conducted by index model, log it be applied to analyze this objective.

Descriptive statistics using frequency and percentage were subjected to identify policy, environmental and management factors that affect sustainable water supply project management in rural areas. The Likert scale presentation using frequency, and percentage was used to determine the effect of community involvement on sustainability of water supply projects. The significance of the coefficient ( $p$ ) was used to test the hypothesis by comparing  $p$  to the critical significance level at  $p \leq 0.05$ .

#### **3.7.2 QUALITATIVE DATA ANALYSIS**

This involves content analysis, which was used to edit qualitative data and reorganize it into meaningful shorter sentences. A thematic approach was used to analyze qualitative data where themes, categories and patterns were identified. The recurrent themes, which emerged in relation to each guiding question from the interviews and FGDs, were presented in the results, with selected direct quotations from participants presented as illustrations.

### **3.8 VALIDITY AND RELIABILITY OF INSTRUMENTS**

#### **3.8.1 VALIDITY**

A validity test was carried out prior to the administration of the research instruments. This was done in order to find out whether the questions are capable of capturing the intended data. Experts in research reviewed the questions to see whether they are capable of capturing the intended

response (Malisova et al., 2012). A content validity index (CVI) was calculated in order to establish the validity of the research instrument. The researcher used the following formula to establish validity of the research instruments as seen below (Eq. 2).

$$CVI = \frac{\text{Relevant items by all judges as suitable}}{\text{Total number of items judged}} \quad (2)$$

By applying the formula (CVI=180/200), the results were found to be 0.90, which is greater than the recommended CVI value of 0.70 (Bailey, 1998). Thus, the questionnaire was valid for data collection.

**Table 2. Validity of questionnaire**

Raters	Items rated relevant	Items rated not relevant	Total
Rater 1	100	15	115
Rater 2	80	5	85
<b>Total</b>	<b>180</b>	<b>20</b>	<b>200</b>

### 3.8.2 RELIABILITY

According to Kember and Leung (2008), an instrument's reliability is determined by how consistently it yields results when used frequently throughout a study. Stated differently, a measure's reliability is a sign of the consistency and stability with which the tool assesses the idea being measured and aids in determining the usefulness of the measure. This can be accomplished by keeping proper records and documenting the processes. The instrument's dependability was determined through the pre-test and re-test procedure. This demonstrates that the created questionnaires were given to the same group of people repeatedly at different intervals to find out how consistent each group member was in the instrument's rating. Labeling the group with numbers one through ten demonstrated this. Both the first and second responses were precisely and consistently assessed in accordance with the specified dependable sample groups and delivered after ten days. The consistency of the group's responses at various times reassured the researcher that the instrument is dependable.

### **3.9 ETHICAL CONSIDERATION**

In the study, ethical issues were considered, first by acquiring permission to undertake the research at the site by requesting a clearance letter from the PAUWES and ward government (**Appendix 5**). Secondly, by ensuring that participation in the assessment was optional and that participants can opt out of the evaluation without charge. Participants were told that the research is solely intended for educational purposes.

No unique identity details were obtained from the respondents. The names of respondents involved in the studies were kept confidential. They were provided a complete explanation, showing the introduction letter and the purpose of the study.

## **4 CHAPTER FOUR: RESULTS AND DISCUSSIONS**

This chapter presents the findings and discussion based on the objectives of the study. It is divided into four major sections. The first section presents results based on respondents' background information. The second section presents results on the levels of community involvement in water supply projects in different project phases. The third section presents results on factors that affect sustainable water supply project management in rural areas. The fourth section presents results on the effect of community involvement on the sustainability of water supply projects.

### **4.1 SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS**

Table 3 illustrates the demographic details that were obtained through interviews with 150 local people involved in the study. A socio-economic characteristic of the respondents was important in this study to understand their gender and age, education level, main occupation, household size, annual household income, main income provider for the household, and controller of household expenditures.

The results showed that 8.0, 28.7, 47.3, 13.3 and 2.7% for 18-24, 25-34, 35-44, 45-54 and >55 years old, respectively. The study findings in Table 3 revealed that no respondent was under 18 years old. This reveals that the heads of households, ward executive officers, village executive officers, and members of the water project committee are mature enough and are in a good position to make decisions and work for better villages' development when it comes to sustainable water-related projects in rural areas. About 47.3% of household heads were within the range of 35–40 years old, which is similar to another study conducted on water-related projects in households (Shan et al., 2015).

From the findings in Table 3, it is evident that 60.7% of respondents were male, while 39.3% were female. This indicates that many village dwellers were male that involved in water related project. This implies that there was a high supply of manpower, hence influencing the government to make them participate in the water supply projects. The study is similar to the findings of Crow et al. (2012), who indicated that household heads are mostly males in water project-growing regions.

The study in Table 3 also found that the majorities (48.7%) of the villagers were attended secondary school. About 25.4% of villagers had a diploma (20.7%) and university (4.7%) level education. This reveals that the majority of respondents are educated; hence, they are in a good position to make plans, decisions, and monitor in the water supply project. This in turn implies

that the ability to read and write in the farming community could help to attain the objectives of training and managing the water supply projects by reading materials like leaflets, pamphlets, and other aids (Harvey and Reed, 2007).

In this study the majority (35.3%) of respondents were farmers followed by business people (23.3%), entrepreneurs (15.3%), private employed (10.0%), government employed (6.0), electrical technicians (5.3%), and water resources (4.7%) technicians (Table 3). Due to the nature of the village, the majority of villagers are engaged in agriculture; hence, they are more available for participation in water supply projects. The study is similar to the findings of Alda-Vidal et al. (2017), who indicated that household heads are mostly farmers in water project-growing regions.

More than half (52%) of the respondents had children aged 6–10, years while others (37.3%) had children aged 11 years and above (Table 3). Furthermore, respondents with children in the 1–5 years range accounted for 10.7%. It is also clearly shown from the finding that none of the respondents had more than one child. Those with 6–10 children were approximately as many in the study area. The previous study also showed that rural areas with the problem of water were characterized by large family sizes (Arbués et al., 2010).

More than half (51.3%) of the respondents had income between 100,000 and 500,000 Tshs, while 28.7% had income greater than 500,000 Tshs. Furthermore, only respondents with an income less than 100,000 Tshs accounted for 20.0%. The study also showed that none of the respondents had an income less than 100,000 Tshs. Previous studies by Piper and Martin (1997) also reported that rural households were expected to earn more than Tsh 60,000 (approximately over \$27 USD) per year, with an underlying assumption that urbanization will impact rural households over time.

The respondents were asked to indicate the main income provider for the household. The majority (65.3%) of the respondents said that husbands (male) were the main income providers for the household, while the wives (30.8%), and 5.3% reported other relatives in the household (5.3%) were reported as source of the income for household (Table 3). This indicates that most of the families are headed by men, and therefore, they contribute a lot to income generation through the sustainability of their water projects. Similar to our finding, another study (Adams and Vásquez, 2019) also indicated that husbands are the main income provider for the household .

Table 3. Socio-economic characteristics of the respondents

Variables	Alternatives	Frequency	Percent
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Gender	Male	59	39.3
	Female	91	60.7
Age (year)	18-24	12	8.0
	25-34	43	28.7
	35-44	71	47.3
	45-54	20	13.3
	>55	4	2.7
	Education level	Primary	19
Secondary		73	48.7
Technical education		20	13.3
Diploma		31	20.7
University		7	4.7
Occupation	Farmer	53	35.3
	Business Person	35	23.3
	Private employed	15	10.0
	Government employed	9	6.0
	Entrepreneur	23	15.3
	Electrical technician	8	5.3
	Water resources technician	7	4.7
	Household size(number)	1-5	16
6-11		78	52.0
>11		56	37.3
Income level (Tshs)	<100,000	29	19.3
	100,000-500,000	79	52.0
	>500,000	43	28.7
Income provider	Husband	98	65.3
	Wife	44	29.3
	Other relatives	8	5.3

## 4.2 COMMUNITY PARTICIPATION IN WATER SUPPLY PROJECTS

The study results in Figure 3a showed that the majority of villagers (83.3%) participated in any stage of the water supply project. While the study results showed that few villagers (16.7%) did not participate in any stage of the water supply project. The results continued to show that few villagers participated in the stage of designing the project, while in the implementation stage, many villagers participated since they provided resources such as labor and financial resources. In the monitoring and evaluation stage, few villagers participated since it involved the village water committee.

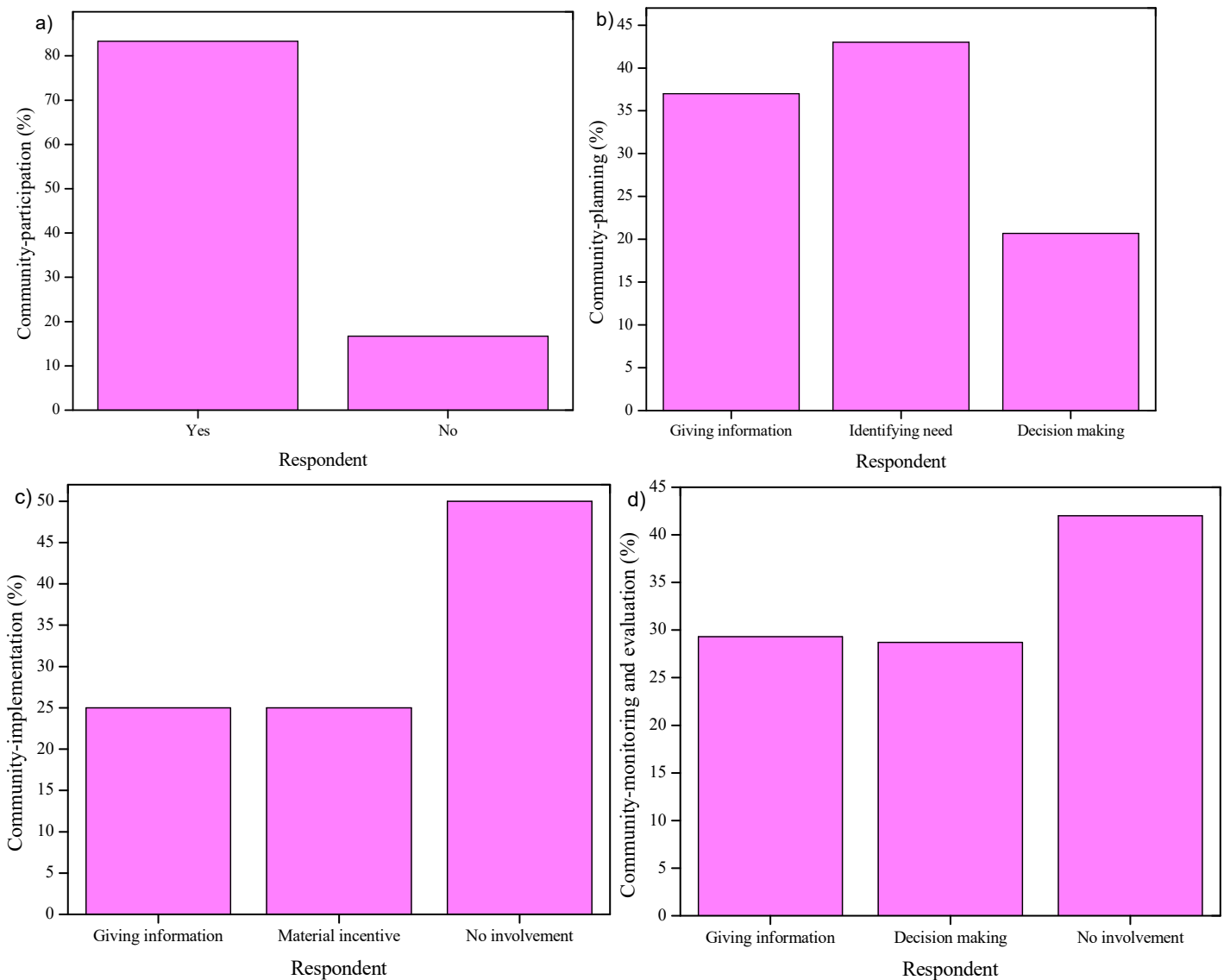


Figure 3. Community involvement in water supply management (a) participation, (b) planning, (c) implementation, and (d) monitoring and evaluation.

The findings are similar to the Gebremedhin and Theron (2007) study, which showed that the majority of the respondents were not involved in the design of the project stage. Also, the results are supported by top-down management theory, which states that decisions about planning and designing the project are made by the government, and the implementation stage is done by the community (Liu and Jensen, 2018). Lacking strong commitment from top-level (government) decision-makers, low-level (community) behavioral changes will ultimately lose momentum (Das and Takahashi, 2014). In addition, the study findings revealed that the majority of the respondents (83.3%) participate very well in the water supply project.

As shown in Figure 3b, more than one-quarters (37%) of the respondents said that involved in giving information during water supply project management at planning phase. The majority (43%) of the respondents were also involved in the identification of the needs. During water project planning phase, few percentages (20.0%) of the respondents were involved in decisions. This indicates that community members were not much involved in decision-making, which could lead to the project being unsuccessful. This is supported by Muniu et al. (2017) and Tillman et al. (2001), who reported that water is an essential resource that needs to be used and managed appropriately, and all relevant stakeholders should be involved in its development and management process.

Involvement of community during water supply project management is implementation is crucial for sustainable water supply management (Figure 3c). Nearly one-quarters (25.0%) of the respondents said that they were involved in giving information during project implementation. Half (50.0%) of the respondents were also said that they were not involved in the implementation phase of the project. Again, the findings were also said they participate through material incentives (contributing money and labor) (25%) to enhance implementation of the project. The intention of the people is to have access to safe and clean water within a very short distance. It has been observed that during the construction of water points, the community members were engaged heavily in material incentives by contributing construction materials like stones and clearing sites.

Community members were expected to contribute their time, labor, and resources during the water system construction. One staff member in Gairo District Council said that *'We believe that the communities totally don't have nothing, but they have something that they can offer. For example, we have offered materials, but they can gather stones, fetch water, dig pits, or bring sand. Then... we move in and give them materials that cost money.'*

According to the majority of RUWASA staff, setting clear expectations about communities' responsibilities during water system construction is a key priority when entering a community. For example, one said, *"Community members were made aware that they were going to help out in terms of providing labor."* In one of these rare instances, RUWASA staff members in Gairo District Council said that while they might know what a community can contribute ahead of time, they

may still ask, *'Here is the requirement of your participation in this undertaking. Now, among these activities, select which ones you can do.'*

One community member in Gairo District Council mentioned, *"Everyone who draws water is supposed to come if they're fixing the borehole."* Another described, *'When there is a need for something to be done, like putting up the fence around the borehole, the [water, sanitation, and hygiene] committee informs the headman, who gathers the community members for action.'*

The community participation in the phase of project implementation was very limited, with a very low level of participation in various components. This is attributed to the institutional structure of water project development and implementation in the study area. The findings are similar to the study by Gebremedhin and Theron (2007), which reported that the government has always continued to be the owner and, in some cases, the operator of the water project in the study area, which has led to a lack of commitment by the beneficiaries to safeguarding the facilities (Hutchings et al., 2015).

Figure 3d showed that involvement of respondents in monitoring and evaluation of various water supply project management by giving information (29.3%) and decision-making (28.7%). However, most (42.0%) of the respondents, argued that they do not participate in monitoring and evaluation of water supply projects through protection and security of the constructed water supply projects. Moreover, findings from key informants showed that the community does not participate during the planning and appraisal stage of the project except for in the implementation stage, where they participate by cutting the tree and clearing the site to construct the water storage and flow points and make security of the materials. Some of the respondents agreed to participate in decision-making and providing information.

As shown in Table 4, various community participation variables affect project outcome. The relationships between the dependent and participation variables were established using frequencies and percentages. Other than the participation levels considered in the previous section, other participatory variables that were included in the analysis were whether all members were involved in making decisions and if members were trained on matters concerning the project. The dependent

variable under consideration was whether the water project was satisfying the needs of the community or not.

Table 4. How various participation affect project outcome

How various participation affect project outcome	Satisfaction of water needs (NEEDSMET)	
	Yes [number (%)]	No [number (%)]
On identification of water as need	125 (83.3)	25 (16.7)
In sharing of ideas concerning the water projects	118 (78.7)	32 (21.3)
In provision of labor for the water project	117 (78.0)	33 (22.0)
In deciding where to locate these projects	113 (75.3)	37 (24.7)
In monitoring of the water projects	102 (68.0)	48 (32.0)
Decision making process involve all members	115 (76.7)	35 (23.3)
Water project related training	112 (74.7)	38 (25.3)

From Table 4, only 125 (83.3%) participants were involved in the identification of water as needed, while the remaining 25 (16.7%) participants did not take part in these activities. This indicates that more respondents were not involved in identifying water as a need, which leads water supply projects did not satisfy the needs of the community, whereas it was unanimously agreed among those who participated at the identification stage that the water projects met the needs of the community. This paints a clear picture that the community should be highly involved in the identification of the water project as one of their needs if such a project has to satisfy their needs. Statistics in Table 4 suggest that 32 (21.3%) respondents who did not take part in the sharing of ideas concerning the water projects, which leads the opinion that the needs of the community were not being met or contrary opinion. Surprisingly, out of 118 respondents who took part in sharing ideas, more than one-third (78.7%) contended that the needs of the communities were being satisfied by the water project.

Table 4 indicated that 33 out of 150 (i.e., 22%) respondents did not provide labor for water projects, whom had the feeling that the water needs of the community were not being satisfied by the projects. A similar opinion (78.0%) of the respondents were took part in the provision of labor for the water project. This may imply that labor provision by the community in water projects does not guarantee satisfaction of the community's needs by such projects. From the same Table 4.3, It can be noted that 24.7% of the respondents who failed to take part in deciding where the project would be located the view that these water projects never satisfied their needs. Among those who

played a role in deciding (75.3%) where to locate these projects had the opinion that the water needs of the communities were being satisfied by these projects.

Table 4 reveal that only 102 out of 150 (68%) respondents were involved in monitoring the water projects, among opinion that the water projects were satisfying the needs of the community. In the category of the 48 (32%) respondents who did not get involved in project monitoring, the projects as having failed to satisfy the water needs of the community. The respondents were also asked to state whether the decision-making process involved all members or not, and 115 (76.7%) of the respondents agreed that all members were involved, with all six advancing the view that the projects were satisfying the community's needs. On the other hand, only 35 (23.3%) respondents argued that not all members were involved in decision-making, that the projects were not satisfying the needs of the community.

The study also sought to know if the respondents had participated in any form of water project-related training (Table 4). About 112 out of the entire sample size of 150 (74.7%) had participated in at least some form of training. Similarly, 25.3% of those who did not get any form of training related to water projects supported the view that water projects had failed to satisfy their needs.

According to one community member in Gairo District Council, community members are only invited to meetings when there is a particular topic for discussion: *'They only call us if there is something serious, for example, if there is a water shortage. They will explain to us the causes of the problem, and we will discuss together how to solve that problem'*.

Likewise, previous studies (Njoh, 2002; Prokopy, 2009) proposed that involving the community strongly impacts the sustainability of projects. Community members' involvement can be in terms of money, labor, material, equipment, participation in decision-making, expression of demand for water, and selection of management structures within the community (Church et al., 2019).

Also, the current study, tallied with a study done by Janssen-Jansen and van der Veen (2017), highlights some of the benefits of community participation, including the ability to obtain project information and make informed choices based on the needs of the community. This results in increased project benefits and better development project outcomes (Gupta and van der Zaag, 2008). Adams and Zulu (2015) argue that the best way the community can obtain bargaining power and exert influence in the decision-making process is through participation. If the community actively participates in the project, they create a greater impact. This is explained by the fact that

participation guarantees high motivation for participants, leading to enhanced benefits for all community members (Thuy, 2018).

### **4.3 FACTORS THAT AFFECT SUSTAINABLE WATER SUPPLY MANAGEMENT**

#### **4.3.1 SOCIAL AND ECONOMIC FACTORS**

A logistic regression model was performed to assess social and economic factors that affect sustainable water supply project management. The modal variables accounted for 44.5% and other variables contributed 100.0% because the Nagelkerke R square = 1.000, as shown in Table 5, indicating a strong relationship between community involvement and rural water project management.

The results indicate that age, education level, cost of water, quality of water, distance to water sources, and specialized training had a negative influence on the probability of households participating in water supply projects. These findings imply that age, education, cost of water, quality of water, distance to water sources, and specialized training may lead to a decrease in the stimulus of engaging in water project activities. The results also indicated that gender and community awareness have a positive influence but are not significant, while occupation, household income, and community awareness have a positive but not significant influence on the probability of participating in water supply projects in Gairo District (Table 5). Other studies, including Njoh (2002) and Giné and Pérez-Foguet (2008), established the existence of a strong relationship between participatory approaches and the sustainability of water projects. Likewise, Hassan et al. (2020), in a study of the determinants of water project sustainability, found that all the independent variables community involvement in project implementation, community training, technology used in water extraction, and the distance to the water access point significantly influenced the sustainability of community water projects (Bos and Brown, 2012).

Kwangware et al. (2014), in an effort to determine whether participation leads to project outcomes, studied one hundred and twenty-one water supply projects in rural areas and case studies in Kenya and Indonesia. The findings showed that increasing participation leads to better project outcomes. Hassan et al. (2020) aims to find out the effect of increasing community participation in non-technical project decisions on project maintenance. The results suggest that there exists a positive relationship between community participation in nontechnical decisions and project outcomes. The reverse is also true for community participation in technical decisions (Prokopy, 2005).

Hoko and Hertle (2006) found that the majority of the community members participated in water supply projects in the implementation phase with more material incentives than at other levels. Community awareness was a significant factor that influenced negatively people's participation, and financial resources were a significant barrier for the community to participate in water development projects (McConville and Mihelcic, 2007).

Table 5. Logistic regression result (variable in the equation)

<b>Independent variables</b>	<b>B</b>	<b>SE</b>	<b>Wald</b>	<b>df</b>	<b>Sig.</b>	<b>Exp (B)</b>
Gender	1.097	1.252E4	0.000	1	1.000	2.995
Age	-8.857	1.953E5	0.000	1	1.000	0.000
Education	-1.541	3.525E4	0.000	1	1.000	0.214
Occupation	2.570	1.487E4	0.000	1	1.000	13.069
Household income	2.903	1.690E4	0.000	1	1.000	18.231
Distance to water sources	-29.518	5.095E4	0.000	1	1.000	0.000
Cost of water	-2.696	1.353E4	0.000	1	1.000	0.067
Community awareness	21.325	1.923E5	0.000	1	1.000	1.826E9
Water quality	-55.853	1.923E5	0.000	1	1.000	0.000
Specialized training	-26.844	1.563E4	.000	1	0.999	0.000
Constant	-2.355	0.290	65.852	1	0.000	0.095
<b>Modal summary</b>						
-2 Log likelihood	Cox and Snell R square		Nagelkerke R square			
.000 <sup>a</sup>	0.445		1.000			
	44.5%		100%			
Significant at 0.05 since P<0.05						

The findings are also similar to a study done by Gebremedhin and Theron (2007) in Woreda, Ethiopia, where there was a relationship between training and the functionality of water systems that would have some influence on their sustainability. This finding supports the findings of delayed responses to repairs by untrained local technicians. Due to the weak managerial skills of water management committees, as observed by Collet et al. (2015), they recommended institutional strengthening through capacity building (education) on holistic water management systems to ensure sustainability (Foster et al., 2018).

#### **4.3.2 POLICY, ENVIRONMENTAL AND MANAGEMENT FACTORS**

As shown in Table 6, 40.7% of respondents reported a regulatory framework, while 21.3% of respondents reported decentralization, which implies a lack of decentralization and decision-making power at the local level can hinder community involvement and ownership. Respondents also said that 38.0% the presence of institutional coordination. The findings are similar to the Vairavamoorthy et al. (2008) study, which stated that weak or inadequate policies, regulations, and legal frameworks can hinder effective water resource management and service delivery. Study in another area also identified poor coordination among different stakeholders resulted in fragmented approaches to water supply management (Forrest, 2001).

As shown in Table 6, the majority (48.7%) of respondents said that climate change impacts are the environmental challenge that brings water scarcity in the study area. Adapting water supply projects to climate change considerations is crucial for their long-term viability. The respondents also identified poor (26.0%) watershed management, which implies poor land use practices that could lead to soil erosion, sedimentation, and reduced water availability. Among respondents, 25.3% mention water availability and quality issues in the study area. The findings are similar to the MacDonald (2010) study, which showed that changing climate patterns can impact water availability and quality. Climate change, deforestation, and pollution can affect the availability and quality of water resources, impacting the sustainability of water supply projects (Issues, 2010).

Half (50.7%) of respondents the presence of operation and maintenance, while 29.3% reported monitoring and evaluation, which implies a lack of monitoring and evaluation mechanisms that impede the identification of problems and the implementation of corrective measures for water supply projects in the study area. About 20.0% of respondents also mentioned capacity building issues in Gairo district. The findings are similar to the Harvey and Reed (2007) study, which showed that inadequate operation and maintenance practices that lead to the deterioration of

infrastructure and a decline in service quality. Others also mentioned that insufficient skills and knowledge among local communities and water management institutions are factors which hinder effective project management (Foxon et al., 2002).

Table 6. Policy, environmental and management issues affecting water supply project management

Variables		Frequency	Percent
Policy issues	Regulatory framework	61	40.7
	Decentralization	32	21.3
	Institutional coordination	57	38.0
Environmental issues	Water availability and quality	38	25.3
	Water shed management	39	26.0
	Climate change impact	73	48.7
Management issues	Operation and maintenance	76	50.7
	Capacity building	30	20.0
	Monitoring and evaluation	44	29.3

#### 4.3.3 INSTITUTION RESPONSIBLE FOR HANDLING PROJECT RESOURCES

The study identified institutions responsible for handling project resources in the study area. The findings in Figure 4 show that 60.6, 30.7, and 8.7% of respondents said that institution for handling water supply project is responsible for village government and community committee leader, community, and donor, respectively. This indicates that the village government and community committee leader are the most responsible institutions for handling project resources (money, tapes, channels, dams, etc.).

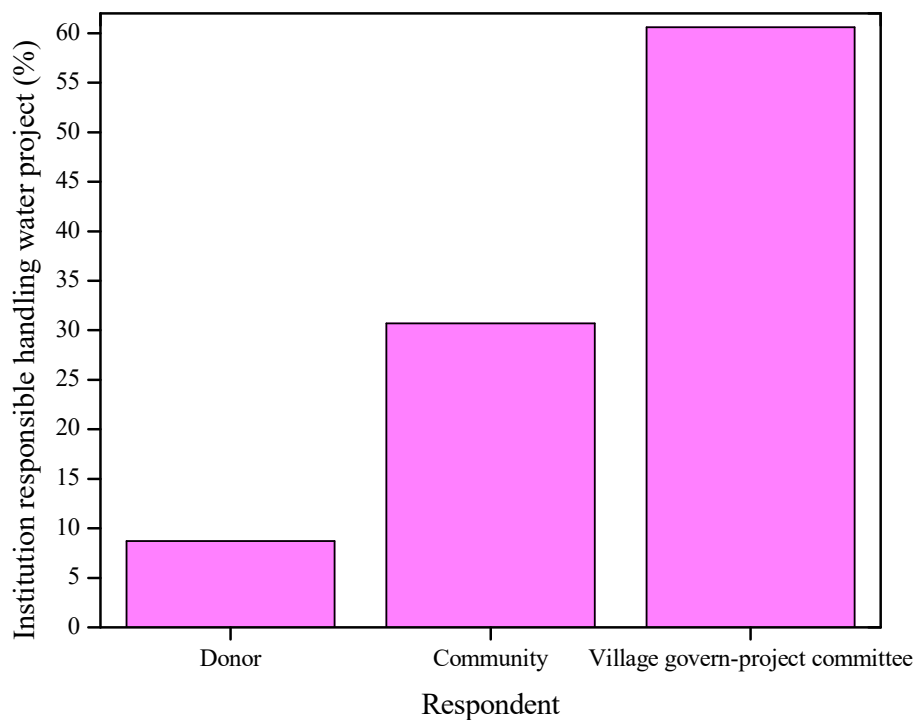


Figure 4. Institution responsible for handling water supply projects

The study was interested in knowing the responsibilities of the village government and the water project committee. From the FGD, it was revealed that a selected team of 15 members (5 water project committee members and 10 community members) has the responsibility of supplying water bills and credit collection, safeguarding water infrastructure, ensuring the project reaches all households, and supervising and overseeing all the project’s activities. One respondent said that:

*“The selected team of 15 members is responsible for reading the units of water used in each household and supplying water bills to the households. Also, the water project committee collects money.”*

Another respondent added that;

*“The team selected safeguards for water infrastructure. They report those who destroy water infrastructure to the village government. Also, they report to the village government those who connect water illegally.”*

During FGD, as shown in Figure 5, it was identified that the water project committee performed their responsibilities very well. One respondent said that:

*“Our water project committee performs their responsibilities very well because the water supply project started with 50 households, but as we speak now, the water supply project has 290 users.”.*

Also, another respondent said that;

*“The water project committee has performed their responsibilities very well since till now the water supply project has existed; they collect all credits. We have enough money to control the water supply project due to the good work of the water project committee.”* Another respondent said that;

*“They protect our water infrastructure very well. There is no illegal connection to water. So, they perform their responsibilities very well.”*

The water project committee played a significant role in ensuring the sustainability of the water supply project (Jacobs et al., 2016). Also, this current study also similar with the research done by Gleitsmann et al. (2007), which finds that a much more successful way to ensure water project improvement and sustainability is to formulate a water project committee so as to obtain serious judgment and evaluation.



Figure 5. FGD with the selected team, which includes water project committee members and community members.

#### **4.4 SUSTAINABILITY WATER SUPPLY MANAGEMENT**

##### **4.4.1 EFFECTS OF COMMUNITY INVOLVEMENT**

The community responded to 10 items about the sustainability of water supply projects by indicating their agreement using a five-point Likert scale (Table 7). The items are presented in the first column of Table 7 and the proportion of respondents to the responses on each of the items is presented in the form of percentages in columns 2 to 5. The last column presents the total percentage of respondents for each of the items.

Table 7. Effects of community involvement on sustainability of water supply projects

Items about project effects	SD	D	NS	A	SA
The project's service delivery is efficient	64 (42.7%)	63 (42.0%)	19 (12.7%)	3 (2.0%)	1 (0.6%)
There is value for money of the project's service delivery	38 (25.3%)	92 (61.3%)	17 (11.3%)	1 (0.7%)	2 (1.3%)
The project delivers quality services	68 (45.3%)	62 (41.3%)	17 (11.3%)	2 (1.3%)	1 (0.7%)
There is reduction in the number of complaints about the project's service delivery	55 (36.7%)	75 (50.0%)	16 (10.7%)	3 (2.0%)	1 (0.7%)
The project's services are easily accessed	72 (48.0%)	57 (38.0%)	18 (12.0%)	-	3 (2.0%)
The project's service delivery is effective	62 (41.3%)	65 (43.3%)	20 (13.3%)	3 (2.0%)	-
The project's responsiveness in service delivery is satisfactory	58 (38.7%)	69 (46.0%)	19 (12.7%)	3 (2.0%)	1 (0.7%)
The project service coverage is satisfactory	37 (24.7%)	93 (62.0%)	17 (11.3%)	2 (1.3%)	1 (0.7%)
The project offers relevant service to the community	62(41.3%)	68 (45.3%)	17 (11.3%)	2 (1.3%)	1 (0.7%)
The project offers reliable service to the community	54 (36.0%)	76 (50.7%)	16 (10.7%)	3 (2.0%)	1 (0.7%)

SA = Strongly agree, A = Agree, NDA = No definite answer, D = Disagree, SD = Strongly disagree

Most community members concurred with all 10 items compared to those who opposed them and some community members who were not sure about them (Table 7). On whether the project's

service delivery is efficient, 64 (42.7%) strongly agreed with the statement, 63 (42.0%) agreed with the statement, 19 (12.7%) said they were not sure, 3 (2.0%) disagreed with the statement, and only 1 (0.7%) strongly disagreed with the statement.

On the value for money of the project's service delivery, 38 (25.3%) strongly agreed with the statement, 92 (61.3%) agreed with the statement, 17 (11.3%) said they were not sure, 1 (0.7%) disagreed with the statement, and 2 (1.3%) strongly disagreed with the statement. Also, on whether the project delivers quality services, 68 (45.3%) strongly agreed with the statement, 62 (41.3%) agreed with the statement, 17 (11.3%) said they were not sure, and 2 (1.3%) disagreed with the statement. And only 1 (0.7%) strongly disagreed with the statement.

There is a reduction in the number of complaints about the project's service delivery. 55 (36.7%) strongly agreed with the statement, 75 (50.0%) agreed with the statement, 16 (10.7%) said they were not sure, 3 (2.0%) disagreed with the statement, and only 1 (0.7%) strongly disagreed with the statement.

The project's services are easily accessed. 72 (48.0%) strongly agreed with the statement, 57 (38.0%) agreed with the statement, 18 (12.0%) said they were not sure, and 3 (2.0%) strongly disagreed with the statement. Moreover, on whether the project's service delivery is effective, 62 (41.3%) strongly agreed with the statement, 65 (43.3%) agreed with the statement, 20 (13.3%) said they were not sure, and only 3 (2.0%) agreed with the statement.

The project's responsiveness in service delivery is satisfactory. 58 (38.7%) strongly agreed with the statement, 69 (46.0%) agreed with the statement, 19 (12.7%) said they were not sure, 3 (2.0%) disagreed with the statement, and only 1 (0.7%) strongly disagreed with the statement. However, the project service coverage is satisfactory. 37 (24.7%) strongly agreed with the statement, 93 (62.0%) agreed with the statement, 17 (11.3%) said they were not sure, 2 (1.3%) disagreed with the statement, and only 1 (0.7%) strongly disagreed with the statement.

The project offers relevant services to the community. 62 (41.3%) strongly agreed with the statement, 68 (45.3%) agreed with the statement, 17 (11.3%) said they were not sure, 2 (1.3%) disagreed with the statement, and only 1 (0.7%) strongly disagreed with the statement. Lastly, the project offers reliable service to the community. 54 (36.0%) strongly agreed with the statement, 76 (50.7%) agreed with the statement, 16 (10.7%) said they were not sure, 3 (2.0%) disagreed with the statement, and only 1 (0.7%) strongly disagreed with the statement.

A comparison of these items shows that the percentages of community members that opposed ranged from 0.7% to 2%, while the percentages that were not sure ranged from 10.7% to 12.7%, and the percentages of those that concurred ranged from 24.7% to 62.0%. From these comparisons, it can be seen that the percentages that opposed the items and the percentages that were not sure about the items were lower compared to the percentages that concurred. Thus, from this analysis, the following is the interpretation: Findings show that most of the project community members were of the view that the project's service delivery was efficient, there was value for money in its service delivery, and it delivered quality services.

In addition, most of the project staff and beneficiaries were of the view that there was a reduction in the number of complaints about the project's service delivery and that its services were easily accessible and effective. Lastly, most of the project staff and beneficiaries were of the view that the project's responsiveness in service delivery was satisfactory, its service coverage was satisfactory, and it offered relevant and reliable services to the community.

The findings of this study is consistent with the study done by Alda-Vidal et al. (2017), who reported that community involvement is one of the essential conditions for the implementation of projects and largely contributes to the sustainability of water supply by resolving problems related to willingness and ability to pay user fees and take good care of the water points, hence ensuring the sustainability of water.

Likewise, previous studies (Tantoh et al., 2020; Ghaffour et al., 2013; Maras, 2004; Varavamoorthy et al., 2008; Meding et al., 2016) also reported that the sustainability of rural water supply projects in rural Tanzania remains a major challenge. They mainly proposed effective community involvement and the separation of power and roles among various stakeholders in water supply projects to ensure long-term sustainability. They also proposed that community involvement in rural water supply services be considered one of the options for achieving the sustainability of water supply projects.

#### **4.4.2 QUANTITY OF WATER REMAINED SINCE PROJECT INCEPTION**

The researcher wanted to know whether the quantity of water remained the same as when the project started. Most (83.3%) of respondents said that the quantity of water remained the same since the project started (Figure 6a). However, 16.7% of respondents said that the quantity of water did not remain the same as when the project started (for the water project).

During FGDs, the respondents mentioned that same quantity of water has flowed all the time since the project started. One respondent had the following to say:

*“The same quantity of water flows all the time since the project started, unless a leakage or problem in the water infrastructure occurs.”*

Additionally, the research was interested in knowing the technology used to ensure water was supplied in the same quantity. In this regard, during FGDs the respondents indicated that the village government, together with the water project committee, constructed an artificial well that can store 50000 liters of water (Appendix 5 Photo of this water construction), which ensured that the project supplied water in the same quantity all the time. Lastly, the researcher wants to know if the village could get assistance in case there was a breakdown or problem in the water supply system. The respondents revealed that they do not get any assistance in case there is a problem with the water supply systems. One of the respondents revealed that:

*“If there is leakage, breakdown, or any problem in the water infrastructure, we use the money collected from users to buy new equipment. The money collected is enough to run the project.”*

#### **4.4.3 INSTITUTION RESPONSIBLE FOR MONITORING THE PROJECT**

The study identified who is responsible for monitoring the project after the donor contribution phase-out in the study area. The findings in Figure 6b show that 36.7, 52.7 and 10.7% of respondents said that institution responsible to manage water projects after the donor contribution phase-out is the community, village government, and district council in the study area, respectively. This indicates that village government is the main institution responsible for monitoring the project after the donor contribution phase-out in the study area, as many have mentioned.

The village executive officer said also mentioned that:

*“After the project was implemented, donors removed their hands. After the water supply project is implemented, it remains in the hands of the local government for three to four years before RUWASA controls it. The local government was responsible for formulating a water committee so as to look at all activities to ensure the sustainability of the project.”*

#### 4.4.4 CAPACITY TO MAINTAIN THE PROJECT

The researcher wanted to know whether the community has the capacity to maintain the project, especially after sponsors or donors phase out. The responses were as follows: Most (88.7%) of the respondents said that the community has capacity to maintain the project (for the water project), especially after sponsors or donors phase-out (Figure 6c). However, only few (12.0%) respondents did not recognize the community capacity to maintain the project, especially after sponsors or donors phase out.

During FGD, one respondent revealed that:

*“The village is technically capable of running the water supply project. Some villagers were trained by donors to repair and connect the water supply system. So, if there is a problem in the water supply system, trained villagers together with the ward water engineer will solve the problem.”*

The findings revealed that the village is technically and financially capable of running the project after donor withdrawal. This is due to the fact that technical and financial capability is essential for project sustainability. The findings are similar to a study conducted by Maras (2004), which found that the key factor for water project sustainability is technical and financial capability since it enables villages to construct, operate, and manage a technical solution.

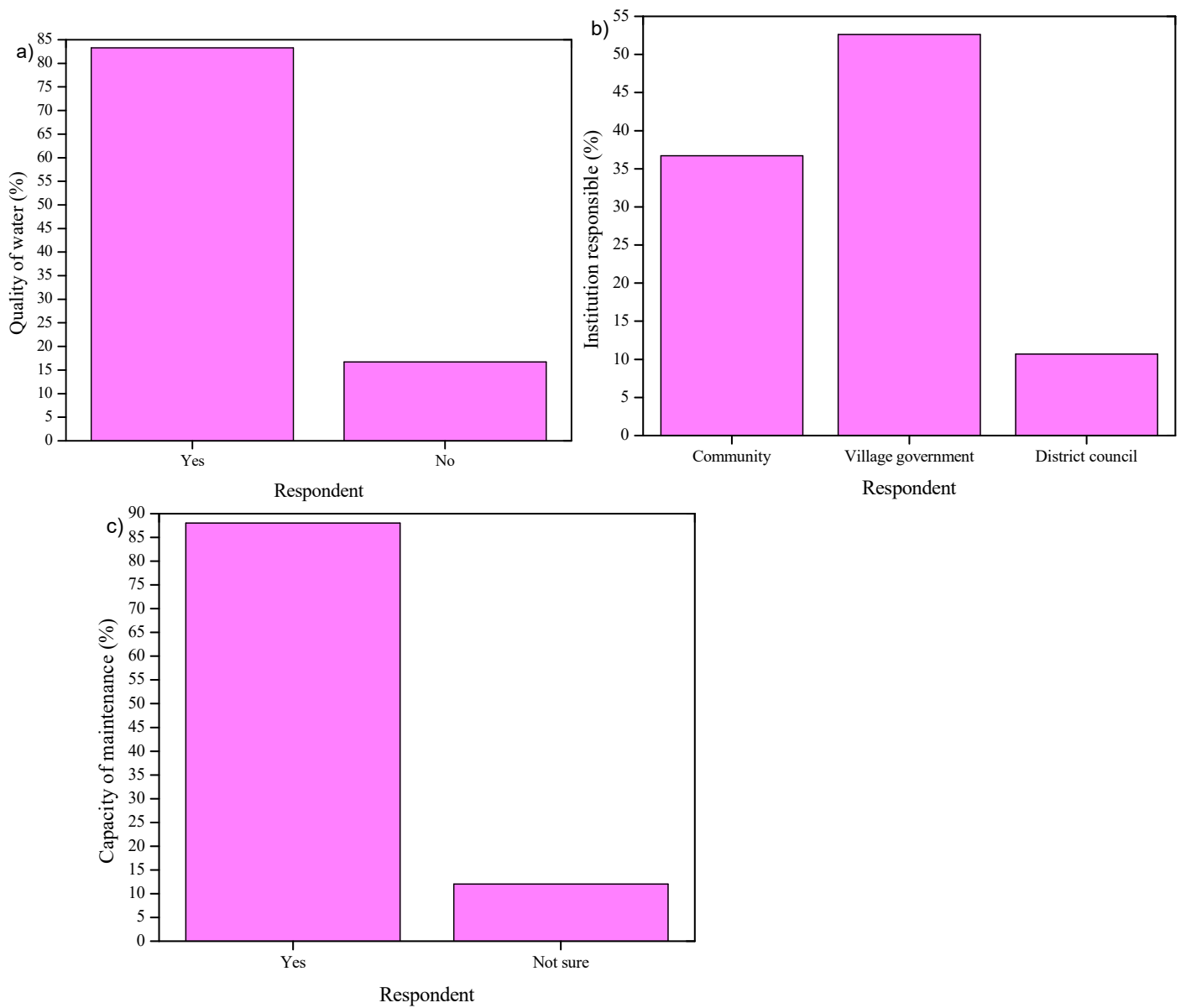


Figure 6. Technical capability after donors phases out

The findings revealed that the village is technically and financially capable of running the project after donor withdrawal. This is due to the fact that technical and financial capability is essential for project sustainability. The findings are similar to a study conducted by Ongley (2001), which found that the key factor for water project sustainability is technical and financial capability since it enables villages to construct, operate, and manage a technical solution.

#### 4.4.5 MEASURES TAKEN TO ENSURE THE LONG-TERM WATER SUSTAINABILITY

The study identified measures that the community has taken to ensure the long-term sustainability of the water supply project in the study area. The findings in Table 8 showed that long-term sustainability is through community engagement and awareness (21.3%); regular maintenance and monitoring of water infrastructure (21.7%); integrated water resource management (21.7%); financial planning and resource mobilization (11.3%); climate change adaptation (11.3%); and diversification of water sources in the study area (6.0%). This indicates that community engagement and awareness are the main measures the community has taken to ensure the long-term sustainability of the water supply project in the study area.

One of the RUWASA staff members noted the importance of including the community and local government in training as *'The local government will also want to be part of it. it becomes more sustainable.'* Collaboration in training was seen as particularly important for fostering links between the water committee, community and local government: *'RUWASA works closely with the community and local government during that partnership to make sure that some of the trainings are conducted by environmental health technicians or water technicians within the community to make sure that when we pull out of the area, the water committee will really have that relationship with the local government so that they can leverage special bonds for them to continue having a normal life'* (RUWASA staff member).

Table 8. Measures taken to ensure the long-term sustainability of the water supply project

Variables	Frequency	Percent
Efficient water management	13	8.7
Regular maintenance and monitoring of water infrastructures	31	20.7
Diversification of water sources	9	6.0
Community engagement and awareness	32	21.3
Integrated water resource management	31	20.7
Financial planning and resource mobilization	17	11.3
Climate change adaptation	17	11.3
Total	150	100.0

The current findings are consistent with Montgomery et al. (2009), which revealed that training the community, especially on technical, financial, and management issues, is significant for the sustainability of the water supply project since training builds up community capacity to manage, safeguard, and repair the water supply infrastructure. Furthermore, Marques et al. (2015) revealed in their study that there is a great chance that a water supply project will not be sustained when there is poor management of these water project resources, insufficient water project operation and maintenance skills, and poor money collection from beneficiaries.

## **5 CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS**

### **5.1 CONCLUSIONS**

Water plays a significant role in the daily lives of every individual. It is the most important basic need of life, and no living organism can do without it. Thus, it can be regarded as the basic unit needed in life. Its uses range from drinking to cooking to washing. This explains the importance of the resource and hence the need for its sustainability, especially in Gairo District, where the main economic activity is agriculture.

Most of the people in rural areas participated in water supply projects by involving themselves more in the implementation stage (manpower and material incentives) than in planning and designing (decision-making) and other levels. The findings show that people participated more through providing labor in collecting construction materials like stones, sand, and graves, clearing water points, and watering the wall, but only a few other people, who cannot participate by providing manpower, participated by giving information, and very few in decision-making.

Community awareness, sex, cost of water, and specialized training were found to be significant factors that negatively influenced people's participation, hence limiting their ability to contribute towards the planning and implementation of community water projects in the study area because they were not aware of their roles, obligations, and importance of participating in water supply projects conducted in their areas.

Financial resources, age, quality of water, and income of household heads are significant barriers for the community to participate in water development projects. Delays in disbursement and shortage of funds from the government mean that the government does not disburse funds at the required time, hence making the implementation of water supply projects and participation unsuccessful.

Therefore, this study concludes that if community-managed water supplies in Gairo District to be sustainable and yield long-term benefits, the community must be fully involved in all project stages and the development process.

### **5.2 RECOMMENDATIONS**

Based on the findings of the study, the following recommendations were given:

- To improve the community's participation and support for water supply projects and achieve access improvement, community members have to be actively involved in all stages, including decision-making in planning and implementation, as well as management and monitoring stages at the district, ward, and village level. The study recommends frequent seminars, trainings, and workshops to build awareness of the importance of participation among people and to emphasize women's participation in water supply project activities.
- Financial resources be allocated to facilitate the participation of the community in water supply projects; however, budgets should be allocated and timely disbursed to the allocated villages and wards to accelerate participation.
- Proper communication should be ensured between water users and their leaders so as to clarify or rectify any problem happening in relation to project implementation at an early time.
- There should be a clear distribution of roles for each actor in water management in the study area.
- With the establishment that the biggest challenges facing water supply projects are frequent breakdowns such as pipe bursts and generators with longer down times, there is a need to promote alternative systems such as solar systems and train local technicians on both current technologies that are easy to operate and maintain.

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## **7 APPENDICES**

### **7.1 APPENDIX 1: QUESTIONNAIRE FOR THE GENERAL PUBLIC**

The purpose of this questionnaire is to collect data that is imperative to “assessing community involvement in sustainable water supply project management in rural areas: A case study of Gairo district council, Tanzania.” The data will be applied for direct academic research fulfillment of the Master of Science degree (M. Sc.) at the Pan African University Institute for Water and Energy Science (incl. Climate Change). The information you provide in these questions will be utilized only for study purposes. Your genuine response is highly valuable for the achievement of the objectives of the research. Confidentiality is guaranteed, so please participate in answering these questionnaires openly and honestly.

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Position: M.Sc. student at PAUWES

**I thank you in advance for your cooperation!**

#### **SECTION A: Respondent’s Background**

1. Sex

Male [ ]

Female [ ]

2. Age

Under 18 years old [ ]

18-24 years old [ ]

25-34 years old [ ]

35-44 years old [ ]

45-54 years old [ ]

55-64 years old [ ]

Over 65 years old [ ]

3. Education

- Primary [ ]
- Secondary [ ]
- Technical education [ ]
- Diploma [ ]
- University [ ]
- Other please specify [ ]

4. Occupation.....
5. How many people live in your household? Please specify number of
  - Adults (above 18 years old) [ ]
  - Children (below 18 years old) [ ]
6. What is your annual household income?
  - Less than 100,000 Tshs [ ]
  - 100,000-500,000 Tshs [ ]
  - More than 500,000 Tshs [ ]
7. Who is the main income provider for your household? Please specify
  - Husband [ ]
  - Wife [ ]
  - Other, please specify .....
8. Who controls your household expenditures?
  - Husband [ ]
  - Wife [ ]
  - Both [ ]
9. On average, how much Tanzanian shillings do you spend on the following items per month or annually?

Item	Tshs/month	Tshs/annul
Food		
Water		
Energy (electricity, fuel, etc.)		
Clothing		

Others (please specify)		
Total amount		

**Section B: Levels of Community Participation in Water Supply Projects in Different Project Phases**

10. In which project phases and scenario are you involved in water supply projects?

Participation in planning phase	Participation in implementation phase	Participation in monitoring and evaluation phase
a. On identification of need	a. On identification of need	a. On identification of need
b. By decision making	b. By decision making	b. By decision making
c. In giving information	c. In giving information	c. In giving information

11. How Participation levels (variables) affect Project Outcome

How various Participation affect Project Outcome	Satisfaction of water needs (NEEDSMET)
1. On identification of water as need	a. Yes b. No
2. In sharing of ideas concerning the water projects	a. Yes b. No
3. In provision of labor for the water project	a. Yes b. No
4. In deciding where to locate these projects	a. Yes b. No
5. In monitoring of the water projects	a. Yes b. No
6. Decision making process involve all members	a. Yes b. No
7. Water project related training	a. Yes b. No

12. Is there a community meeting?

Yes [ ]

No [ ]

13. What was discussed in those meetings?

Water project issues [ ]

Non water project issues [ ]

No idea [ ]

14. Are you still participating in such meetings?

Yes [ ]

No [ ]

15. Is everyone free to air his or her views in the meeting?

Yes [ ]

No [ ]

16. Is everyone free to contribute to the public meeting discussion?

Yes [ ]

No [ ]

17. Are the opinions of everyone heard and respected?

Yes [ ]

No [ ]

18. Who has the final say in the public meetings?

Elected officials [ ]

Community leader/head [ ]

Chairperson/moderator [ ]

Consensus of the participant [ ]

Voting system [ ]

Government representative [ ]

No idea [ ]

### **SECTION C: Social and Economic Factors that Affect Sustainable Water Supply Project Management in Rural Areas**

19. What are the socio-economic factors influencing you to participate in rural water supply projects?

a. Age

- b. Gender
- c. Education level
- d. Marital status
- e. Occupational status
- f. Community awareness
- g. Financial resources
- h. Specialized training
- i. Cost
- j. Good water quality
- k. Easy access
- l. Others .....

20. Who collect water for household?

- Girls [ ]
- Boys [ ]
- Mother [ ]
- Father [ ]

21. What is the source of water used for household purposes?

- Municipality water supply [ ]
- Groundwater [ ]
- Surface water [ ]
- Rainwater harvesting [ ]

22. How far, in kilometers, is the water source from your household?

- Less than 1 kilometer [ ]
- 1-5 kilometers [ ]
- 5-10 kilometers [ ]
- 10-20 kilometers [ ]
- More than 20 kilometers [ ]
- No idea [ ]

23. Do you have to pay for the water?

- Yes [ ]
- No [ ]

24. If yes, please specify how much Tanzanian shillings .....

25. Who is responsible for handling project resources (money, tapes, channels, dams, etc.)?

Donor [ ]

Community [ ]

Village government and community committee leader [ ]

26. Where is the project money kept?

Bank [ ]

In the village safe [ ]

Home of one of the project leaders [ ]

No idea [ ]

27. Do you know the cost of the project?

Yes [ ]

No [ ]

28. Are you aware of the project budget?

Yes [ ]

No [ ]

29. Who was responsible for the project budget?

Community [ ]

Water committee [ ]

Government [ ]

Donor [ ]

Others specify .....

**Section D: Environmental Factors that Affect Sustainable Water Supply Project Management in Rural Areas**

30. What do you think are the environmental factors affecting sustainable water supply project management in rural areas?

- a) Extreme weather events such floods and droughts
- b) Land use and land management
- c) Ecosystem impact

- d) Ground water depletion
- e) Population growth and demographics
- f) Contamination from agriculture and industrial activities and natural pollutants
- g) .....

31. How aware are you of the concept of climate change and its potential impact on water projects?

- Very aware [ ]
- Somewhat aware [ ]
- Not very aware [ ]
- Not aware at all [ ]

32. In your opinion, what are the most significant climate change-related challenges facing the water project in your community?

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.....

33. How have you observed climate change affecting the availability, quality, or sustainability of water for the project?.....

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34. What measures or strategies do you think could be implemented to address or mitigate the impact of climate change on the water project?.....

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35. How involved do you think the community should be in adapting the water project to climate change challenges? .....

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**SECTION E: Effect of Community Involvement on Sustainability of Water Supply Projects**

36. What do you think are the effect of community involvement on sustainability of water supply projects?

Items about project effects	SD	D	NS	A	SA
1. The project's service delivery is efficient					
There is value for money of the project's service delivery					
The project delivers quality services					
There is reduction in the number of complaints about the project's service delivery					

The project's services are easily accessed					
The project's service delivery is effective					
The project's responsiveness in service delivery is satisfactory					
The project service coverage is satisfactory					
The project offers relevant service to the community					
The project offers reliable service to the community					

Key: SA = Strongly agree, A = Agree, NDA = No definite answer, D = Disagree, SD = Strongly disagree

37. Is the quantity of water the same as when the project started (for the water project)?

Yes [ ]

No [ ]

38. Do the water facilities still work effectively as the project started?

Yes [ ]

No [ ]

39. Who is responsible for monitoring the project after the donor contribution phase-out?

Community [ ]

Village government [ ]

District council [ ]

Central government [ ]

40. Do you have the capacity to maintain this project, especially after sponsors or donors phase out?

Yes [ ]

No [ ]

41. If you do not have the capacity, where do you get assistance in case there is a breakdown of the system?

Local government authorities [ ]

Non-government organization [ ]

Community support group [ ]

Regional or national government agencies [ ]

Mutual aid agreements with neighboring communities [ ]

Private contractors or service providers [ ]

42. What measures has the community taken to ensure the long-term sustainability of the water supply project?.....

.....  
.....  
.....

**Thank you so much for your time and ideas**

## 7.2 APPENDIX 2: QUESTIONNAIRE FOR THE OFFICIALS

### Questionnaire for the officials

The purpose of this questionnaire is to collect data that is imperative to “assessing community involvement in sustainable water supply project management in rural areas: A case study of Gairo district council, Tanzania.” The data will be applied for direct academic research fulfillment of the Master of Science degree (M. Sc.) at the Pan African University Institute for Water and Energy Science (incl. Climate Change). The information you provide in these questions will be utilized only for study purposes. Your genuine response is highly valuable for the achievement of the objectives of the research. Confidentiality is guaranteed, so please participate in answering these questionnaires openly and honestly.

Researcher Name: Gidion Richard Mduma

Email: gidionmduma1995@gmail.com Telephone number: +255658053800

Position: M.Sc. student at PAUWES

**I thank you in advance for your cooperation!**

#### Section A: Personal Particular

1. Education level  
Primary [ ]  
Secondary [ ]  
Technical education [ ]  
Diploma [ ]  
University [ ]  
Other, please specify.....
2. Occupation .....
3. Position .....
4. Mobile phone number .....
5. Email address.....

#### Section B: Participation in Project Activities

6. To your understanding, what does “community involvement/participation” mean?.....





**Section D: Management of the Fund**

- 15. Who manages the project fund?.....
- 16. Is there a bank account for project management?  
Yes [ ]  
No [ ]
- 17. Who are the bank signatories? .....
- 18. Who selects them, and what are the selection criteria?.....  
.....  
.....  
.....  
.....

**Section E: Sustainability of the Water Project**

- 19. Is the sustainability of the project adequately addressed during the design stage of the project?  
Yes [ ]  
No [ ]
- 20. If yes how .....  
.....  
.....  
.....  
.....
- 21. What strategies are in place to ensure the sustainability of the water project?.....  
.....  
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.....  
.....
- 22. Do you think a participatory approach alone leads to the sustainability of a water project?  
Yes [ ]  
No [ ]
- 23. If yes how .....



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28. Do you think the community is empowered enough to carry on the project's activities?

Yes [ ]

No [ ]

29. If yes, give the reasons.....

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30. Why do some of the development projects fail after the expiration period of funding?.....

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**Thank you so much for your time and ideas**

### **7.3 APPENDIX 3: A CHECKLIST FOR FOCUS GROUP DISCUSSION**

1. What are the water sources available in this area?
2. Who established these water sources?
3. Were you aware of the development and implementation of the water source?
4. Who decided on the construction of the water project in your village?
5. Do you have a water committee at this village?
6. Are there women on your village water committee?
7. Do you attend water meetings?
8. Do you speak when you attend water meetings?
9. What are the main problems facing your water project?
10. What are your opinions on how to improve the functionality of the water project?
11. Why do you think some projects are functioning properly and others are not?
12. What do you think are factors which affect sustainability of water project?
13. What are your opinions about achieving sustainability in water projects?

**Thank you for your cooperation**

**7.4 APPENDIX 4: A CHECKLIST FOR KEY INFORMANTS**

(a) District water engineer

1. What are the main water sources available in your area?

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2. How do you describe the area in terms of water availability and supply?.....

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3. Is the water available enough to meet the demand?

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4. Are there any water availability challenges in this district?

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5. If yes, in question 4 above, what are the causes of those challenges??

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(b) District planning officer

1. Is the water sector among the priority sectors in this district?

- .....  
.....  
.....
2. Do you allocate money for the maintenance of water projects available in your district?
  3. If yes, at which interval of time do you disburse the money?  
.....  
.....
  4. Do you have a plan for any training for water management at this district?
  5. If the answer is yes in question 4 above, how many trainings are conducted for one year?  
.....

(c) District development officer

1. What is water access status in this area?  
.....  
.....  
.....  
.....
2. Do people participate in the development of water projects in this district?  
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.....
3. At what level of water project development do they participate?  
.....  
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.....  
.....
4. Do people take care of the water projects developed in their area?  
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.....

5. How is people's awareness of environmental protection in this district?

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.....  
.....  
.....

6. Do you have a plan for creating awareness about water management at the village level?

7. If the answer is yes in question 6 above, how often do you conduct seminars?

.....  
.....

**Thank you for your cooperation**

## 7.5 APPENDIX 5: LIST OF IMAGES DURING DATA COLLECTION

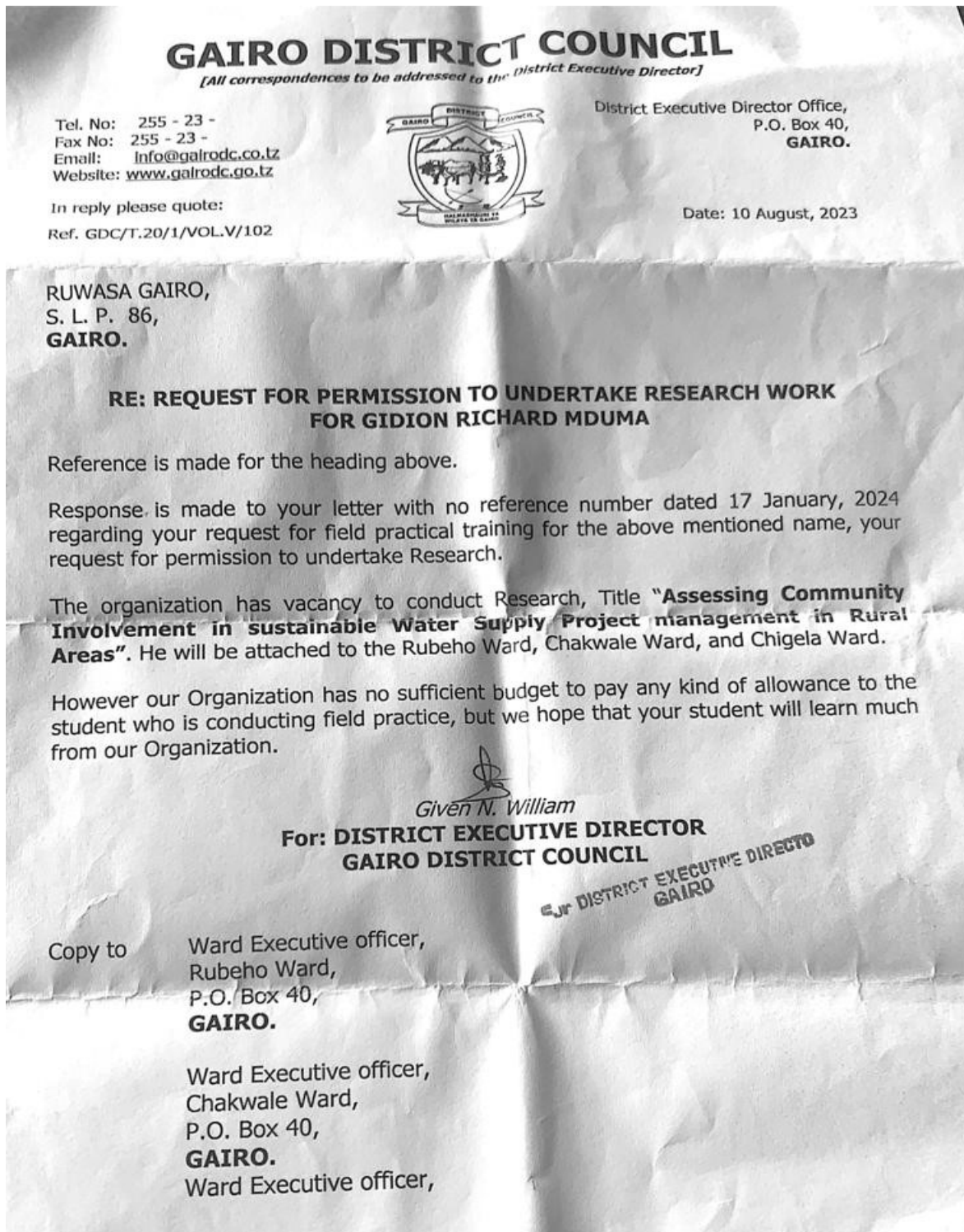


Image 1: Authorization letter for data collection from Gairo District Council



Image 2: One of the water tanks constructed from water supply projects in Gairo District



Image 3: Interview with water committee Rubeho Village in Gairo District



Image 4: FGDs discussion with community members at Kimashale village in Gairo District



Image 5: Water construction intertake at Ihenje village