ROLE OF LOCAL STAKEHOLDERS ON MANAGEMENT OF WATER SUPPLY IN MURANG'A COUNTY, KENYA

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DECLARATION

Declaration by Student

This research thesis is my original work and has not been submitted to any other university for the award of a degree.

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DEDICATION

I dedicate this thesis to my loving wife and children for their support and understanding for the many times I was absent as I undertook my studies and for laying a foundation on which I have built my academic life to this far and hopefully beyond. I give it to them for their unending love and support that no words can describe. I also wish to dedicate this work to my parents, bro, and sisters, fellow coursemates, and colleagues who have always been there to offer me the support I need, I feel so indebted to them for their unwavering support.

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OPERATIONAL DEFINITION OF TERMS

Data Management	This is the practice of organizing and maintaining data processes to meet ongoing information lifecycle needs. In this study, data management was considered in terms of auditing and accounting, information/reporting, and inventory management.
Decision Making	This is the process of making choices by identifying a decision, gathering information, and assessing alternative resolutions. This involves various steps like problem identification, agenda-setting, and monitoring and assessment in the management of water supply.
Local Stakeholders	These are individuals, a group, or communities living within the influence of the water supply resource or likely to be affected by a management decision. In this study, local stakeholders included common citizens, local institutions, local leaders, water consumers, and beneficiaries of the water services.
Management of Water supply	This is the activity of planning, developing, distributing, and managing the optimum use of water resources. In this study, the management of water supply is operationalized in terms of sustainability, accessibility, transparency, and accountability.
Resource Mobilization	This is the entire process of generating and gathering resources from various sources by utilizing various methods to enhance the realization of the pre-determined goals of the water resource project. In this study, resource mobilization involves financial management, resource maintenance, and entrepreneurial capacity.

Technical Support	It refers to the relevant assistance provided to individuals or stakeholders who are experiencing technical problems with water supply materials or services. The study focuses on the adoption of IT, maintenance, and repairs as well as water infrastructure upgrading.
Water Supply	This is the provision of water by public utilities, commercial organizations, community endeavors, or individuals, usually via a system of pumps and pipes. Management of water supply will be viewed in terms of sustainability accessibility, transparency, accountability, and reliability.

LIST OF ABBREVIATIONS AND ACRONYMS

BMGF	Bill and Melinda Gates Foundation
CDC	Community Development Councils
CSA	Central Statistical Agency
EC	European Commission
EEA	European Environmental Agency
EU	European Union
HR	Human Resource
ICT	Information and Communication Technology
JICA	Japan International Cooperation Agency
KNBS	Kenya National Bureau of Statistics
MDGs	Millennium Development Goals
MUWASCO	Murang'a Water and Sewerage Company
NACOSTI	National Commission for Science, Technology and Innovation
NDO	Netherlands Development Organization
NEMA	National Environmental Management Agency
NGOs	Non-Governmental Organizations
NSF	National Science Foundation
PP	Public Participation
SDG	Sustainable Development Goal
SHGs	Self Help Groups
SPSS	Statistical Package for Social Science
SWD	Staff Working Document
TARDA	Tana Athi River Development Authority

UK	United Kingdom
UN	United Nations
USA	United States of America
WFD	Water Framework Directive
WRMA	Water Resource Management Authority
WRUAs	Water Resources Users Associations
WSB	Water Service Board
WSC	Water and Sanitation Centre
WSRB	Water Services Regulatory Board
WSSUG	Water Supply and Sanitation User Groups
WSTF	Water Services Trust Fund
WSUC	Water Supply User Committee
KNBS	Kenya National Bureau of Statistics
CHS	Centre for Health Solutions

ABSTRACT

The general objective of this study was to establish the role of local stakeholders in the management of water supply in Murang'a County, Kenya. The specific objectives were to determine the role of data management on the management of water supply, to establish the role of decision making on the management of water supply, to establish the role of technical support on the management of water supply, to assess the role of resource mobilization on the management of water supply, to determine the mediating role of supporters on the management of water supply in Murang'a County, and to establish the moderating role of institutional and regulatory actors on the management of water supply in Murang'a County. Interpretivist research philosophy was used to establish the role of local stakeholders in the management of water supply in Murang'a County, Kenya. This research used a descriptive study design. The target populace comprised the local stakeholders or the beneficiaries (households), water supply and management organizations staff, national and county government officials from the Ministry of Water, and staff of non-state actors dealing with water in Murang'a County, a total population of 89,415. This study used a sample size of 225 respondents. This study utilized a self-administered research questionnaire to gather both qualitative and quantitative data. The researcher dropped the questionnaires physically at the respondents' places and picked them up once filled up. In addition to the questionnaire, the study used 12 interview schedules to collect qualitative data. The research used Cronbach's alpha to measure internal consistency, where an alpha value of $0.7 \leq \alpha < 0.9$. SPSS version 25 was used to aid in data analysis. The data was presented in tabular form as well as diagrams like pie charts and bar graphs for easy understanding and interpretation. The regression model was used to measure the relationship between the variables. The findings revealed that there was a positive and significant relationship between data management and management of water supply ($\beta = .300$, $p=0.000$), there was a positive and significant relationship between decision making and management of water supply ($\beta = .146$, $p=0.027$), there was a positive and significant relationship between technical support and management of water supply ($\beta = 0.365$, $p=0.000$) and that there was a positive and significant relationship between resource mobilization and management of water supply ($\beta = 0.277$, $p=0.000$). In addition, the findings of the study revealed that institutions and regulatory actors had a moderating effect on the relationship between the role of local stakeholders and the management of water supply in Murang'a County. Further, the study tested the mediating effect of supporters on the management of water supply in Murang'a County, and the results revealed that supporters had a partial mediating effect on the management of water supply in Murang'a County. The study further tested hypotheses to assess the influence of each variable on the management of water supply. All the null hypotheses were rejected and alternative hypotheses adopted, indicating that all the study variables had effect on the management of water supply in Murang'a County. Based on the findings, the study concluded that all the study variables were significant in explaining the management of water supply in Murang'a County. It was hence recommended that the stakeholders in the management of water supply should strive to put in place initiatives which will enhance management of water supply in Murang'a County.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Management of water supply in the past has been dominated by government and community organizations in an attempt to ensure this commodity is available for consumption. Haiyan (2018) pointed out that water of acceptable quality is increasingly hard to come by because local sources are being used for the purposes originally intended, are depleted by over pumping, or are diminished by drought stress. Mohammadpour and Bagheri (2017) allude that water is a common resource which is essential for the survival of living things, especially human beings. Ostrom (1990) indicates that sustainability is a major challenge in the rural water supply sector, where efforts to realize the right to clean water are undermined by high levels of non-functionality.

As with other common resources, water management is worsened by the fact that the current trend of using natural resources jeopardizes the availability of the resource to the future generation (Kwangware *et al*., 2014). The current trend in population growth does not seem set to change in the near future. McNicholl *et al*. (2017) opines that stakeholders play a central role in setting up priorities and objectives of water initiatives in order to ensure relevance and appropriateness. Rehema *et al*. (2018) indicate that the participation of local stakeholders in water resource management is a crucial prerequisite for the sustainable supply and use of scarce water resources. Haiyan (2018) reiterates that in the absence of proper management of water, conflicts within communities often arise from

competing water uses and from overlapping and competing jurisdictional mandates of agencies dealing with water issues.

One of the United Nation's 2000 Millennium Development Goals (MDGs) is to increase the proportion of the world's population that has access to safe drinking water and basic sanitation. Kadurenge *et al*. (2016) in a research on the evolving nature of community participation in public development projects in Kenya reveal that the insufficiency of water supply is an important drawback that may discourage and slow down further investment in Kenya and other developing countries. The following sections are devoted to the arguments on the role of local stakeholders in the management of water supply globally, regionally and locally.

There are more than 1 billion people in the developing world who are unable to access a reliable source of clean, fresh water on a daily basis (Rolston *et al*., 2017). Esera (2014) points out that the challenge of water for all is one that has taken on renewed interest through the declaration of the Millennium Development Goals with the specific target of reducing by half the proportion of people without sustainable access to safe drinking water by 2015. The world met the MDG drinking water target of 88% in 2010, since by 2012 89% of the global population was having access to an improved drinking water source. Despite this, 748 million people, mostly the poor and the marginalized, still lack access to an improved drinking water source (Lucas, Klas, Berit, Ulla & Jerker, 2018). Of these, almost a quarter of the above figure (173 million) rely on untreated surface water, and over 90% of them live in rural areas.

According to Rehema *et al.* (2018), a significant proportion of the world population (87%) has got access to safe drinking water, which is an increase of 10% within the last two decades. Concerning countries of the world whose people have access to safe drinking water, it is estimated that less than 50% people in a little over 10 countries have access to safe drinking water. If the current trend continues, there will still be 547 million people without an improved drinking water supply in the year 2015. Carr, Blöschl and Loucks (2012) carried out an evaluation on community participation in water resource management in the European Water Framework Directive and the U.S Clean Water Act and revealed that public and stakeholder participation in water resource management is required so as to enhance resource management and involve individuals and groups, doing so in a democratic way (Garfin *et al.*, 2015).

EurEau (2017) reports that the total volume of water supplied in the EU is 44.7 billion m^3 per year. There are of course significant differences in consumption among European countries. The United Kingdom, Sweden, France and Germany had the highest amount of fresh water resources, with long-term annual averages ranging between 172.9 and 191.0 billion m^3. European Environmental Agency—EEA—(2014) indicated that Public Participation (PP) is viewed as a means of improving water resource management through better planning and in making more informed decision-making. In 2015, freshwater abstraction by public water supply across the EU Member States ranged from a high of 159.1 m^3 of water per inhabitant in Italy down to a low of 31.3 m^3 per inhabitant in Malta.

Ngilambi and McCubbin (2017) in a paper on effective implementation of community based water safety plans and stakeholders' engagement in Afghanistan report that the

majority (78% to 80%) of Afghans live in rural environments where conditions are very basic. As a result, they don't have access to piped water in their premises or water that is treated before distribution let alone the capacity to regularly monitor water quality. Community water supply is so far the principal service delivery model in rural areas in Afghanistan Voluntary Water Supply and Sanitation User Groups (WSSUG) or Community Development Councils (CDC)/Water Supply User Committee (WSUC). Executive committees are tasked with the operation and maintenance of the system.

Acheampong, Swilling and Urama (2016) report that in many African countries, the supply of drinking water is still an obvious issue, with only 68% of the population having access to improved sources of drinking water. Dyer *et al.* (2014) corroborate that shortage of water supply is much worse in the rural areas where coverage is a mere 50% compared to 86% in urban areas. Rehema, Juliette, Mariella and Sharon (2018) concur that by 2025, at least 48 countries are expected to be facing water shortages. No fewer than 22 of these are in Sub-Saharan Africa, which means that approximately 2.8 billion people (35% of the projected world population) will be living either in water-scarce areas (less than 1,000 cubic metres/cap/yr) or in water-stressed areas (between 1,000-1,700 cm/cap/yr).

McNicholl *et al.,* (2017) assert that water availability in the African continent is restricted by a trend towards urbanization, poor or no city planning, lack of resources and competition for available fresh water from sectors such as industry, municipal water and agriculture. About 884 million people worldwide, out of which Africans account for more than 37% of this figure, are still drinking water from unsafe supply spots (Acheampong *et*

al., 2016). Acceleration of the competition from the main water uses—domestic, industrial and agricultural use—calls for effective and sustainable water resources management.

Given the weak economies of African countries, it is evident that they will continue to contend with the challenges of diminishing natural resources, water being one and being the most vital of them all. McNicholl, McRobie and Cruickshank (2017) indicate that population increase in sub-Saharan Africa and other parts has played a crucial role in informing projections of resource availability trends. Water supply services in Zambia vary widely from one settlement to another, even within the same town. Water supply systems have been poorly maintained in the last 20 years because local authorities and ministry departments as providers have absconded their duty and compromised their professionalism to deliver these services efficiently and in a sustainable way (Acheampong, Swilling & Urama, 2016).

According to Africa Development Bank (2013), Sub-Saharan Africa experiences an even worse situation, with 40% of its 783 million people without access to an improved source of drinking water. As such, Sub-Saharan Africa is far from meeting the United Nations Millennium Development Goal on water, with just 61% water coverage against a target of 75% set for the region (McNicholl *et al.*, 2017). An analysis of data from 35 countries in Sub-Saharan Africa shows significant differences between the poorest and richest population in both rural and urban areas. Over 90% of the richest group is in urban areas and use improved water sources, with over 60% having piped water on their premises. In rural areas, piped water is non-existent in the poorest 40% of households, and less than half of the population use some form of improved source of water (Jacobsen *et al.,* 2012).

According to Nwankwoala (2011), rural water projects in Nigeria have suffered from poor co-ordination, poor maintenance culture, lack of community ownership, poor technical and institutional structure and over bearing bureaucratic control by various supervising ministries. In Kalomo Zambia, the local community was mobilized to manage provision of water services, whereby villagers protected a catchment area by building a fence around the borehole and carrying out regular cleaning of water point (McNicholl *et al.,* 2017). In Ghana, the Integrated Water Resources Management Project in the Volta involved the local communities and employed their traditional catchment management skills by declaring the whole catchment and its wooded vegetation as sacred (McNicholl *et al.,* 2017).

Closer home, local communities in different areas of Tanzania have developed strategies to ensure conservation of water resources (Nkonjera, 2013). However, some of the traditional strategies have been eroded by modernization factors and population pressure to the extent of affecting water quantity and quality. Abebe (2012) in a study of rural water supply management and sustainability in Adama area in Ethiopia established that the community members in the study communities take the lead in implementing the project idea of the water supply scheme.

Spaling, Brouwer and Njoka (2014) in a research on factors affecting the sustainability of a community water supply project in Kenya reported that for decades, water scarcity has been a major issue in Kenya, caused mainly by years of recurrent droughts, poor management of water supply, contamination of the available water, and a sharp increase in water demand resulting from relatively high population growth. Echoing the same, Kwena

and Makori (2015) reiterated that the Kenyan portion of people without safe drinking water is close to 3% of the global figure. In comparison to neighboring Uganda which had similar water coverage two decades ago at the advent of water reforms in both countries, Kenya's water coverage remained sluggish after the reforms, despite its economy being double that of its neighbour but with comparable size of population and land size. There are convincing reasons why Kenya should have met its water targets, including those of the MDG.

Mulwa (2013) in a study of factors influencing sustainability of water supply projects in central division, Machakos District of Machakos County reveals that planning and implementation, community management, cooperation of stakeholders and financial management influence sustainability of water projects. Lack of the right skills, poor leadership and lack of top management support leads to poor management of water supply. Ngile (2015), while assessing stakeholder participation in water resources management in Machakos Sub-County, Machakos County, Kenya, indicated that the key stakeholders in water resources management in the sub-county were WRMA, NEMA, CAAC, Tana-Athi WSB, SHGs, MUWASCO, WRUAs, TARDA and private water service providers.

However, the mean quantity of water available for domestic use from household-constructed sources was significantly lower than the recommended BWR of 50 litres/ person/ day. In addition, most of the household heads participated in community water resources management activities, despite not belonging to community-based water associations (Mwando, 2015). From their study on the costs of coping with poor water supply in rural Kenya, Cook, Kimuyu and Whittington (2016) report that there is a

significant relationship between training in water resources management and the impact one makes in water resources management activities.

Murang'a County is one of the 47 counties in Kenya, located in the Central region of the Republic of Kenya (CHS, 2018). It borders Nyeri to the North, Kiambu to the South, Nyandarua to the West and Kirinyaga, Embu and Machakos counties to the East. It lies between latitudes 0^{o} 34'; 1^{0} 7'South and Longitudes 36^{o}; 37^{o}27' East. The county occupies a total area of 2,558.8 Km^{2}. It is one of the five whose borders extend to the top of Mount Kenya, the second highest mountain in Africa at 5199m. The county lies between 3,353m above sea level, in the West along the slopes of Aberdare ranges and 914m ASL in the East (KNBS, 2017). The western highlands have deep dissected topography and drain into various rivers. These rivers flow from the Aberdare ranges to the west, south east and drain into Tana River. The county's geology and basement system comprises volcanic rocks of the Pleistocene age and Achaean rock type respectively. The western part of the county bordering the Aberdare is characterized by volcanic rocks, whereas the eastern part features the rocks of the basement system (KNBS, 2017).

In Murang'a County, only 41% of residents use improved sources of water, with the rest relying on unimproved sources (CHS, 2018). Use of improved sources is slightly higher in male-headed households at 42%, compared with female-headed households at 40%. Porous beds and disconformities within the volcanic rock system form important aquifers, collecting and moving ground water and thus regulating water supply from wells and boreholes. The county's rugged, dissected topography and geology is both an asset and liability to the county's development. Murang'a County's water resources are rivers,

shallow wells, springs, dams, boreholes and roof catchment. There are 10 permanent rivers, 400 shallow wells, 75 springs, 30 dams and 100 bore holes that supply water for domestic and agricultural use in the county. These sources supply 60 per cent of the county's population with clean and safe drinking water (Mwobobia, 2013).

Murang'a Water Company (MUWASCO) has received funding from various donors, like World Bank, Japan International Cooperation Agency (JICA) and Water Services Trust Fund (WSTF) by way of grants, result-based financing and also commercial financing. Murang'a County has 27 water supply schemes and about 16 irrigation schemes. Water supply schemes are managed by three different entities. There are some which are managed by the water companies, the department of water and others by the community members through water project committees. The irrigation schemes, managed by the community members, get funding from the community's own initiatives as well as from the government and development partners.

1.2 Statement of the Problem

The road to the realization of Kenya's Vision 2030 is facing various challenges, such as inadequate or limited availability of resources, especially water that is clean and is accessible by all people (RoK, 2019). According to the 2010 constitution, it's the right of every citizen to have access to clean water and sanitation (WASREB, 2019). The UN stipulate water access as a human right that member states should ensure is enjoyed by citizens (UN, 2019). Despite these ambitious objectives, the ratio of people with access to water source remains low due to up to 33% failure of water projects (UNDP, 2019). Further, while the aim of Kenya's MDG goals was to have 70% of the population having

access to water by 2015, up to 38% of rural population lack access to clean water (UNDP, 2020). Population growth, increased demand for and rising cost of energy, increased urbanization, watershed and environmental degradation, natural disasters, conflict, climate change, and weak water governance are putting water resources under increasing pressure.

In Murang'a County, the proportion of the population with access to clean and reliable water supply is 47%, with 100% of water projects in the county not sustainable since their cost coverage is less than 130% (WASREB, 2019). Additionally, Murang'a County has the second lowest sewerage coverage in Kenya, with only 3% of population covered and thus compromising the quality of water used by residents (WASREB, 2019). The foregoing, coupled with diminishing water resources and the ever-increasing population and the attendant, expanding water demand create water projects sustainability challenge. Generally, Murang'a county development and economic empowerment has been hampered by lack of access to water.

Despite the continuous efforts which have been made to provide water, the commodity is still not enough for all. Rolston *et al.,* (2017) report that globally, there are more than 1.8 billion people who face the challenge of accessing reliable source of clean fresh water. According to Omarova *et al.* (2019), the major sectors affected by poor provision of water supply include health (50% of the diseases are attributed to lack of access to clean water in developing countries), industry and commerce (lack of water supply accounts for 20% of the industrial/manufacturing inefficiencies) and agriculture (15% of agricultural activities are fully dependent on sources of water supply other than rain). Johannes and Sonja (2018) state that in Africa alone, more than one billion people do not have access to safe drinking

water and three hundred million people do not have access to safe drinking water. Acheampong, Swilling and Urama (2016), Ngilambi and McCubbin (2017) and McNicholl, McRobie, and Cruickshank (2017) found out that Africa of the continents that make up the world, Africa has the lowest total water supply coverage. Acheampong *et al.,* (2016) indicated that poor water supply and sanitation services continue to be a critical problem in developing countries like Kenya, despite the considerable effort to improve and expand its access.

According to Water Services Regulatory Board (2016), the mounting evidence indicates that the centrally managed schemes in Kenya are difficult to implement and operate when the communities served are disperse, remote, and relatively small and lack the financial resources and physical social infrastructure needed to support development or to maintain new systems. Chepyegon and Kamiya (2018) established that out of a population of about 40 million people in Kenya, about 17 million (43%) do not have access to clean water. While the role of the private sector tends to focus on companies delivering water supply and sanitation, business companies have paid increasing attention to water governance in their strategies, especially to cope with regulatory risks and secure water allocation (Kwena & Makori, 2015). In parallel, citizens and users' associations have gained increasing influence on political decisions on water. Local studies (Spaling *et al.,* 2014; Kwena & Makori, 2015; Chepyegon & Kamiya, 2018) have shown that despite increased government investment in the water sector (from $5 million to $450 million in 10 years), access to water and sanitation services remains low, at 56% and 70% respectively. This is well below the Sustainable Development Goal (SDG) targets.

Murang'a County is located in one of the major water catchment areas in Kenya. However, only 41% of its residents are supplied with improved sources of water (CHS, 2018). This leaves a major proportion of its population without access to water supply, thus resorting to other sources of water. There have been inconsistencies on the findings on the role of local stakeholders in management of water supply in Kenya. Omarova, Tussupova, Hjorth, Kalishev and Dosmagambetova (2019) Rolston, Jennings and Linnane (2017) and Wehn *et al.,* (2015) reported that many countries have realized several positive changes in water supply after implementing strategic development goals; however, Chepyegon and Kamiya (2018), Nyanje and Wanyoike (2016), Kwena and Makori (2015) had a different view, painting Kenya as a country that lags behind in meeting this goal.

Murang'a County was selected particularly due to the emerging issues regarding water sourced from the county and supplied in Nairobi City County, leaving local stakeholders unable to enjoy the benefits arising from the supply of the water as a resource. In addition, Murang'a County has encountered persistent water problems due to rapid population growth in the face of poor management of existing water supply networks. It is against this backdrop that the current study sought to explore the knowledge, methodological and contextual gaps in an effort to establish the role of local stakeholders in the management of water supply in Murang'a County.

1.3 Objectives of the Study

The specific objectives were:

1. To determine the role of data management on the management of water supply in Murang'a County, Kenya.

2. To establish the role of decision making on the management of water supply in Murang'a County, Kenya.
3. To establish the role of technical support on the management of water supply in Murang'a County, Kenya.
4. To assess the role of resource mobilization on the management of water supply in Murang'a County, Kenya.
5. To assess the moderating role of regulatory actors on the relationship between role of local stakeholders and management of water supply in Murang'a County, Kenya.
6. To establish the mediating effect of supporters on the management of water supply in Murang'a County, Kenya.

1.4 Research Hypotheses

The study made the following research hypotheses:

1. **H_{01}:** There exists no relationship between data and management of water supply in Murang'a County, Kenya.
2. **H_{02}:** There is no relationship between decision making and management of water supply in Murang'a County, Kenya.
3. **H_{03}:** There exists no relationship between technical support and management of water supply in Murang'a County, Kenya.
4. **H_{04}:** There is no statistically significant relationship between resource mobilization and management of water supply in Murang'a County, Kenya.

5. **H_{05}:** The regulatory actors have no moderating role on the relationship between the role of local stakeholders and management of water supply in Murang'a County, Kenya.
6. **H_{06}:** There is no mediating effect of supporters on the management of water supply in Murang'a County, Kenya.

1.5 Justification and Significance of the Study

1.5.1 Justification of the Study

Effective planning and implementation of water projects or water development programmes call for, among others, the availability of adequate and reliable data to ensure that the objectives for which they are undertaken are actually realized. Despite the international and national efforts made over the last decades to involve local communities in the management of water supply projects, particularly rural community projects, the problem of water supply is still acute in many developing countries. In the local setting, water supply may require more energy intensive infrastructure, which adds to the financial and technical difficulties facing the stakeholders.

Involving local stakeholders in the management of water supply has been recommended as a way out of retrogressive or stagnant state management of water supply (World Bank, 2011). The problem as has been amply shown above lies in the fact that local stakeholders have been inactive or lacking in the management of water supply projects. It is further noted that, to a certain extent, the problem is mainly due to inadequate members of the local communities in the management of water supply projects.

During the last two decades, the management of water supply in most countries in Sub-Saharan Africa was the responsibility of community and central government. But much larger water supply projects that were established and managed by the community and relevant authorities in Kenya failed mainly due to inadequate participation of local stakeholders in planning and implementing such projects (Word Bank, 2015). In light of this, this study sought to establish the role of the local stakeholders in the management of water supply in Murang'a County, Kenya.

1.5.2 Significance of the Study

It is expected that the findings would enable stakeholders in Murang'a County and the country as a whole to make informed decisions in respect of identifying, planning, designing and implementation of water supply projects to enhance sustainability of these projects, thus contributing to the achievement of the Sustainable Development Goal Six (SDG 6). It is also hoped that the findings of this study would assist the national and county governments, development partners seeking to invest in management of water supply, non-state actors, consumers and other beneficiaries. These stakeholders would understand the approaches tailored to fit the needs and conditions of the local beneficiaries so as to enable them to manage water supplies and enhance accessibility to this essential resource.

The study is expected to be significant to the policy makers and development agencies seeking to invest in management of water supply projects by facilitating informed decision-making while planning and developing policies on these projects by taking into consideration the paramount importance of the local stakeholders. The findings would

assist various stakeholders, including service providers and the government, in designing policies that are geared towards enhancing sustained management of water supply in Kenya.

This study would offer academic value in two folds: First, the conceptual and empirical insights stemming from this study can be used to develop new knowledge, thereby helping broaden and deepen researchers' understanding of the role of stakeholders in management of water supply, in particular with regards to the Kenyan context. Second, the study provides researchers with a rigorous and methodologically sound way of how to integrate quantitative and qualitative methods in order to contribute to a rich and comprehensive study.

1.6 Scope and Limitations of the Study

1.6.1 Scope of the Study

The conceptual scope of this study lay on establishing the role of the local stakeholders in management of water supply in Kenya. The specific context of the study were the local stakeholders involved in the management of water supply in Murang'a County, Kenya. In developing countries like Kenya, there is a dearth of literature focusing on this important aspect of public policy and management in general, which explains the existence of performance disparities in the management of water supply. So a need has arisen to study the relationship between the participation of local stakeholders and performance of the management of water supply in Murang'a County, Kenya. This study was limited to Murang'a County where special focus was on the local stakeholders (the beneficiaries) and the management staff of the water resource projects in Murang'a County. This study

involved collecting primary data obtained from the target respondents and secondary data from the secondary sources on the role of the local stakeholders in management of water supply. This was relevant in collecting the data required as finances and distances were limiting factors that could inhibit collecting the data from all the water resource projects across the country.

1.6.2 Limitations of the Study

This study was limited to a specific time schedule and budget, since the researcher was self-sponsored. Language barrier was another limiting factor, since respondents required interpretation of questions in the questionnaires due to the generally low literacy level in the county. This challenge was, however, countered by training the research assistants who better understood the local language.

There was also lack of cooperation from committee members of the water projects, most likely arising from suspicion on the motive of the research study. Working closely with community leaders and volunteers as well as making the respondents understand that the research was solely for academic purpose, however, helped to mitigate this challenge.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature review was aligned to the objectives of the study. As such, the chapter covers management of water supply, role of local stakeholders, data management, decision making, technical support and resource mobilization. The review also included the theoretical review, empirical review and a critique of existing literature.

2.2 Management of Water Supply

Management of water supply can be achieved when equity, accountability and transparency are put in place by using key aspects such as social justice, self-reliance and empowerment of the local people. However, Haiyan (2018) alludes that the minimum amount of water required to sustain native peoples, a riparian system, or an endangered species would eventually need to be known in order to manage the available water supply (McNicholl *et al.*, 2017). Near population centres, surface water supplies are fully appropriated, and many communities are dependent upon ground water drawn from storage, which is an unsustainable strategy. European Commission (2016) indicate that some of the patterns of freshwater abstraction for public supply are informed by specific conditions in the EU member states.

EC (2016) reported that in Ireland (135.5 m^3 per inhabitant) the use of water from the public supply was still free of charge for many households, while in Bulgaria (120.7 m^3 per inhabitant) there were particularly high losses from the public network. Abstraction rates were also high in some non-EU Member States, notably in Norway (169 m^3 per inhabitant

(EEA, 2018). Through participation, these rural communities tend to manage their water supply networks for sustainability, cost effectiveness and efficiency in their water supply development. Transparency in management of water supply necessitates strong sector performance monitoring systems, which may enhance accountability for the use of resources by service providers.

Rolston *et al.* (2017) opine that decentralization of water supply provides an opportunity for the introduction of transparency and accountability measures, but also introduces threats to the same if community and non-state actors concerns are not well articulated. Kwena and Makori (2015) affirm that the active involvement of all interested parties and influencers in the deliberation and decision making process is generally expected to foster an environment of accessibility, receptiveness and mutual respect. Involvement of all interested parties ultimately promotes transparency and trust among participants and can then increase the success rate of policies due to better acceptance by stakeholders (Susanne *et al.*, 2018).

Haiyan (2018) is of the view that involvement aims at identifying the problems associated with water supply and management, and look for possible solutions in addressing these issues. Local participation has proven to be a powerful tool, as it engages the various stakeholders in different responsibilities as a result of active involvement in the management process. Kwena and Makori (2015) indicated that combined experience, knowledge and understanding of the different local people and groups have been vital for the bottom-up management approach which most government experts and private sector are now implementing as management alternative. This has very much evolved over the

past decades in developing countries because of weak governance in water institutions as well as mismanagement (McNicholl *et al.,* 2017).

Nyanje and Wanyoike (2016) allude that governments in most countries have realized that the centralized system is no longer reliable in supplying the local communities with potable water; they have thus engaged in the decentralized system, acting as facilitators rather than just providers and encouraging communities to develop and/or manage their water systems through policy reforms. Rolston *et al.,* (2017) undertook a survey of current opinion on water management and community initiatives in the Republic of Ireland and the United Kingdom (UK). They indicated that water resource management is moving from the traditional top-down approach to more integrated initiatives employing community-led action. Water supply in most developing countries is being bankrolled by external funds from national and international agencies like the World Bank, international NGOs as well as government as part of poverty alleviating efforts.

Alberto and Miguel (2017) in a study of public participation in European water management revealed that it is important to involve the local communities in assessing and solving their water problems since they are the ones who interact with their own environment and carry out activities that have an impact on the environment. Johannes and Sonja (2018) in a report titled 'From Information to Participation and Self-organization of European River Basin Management' established that coordination of stakeholders in formulation of sound sustainable mechanisms leads to a lasting solution and plays a vital role in development of sustainable rural water supply schemes. Since the study was carried out in Europe a developed context, a contextual gap exists which the current study

addressed by seeking to establish the role of local stakeholders in management of water supply in Murang'a County, Kenya.

National Science Foundation (2016) indicated that in the Western United States, the availability of water has become a serious concern for many communities and rural areas. Water security in the U.S is increasingly threatened whereby many utilities are facing major supply issues for example water quantity and/or water quality, aging infrastructure and major funding shortfalls. In the last decade, prolonged droughts and floods from Texas to California to Colorado to the Mississippi to the North-East have stressed or strained water storage and flood control infrastructure, and led to considerable environmental, social and economic impact (Garfin, Franco, Blanco, Comrie, Gonzalez, Piechota, Smyth & Waskom, 2014). The studies were, however, carried out in a developed country where there are better policies governing management of water resources; hence the existence of contextual gaps which the current study addressed by seeking to establish the role of local stakeholders in management of water supply in Murang'a County, Kenya.

Some of the inherent characteristics of the West add complexity to the task of securing water supplies. The Western States, including the arid Southwest, have the most rapid population growth in the United States (NSF, 2016). European Commission (2012) reported that while the concept of PP is now well established, and commonly plays a part in the environment and sustainability agendas of international organizations and national authorities, its effectiveness in achieving European water-policy goals is still being assessed. According to Haiyan (2018), over 40 million people lack access to an improved

water source and more than 110 million of the country's 240 million people have no access to improved sanitation.

Constitutionally-triggered decentralization has led to democratically elected bodies of local governance being given broader water-related competencies (Susanne, Peter & Helena, 2018). There have thus been significant changes in the discourse concerning public participation in the water sector. It should be stressed at this point that the variable of empowering the stakeholders with capacity to negotiate is especially important for a water resource management. Rolston, Jennings and Linnane (2017) undertook a survey of current opinion on water management and community initiatives in the Republic of Ireland and the United Kingdom. They indicated that water resource management is moving from the traditional top-down approach to more integrated initiatives focusing on community-led action.

Nana (2013) in a study on stakeholder participation in water resources management in Densu Basin in Ghana reiterated that there is a democratic deficit of community participation in water resource management, with the appointment of 30% of District Assembly (DA) members and the District Chief Executive by the central government encouraging upward accountability and less of downward accountability from the local electorates. In addition, there is incomplete decentralization recruitment of personnel, and payment of salaries at the decentralized departments are done in Accra (headquarters), creating problems of disloyalty to the DAs by these departments. McNicholl *et al*., (2017) also reported that in Ghana, the water laws and the national water policy promote community, public and private sector participation in the management of water, especially

in the water delivery sub-sector. Stakeholder in water resources management at the national level is mainly about developing policies and legislation, and provision of the necessary guidelines for various water uses, policy implementation and monitoring and collaboration between government agencies in performing their functions (Nana, 2013). These studies were conducted in Ghana where policies with regards to stakeholders role in management of water supply are likely to be different from that in Kenya where both conceptual and contextual gaps are evident. The current study addressed the identified gaps by establishing the role of local stakeholders in management of water supply in Murang'a County, in the Kenyan context.

A study by Chepyegon and Kamiya (2018) on challenges faced by the Kenya water sector management in improving water supply coverage reported that in most areas, the shortage of water in Kenya has been amplified by the government's lack of investment in water, especially in rural areas. Odongo (2014) while assessing water supply and demand management in industries and commercial enterprises in Athi River Town, Machakos County, established that most of the poor Kenyans only have access to polluted water, which greatly contributes to cholera epidemics and multiple diseases that affect health and livelihoods. Nyanchaga (2016) reviewed the history of water supply and governance in Kenya between 1895 and 2005 and found out that most of the rural water service systems are still not sustainable because of inadequate participation in their management by local communities, leading to breakdown of facilities and low access rate, poor water quality and increased disputes.

Kibuika and Wanyoike (2012) also assessed the factors affecting sustainability of rural water supply scheme with a special focus on Kangui Water Scheme Nyandarua County Kenya and found out that in spite of the new policy, legislative frameworks and increased sector investments in rural water development which rose from Kshs 3 billion in 2003/2004 financial year to Kshs 12 billion in the 2010/2011 financial year, access to improved drinking water still remains low (Water Services Regulatory Board-WSRB, 2016). The country is facing a number of challenges related to performance of water projects. Nyaguthii and Oyugi (2013) established that most members of the community in Mwea Sub County do not participate in the management of community water projects during the initiation phase, leading to failure before execution phase.

While analyzing the factors affecting the implementation of non-governmental organization projects in Nakuru, Nyanje and Wanyoike (2016) found out that there are a number of water resource projects that have been inefficient or non-operational in relation to their objectives. The under-performance of these projects has greatly affected the communities as the beneficiaries and the implementing organizations. Kwena and Makori (2015) investigated the determinants of sustainability of rural water projects of Netherlands Development Organization (NDO) supported water schemes with a focus on Kajiado County and found out that stakeholder participation in water resources management has not been effectively implemented in the past and even identification and categorization of stakeholders has not been carried out in most parts of the developing countries.

The foregoing review showed that there have been numerous attempts to document the role of communities and citizens in water resource management. However, the available

researches have not focused on establishing the role of local stakeholders in management of water supply in Kenya. This leaves a major gap that ought to be closed by linking data management, decision making, technical support and mobilization of local stakeholders in the management of water supply, which is the main focus of the current study whose contextual focus was Murang'a County.

2.3 Empirical Review

2.3.1 Local Stakeholders and Management of Water Supply

To achieve sustainability in water projects, there must be full participation by all individuals or representatives in all the stages of project management. Finch (2015) indicated that community engagement is a governance approach that has many benefits: namely, citizen empowerment; the generation of new, diverse and innovative ideas and actions on performance; enhancement of citizen-government relationship; appropriate prioritization of development projects; improved delivery of public services; and promotion of the government's responsiveness. Wehn, Collins, Anema, Basco-Carrera and Lerebours (2017) clarify that community engagement is the involvement of people in the community in solving community problems.

Akhmouch and Clavreul (2016) posit that the depth of engagement is more important for the sustainability of water projects in a community. The degree of community participation during planning and decision making has a direct positive impact on community project satisfaction. As van Buuren, Driessen, Teisman and van Rijswick (2014) put it, community participation is merely a process of taking part in diverse spheres of societal life: economic, political, social, cultural and others. Effective engagement of stakeholders

brings benefits to projects by reducing conflicts and increasing cooperation between the organizers and the community (Wehn & Evers, 2015).

In order to maximize the benefits of the engagement process, trust and credibility should be reinstated into the community (Haiyan, 2018). The government, organizing body and the community trusted personnel (clergy, community leaders, parents and teachers) should realize the link between success, trust and credibility. According to Ho *et al.*, (2014), the greater the community trust for the organizing the bodies, the more likely they are to embrace any aspect of the engagement process and vice versa. Unfortunately, this is a major challenge because most communities have little or no trust in the government and its allies (Wehn, McCarty, Lanfranchi & Tapsell, 2015).

Concerning community engagement in drinking water supply management, Ulrike, Derek, Chenai, Bianca, Mandisi, Jean-Paul and Chigona (2015) indicated that this is an important component of sustainable water supply management because it provides, on the one hand, an avenue to establish the needs of communities and, on the other hand, ensures the buy-in and trust into systems developed by government authorities to deliver services. Active community engagement, however, calls for communities willing to engage in and contribute to the management and governance of services and the governance structures seeking pro-actively such engagement (Rivett, Champanis & Wilson-Jones, 2013).

Dean, Fielding, Newton and Ross (2016) conducted a review of different engagement approaches involving communities with water-stressed cities and indicated that effective communication techniques, combining good information and suitable message framing can build support for new policies. Another important impact of an effective feedback

mechanism is its ability to improve community partnership and collaboration in water development, as evidence suggests that people are most committed to implementing projects that they have helped to plan (Lucas *et al.,* 2018). Listening to and addressing people's concerns and interests have proven to enhance motivation for involvement.

Ngilambi and McCubbin (2017) in a study on stakeholders' engagement process in Afghanistan averred that the core value of community management is to empower and equip communities to take control of their own development (Doe & Khan, 2004). However, community management encounters a number of challenges. One of them is that it cannot work successfully due to absence of right configuration of markets, government institutions and tradition (Kleemeier, 2010). In addition, a sticky problem with the volunteer-based community management of water supply is that community-level committee and care taker lose interest or trained individuals move away, or community fail to own the new infrastructure (McNicholl *et al.,* 2017).

Further, Ugbah, Meldrum and Ehiwario (2017) in a study on water access and community engagement in Nigeria recapped that sustainable rural water supply projects in developing countries face several threats. These include dependency on community spirit becoming weaker with the modernizing influences such as increased mobility through infrastructure development, more off land employment access, industrialization, rural urban drift, increased wealth, materialism and individualism which erode the traditional structures and values. This is not to mention bureaucracies of government structures in developing countries, which are not suitable for community management approach (Rolston *et al.,* 2017).

2.3.2 Data Management and Management of Water Supply

Data management is a new form of teamwork between support groups and the community (Wehn & Evers, 2015). It is seen as a means of improving reliability, increasing cost effectiveness and ensuring sustainability by putting the larger portion of responsibility when it comes to maintenance and operations of systems in the hands of community members/users themselves (Acheampong *et al.,* 2016). Through data management, communities get control over their systems and make decisions in line with the organization of the management. Cook *et al.,* (2016) also noted that stakeholders often work in partnership with external agencies, such that both provide resources that can be used in the most effective manner to develop reliable and sustainable systems. Such partnerships involve the central agencies who focus their resources on activities that benefit shared efforts and the local resource which is under the control of the locals.

Data management aims at strengthening the community's capability by finding out and endorsing the community's interests. It maintains control on development and promotes running of systems by the community members themselves, and for such goals to be attained, it is necessary for the community to be trained and empowered so as to take on its role in collaboration with its partners. Kleemeier and Narkevic (2010) have described elaborately the problems of data management approach. Some of the significant problems include the impossibility of being able to predict funding from one year to the next. As a result, it becomes very difficult to make even short-term sector planning among poorer, dispersed, and less organized communities, resulting, in most cases, with minimal or no follow up after construction.

Wehn and Evers (2015) in their investigation of the innovation potential of ICT-enabled citizen observatories in increasing e-participation in local flood risk management revealed that there was a dramatic drop in management capacity of local water committee over time as people lost interest. This is because though committee members are initially trained extensively, there is no provision/ option for upgrading skills or replacement when those who are trained move away, spotty cost recovery for operation and maintenance; if too much raised, attract misuse by those in office, otherwise more often too little is collected which cannot meet the expenses of repair when needed. Technologically complex systems or large number of customers make operations and maintenance challenging; recovery of investment cost stops once an upfront payment has been made; and availability of spare parts, trained manpower and tools for major repairs become scarce, resulting in the infrastructure sitting idle for long period of time.

Johannes and Sonja (2018) in a study titled 'From Information to Participation and Self-Organization' reveal that data management system works successfully if local capacity is adequately strengthened with external support prior to the community's assumption of full control of water supply systems and when assumption of responsibilities takes place gradually. In addition, capacity building, construction supervision and providing support to the community-owned management during the first year of implementation are recommended for maintaining long-term functionality of water points (Jiménez & Pérez-Foguet, 2011). The management of data limitation is thus key to successful resource assessment. Well-structured metadata provide an important tool to assist the modeler in understanding the information limitations on which assessment results are based.

Spaling *et al.* (2014) observed that the pressure to manage the country's water resources more efficiently and ensure that water services are availed equitably among the diverse uses is bound to increases as the country gears itself towards meeting the Vision 2030 goals. ICTs have a potential to contribute towards improvement in water resource management techniques; strengthen the voice of the most vulnerable within water governance processes; create greater accountability; provide access to locally relevant information needed to reduce risk and vulnerability; and improve networking and knowledge sharing to disseminate good practices and foster multi-stakeholder partnerships, among others (Finlay & Adera, 2012).

2.3.3 Decision Making and Management of Water Supply

Kristan (2013) in an investigation of decision maker perceptions of water quantity and supply side management in western North Carolina reveal that there is only low level concern about water quantity, and this drives a continued emphasis on supply side management and no perceived need for hydrological data. The historical realities of low demand and abundant water have generated a perception of 'water supply' as disconnected from physical, hydrological systems and allowed for *ad hoc* decision making processes to prevail. The lack of well-established processes may, ironically, provide significant opportunities for employing collaboration among researchers and decision makers to develop policies and processes that integrate data into making water management decisions and thus prompt increased attention to water demand.

Kelli, Dave, Patricia and Amber (2015) studied decision making under uncertainty for water sustainability and urban climate change adaptation in Phoenix, Arizona, U.S.A and

affirmed that the complexities involved with human environment systems have contributed to the challenges of utilizing scientific understanding for decision making insights. The large uncertainties associated with data and modeling have impeded the capacity of decision makers to translate expanding knowledge about the climate system into adaptive actions.

Mala and Komlan (2015) indicated that water regulation in India has traditionally involved very little public and local community participation in the resource management. Major changes have taken place in the past couple of decades from different perspectives. On the one hand, the international participatory agenda has been reflected in the adoption of a series of policies and laws emphasizing the need for fostering the participation of water users. Uncertainty quantification is seen as a strategy to produce risk-based assessments, and thus facilitate informed decision making. Rising industrial and commercial demand linked to industrialization and rising incomes for some have nourished expectations of higher quantities and better quality of water, increasing pressure for improved water management policies and implementation (Rolston *et al.*, 2017). Rapid urbanization, for others, is accompanied by poor urban planning and expanding slum populations.

Thomas (2016) in a study on decision making methods for water resources management revealed that with increasing water stress and water scarcity, information requirements and data collection needs increased dramatically. The rapid growth of computerized information systems has had a major influence on data acquisition in general and on the utility of information. Trenberth (2010) has warned that greater knowledge about climate system with respect to important relationships and feedbacks and the use of empirical data

to initialize system conditions may have the paradoxical effect of increasing, not decreasing, uncertainty for certain system parameters and dynamics, which is problematic for decision makers.

2.3.4 Technical Support and Management of Water Supply

Many projects have failed because the users are not involved in provision of technical support (Wendling, Radisch & Jacobzone, 2013). In some cases, fashionable choices were made for some communities that lacked the potential of maintaining the technologically sophisticated option chosen for them. These have resulted in the breakdown of many boreholes. Garfin *et al.,* (2014) showed that the water facilities designed by government and constructed with little or no community involvement are not adequately maintained and some have been abandoned. The study shows that whilst most of the hand pumps are in good working condition because the technology is so simple that the village mechanic and bicycle repairer can repair the pumps, about 58% of the motorized schemes have ceased functioning.

Kadurenge *et al.* (2016) indicated that selecting standardized equipment that is used in other parts of the region or country or in other sectors (agriculture or industry) facilitates the procurement of spare parts and the services of mechanics when repairs are needed. The choice of technology affects people's willingness to pay as well as the prospect for workable arrangements and for continued use of the system. Thus, in the selection and procurement of pumps, there should be the maximum possible standardization on one or a small number of models which are robust, appropriate to the local situation, simple and on which maintenance can be undertaken by community members with a minimum of tools

and training (Lunduka *et al.,* 2012). In this regard, technologies must be chosen which provide an appropriate level of service for meeting consumer needs now and in the future. Even when responsibility for maintenance and repairs is clearly defined and accepted, and funds and technical skills are available, neither routine maintenance nor repairs should be done promptly unless the necessary tools and spare parts are also on hand at the local level, and at reasonable and affordable prices (Odongo, 2014).

Hweitzer and Mihelcic (2012) assert that technology which fails to fulfill the needs of its users, which is poorly installed or which is difficult to maintain or repair possesses significant challenges for sustainability. World Bank (2016) allude that there is no such thing as a maintenance-free technology yet; even gravity water supply schemes, which were expected to provide sustainable services, have failed to live up to that promise. Hardware (including pumps, pipes, and spare parts) is often sourced and procured by international agencies, governments and private providers. But links, particularly between the community and the suppliers of spare parts, are crucial. The community needs to be trained on how to use the taps, springs, hand pumps, among others, and it should also be trained on how to maintain the facilities because the external institutions may not always be available in case of breakdowns.

According to Acheampong *et al.,* (2016), technology should not be predetermined in any rural water supply programme; rather, the final choice of technology should be made by the community from a range of feasible options. Communities need to be encouraged to select feasible options rather than fashionable options. They must be given real freedom to select their own technology, however low the cost, and not be pushed towards the

implementer's preferred choices. Most of the problems had to do with inability to carry out repairs on the attached generators or lack of money to buy diesel and lubricants necessary to run the generator. If the communities are properly guided to make feasible choice of technology in water supply projects, the menace of broken down boreholes can be reduced. Awoke (2012) in his study of challenges of sustainability of rural water supply in Quarit Woreda and Amhara region found out that selection of appropriate water technology type is essential for the community to be able to operate, maintain and pay for. Where the technology deployed is remote from the users' capacity, their prospects of effective participation is equally remote.

2.3.5 Resource Mobilization and Management of Water Supply

Dyer *et al.,* (2014) pointed out that the fundamental goal of resource planning and management is to match the demand for water by the socio-economic system with the supply (quantity and quality) of the water system through administrative control and management (water regulations/laws and infrastructure) without compromising eco-system sustainability. Since water is a shared common property and water services have some basic investment costs, it is imperative that local communities work together to manage the resource and the service costs accruing. Resource mobilization is an indicator of a demand-responsive project and can distinguish a project in which people merely participate. Therefore, communities should engage in civic organizations in response to donors encouraging them for shared action or co-production of the services.

Endalcachew (2017) in the assessment of water resources mobilization in Ethiopia revealed that water projects require to collect tariffs and cost recovery from beneficiaries,

to take care of routine operation and participate in the maintenance of the infrastructure. Besides, there is need for continued involvement of both men and women in the community in aspects of system management and maintenance. Endalcachew (2017) further indicated that the users' level of willingness to provide the necessary resources for keeping the system functioning, which include time, money and labor, may affect the level of sustainability of rural water system. The willingness may be affected by socio-economic factors such as income level, ethnic homogeneity, and the social capital of the villagers. Needless to say, willingness may also depend on the level of satisfaction that the consumer derives from one water project as compared to a previous one.

Communities would be more willing to pay for operation and maintenance if they perceived significant improvements in services of the water system (EurEau, 2017). Akhmouch and Clavreul (2016) aver that willingness of the community to pay for water services is also affected, either by perceptions of ownership or sense of entitlement to free services from the government (Ohiani & Oni, 2010). Ohiani and Oni (2010) observed that many of the efforts to strengthen sustainability of community water projects are mainly directed towards the willingness to pay. Willingness to pay can be described as the decision taken under a situation of free choice to spend some of the available resources on a service or good. Willingness to pay is an expression of the willingness to contribute in cash or in kind (Wehn, McCarty, Lanfranchi & Tapsell, 2015). Community contribution is the amount people give in cash, in kind, and labor in exchange for services, and should be linked to the relative cost of providing different levels of service.

2.3.6 Supporters in Management of Water Supply

Supporters' role in management of water supply is a form of cooperation between communities and support agencies (both private and government agencies) involved in the water sector (Johannes & Sonja, 2018). For a water supply system to be sustainable, it must continuously maintain and deliver the desired outcome to its beneficiaries and supporters, such as non-state actor's consumers and associations. Ananga (2015) indicated that quality social relations provide a social support safety net and enable benefitting members to collectively resolve their common problems while achieving mutual benefits. Local people are the ones directly affected and most motivated to seek solutions to their own water and sanitation issues; as a result, they are generally motivated toward broad inclusion in decision-making. Sponsors and advocacy groups are organized at local, national and international level and in a diversity of peer groups ranging from professional background, religious or political affiliation, ethnicity or nationality, to thematic face and interest groups (Chowns, 2015).

Johannes and Sonja (2018) pointed out that the vast social capital is a substantial resource for collective action at all levels, contributing to social cohesion, democracy, economic development and sustainability of interventions. The role of beneficiaries is so interrelated with effective community participation that it must be analyzed simultaneously with community participation in order to develop program objectives or to prepare meaningful guidelines. Beneficiaries appreciate the fact that the urgent need for improved and more accessible water for domestic consumption is well understood and documented (Chowns, 2015). Given their intrinsic knowledge and stewardship traditions and their dependence on

the natural environment, supporters of water projects have much to contribute to integrated water resource management and the implementation of the human rights to water and sanitation.

The fulfilment of their right to water for enjoying many other basic rights, such as health, self-determination, and more generally a life of dignity warrants particular attention in national policies and regulations, which possibly affect their lives. Alberto and Miguel (2017) assert that stakeholder engagement has gained traction in the water supply management through many declarations, binding conventions or other normative frameworks, a set of objectives related to inclusive decision making and implementation, transparency and accountability. While the international community has made advancements toward this goal over the past decade, progress in rural areas is lagging relative to urban areas (McNicholl *et al.,* 2017). The sustainability of water supply programs can only be achieved through ongoing financial and technical support to communities by external bodies.

Kivits (2013) in a multi-dimensional stakeholder analysis in Australia revealed that the issue of fairness has appeared in most research as being the reason behind poor participation levels. It is important that fairness be applied to both the decision making process and the outcome. However, agreement about fairness and sound decision-making varies from one individual to another, or within a group and this can be a difficult issue. Although decisions should be technical and scientifically sound, care must be taken not to be perceived as unfair to any party because this could affect their level of involvement if they feel left out from the decision making process (Greaves & Simons, 2011). Without

an enabling environment and some form of support, it is often reported that community engagement does not automatically lead to sustainable projects and programs. Increasingly, the idealistic view of assumed gains through preliminary community engagement has been challenged by practices from the field.

2.3.7 Institutional and Regulatory Actors in Management of Water Supply

Achieving sustainability of water, sanitation and hygiene promotion has continued to challenge southern governments and development actors. According to Chowns (2015), institutional and regulatory actors in water resources management span the range of local, basin, national and international levels. Governments at international, regional, national and county levels design and implement water supply initiatives with the aim of attaining certain development milestones and change the current situation. According to Chan and Effah (2013), policy directions of water supply services in most countries are indicated in specific documents, such as the regulation on water services licensing and regulations on minimum required service level for water service provision. To Herrera and Post (2014), good governance consists of transparency, justice, accountability, responsibility, effective coherence, efficiency (proportionality) and greater sensitivity to the immediate context that is promised by subsidiary.

Smoke (2015) opines that the key requirements for managing decentralization of water supply in developing countries include means of internalizing external costs and ensuring integration of policy considerations, evaluation of options and dealing with trade-offs. It is worth noting that good governance emphasizes the role of institutions as entities that are largely viewed as being ‘up there’ and at least currently not sufficiently within the reach of

ordinary citizens. This view of governance seems concerned primarily with minimizing bureaucratization and hierarchy. Tukahirwa, Mol and Oosterveer (2013) further indicated that governance for sustainability has certain key features and components, which include policy integration, shared sustainability objectives, criteria, trade-off rules and indicators, information and incentives for practical implementation programmes for system innovation. Policy integration involves the coordination of government policies and the corresponding and complementary positions and initiatives of other governance actors. Smoke (2015) agrees that sustainability requires policy integration, along with improved interaction between government and non-government institutions and the creation of a longer-term view in government.

Chowns (2015) observes that shared long-term objectives, common criteria for planning and approval of significant undertakings, specified rules for making trade-offs and compromises, and widely accepted indicators of needs for action and progress towards sustainability are necessary for governance institutions which have broad sustainability ends in mind. Policy making on sustainability has, for the most part, relied on performance standards or the prescription of certain solutions. The solutions adopted help to secure partial sustainability benefits. However, governance for sustainability requires policy making frameworks that incorporate programmes for system innovation that actively seek to identify, nurture, and coordinate action for more sustainable technological niches (Brinkerhoff & Brinkerhoff, 2015). These depict vibrancy of the national government/county authorities, water management organizations and the existing policy frameworks.

According to the Howlett and Ramesh (2017), appropriate regulatory frameworks and institutions at national level to oversee water and sanitation service provision are essential to operationalize national policies, protect property rights, and generate equitable returns on private investments through efficient tariff structures and levels, service standards, and expansion targets. When responsibility is delegated to local bodies for provision of services, an appropriate distribution of roles between national and local authorities is essential and should be clearly defined. The concern with public service delivery is lack of accountability, lack of incentives to perform, and poor monitoring (Lunduka *et al.,* 2012). Non-state actors are increasingly seen as a key player in this process, complementing the work of state actors and inter-governmental organizations. Non-state actors are constantly shifting concept describing the social formation that is intermediate between the community and the regulatory actors. It is the arena in which people come together to advance the interests they hold in common, not for profit or political power, but because they care enough about something to take collective action.

2.4 Theoretical Review

This section explored the existing theories formulated to explain, predict, understand and, in many cases, extend existing knowledge within the limits of critical bounding assumptions. There are various scholars and researchers who have undertaken studies and research in the area of local stakeholders and management of water supply. A review of the research studies avails insights for this research study by revealing what has been established and what is yet to be established. The theoretical framework is the structure that can hold or support a theory of a research study. It introduces and describes the theory

which explains why the research problem under study exists. Alan (2008) believes that theories are formulated to explain, predict, and understand phenomena and, in many cases, to challenge and extend existing knowledge within the limits of the critical bounding assumptions. The theoretical framework must demonstrate an understanding of theories and concepts that are relevant to the topic of the research and that will relate to the broader fields of knowledge in the study you are taking. The selection of a theory should depend on its appropriateness, ease of application, and explanatory power. The theoretical framework connects the researcher to existing knowledge (Orodho, 2003).The current study was informed by Stakeholder theory, Cognitive Engagement Theory and Deliberative policy theory.

2.4.1 Stakeholders Theory

Stakeholder theory, proposed by Freeman (1984), states that the first possible approach to take into consideration the external influences of a firm is to imagine all the groups and individuals that could affect a firm's objectives or be affected by them. Those groups or individuals are said to play an important role in the firm and have a stake in it, referred to by the term "stakeholder". Stakeholder theory promotes a practical, efficient, effective, and ethical way to manage organizations in a highly complex and turbulent environment (Freeman, 1984; Freeman, Harrison and Wicks, 2007). It is a practical theory because all firms have to manage stakeholders; whether they are good at managing them is another issue.

It is efficient because stakeholders who are treated well tend to reciprocate with positive attitudes and behavior towards the organization, such as sharing valuable information (in

the case of stakeholders), buying more products or services (in the case of customers), providing tax breaks or other incentives (communities), providing better financial terms (in the case of financiers), buying more stock (in the case of shareholders), or working hard and remaining loyal to the organization, even during difficult times (in the case of employees). Moreover, it is effective because it harnesses the energy of stakeholders towards the fulfillment of the organization's goals. It is useful in a complex and turbulent environment because firms that manage for stakeholders have better information upon which to base their decisions, they are attractive to other market participants, and they have a degree of strategic flexibility that is not available to competitors who do not manage for stakeholders.

All management decisions contain an ethical component, and the ethical arguments in defense of managing for stakeholders are as important to the theory as are the practical considerations. This theory of stakeholder identification is said to be of great value for determining how power and legitimacy are mutually influenced. Power and legitimacy, combined with urgency, are said to provide the definition of stakeholder types, defining patterns of behaviour between stakeholders and the firm. Some theories explain the role of each of those attributes, which are said to be determinant variables in the definition of relationships between stakeholders and managers. For local level residents and community groups, social interaction, gaining knowledge and skills, or ability to make a difference in the community can act as a motivation to take part in water resource management initiatives.

Additionally, where participation leads to avoidance of litigation or legal action and results in avoidance of legal costs, community members would get motivation to participate in water resource management activities (Neysmit and Dent, 2010). For industries, the threat to loss arising from fines, discharge fees or legal costs associated with legislative enforcement can act as a powerful incentive to participate in water-related pollution reduction (degradation abatement) programmes (Triana and Ortalano, 2005). Public pressure resulting from public release of adverse information by government agencies can be an effective tool against firms that do not comply with environmental regulation.

A successful stakeholder participation program must be integral to the planning process and focuses on its unique needs; is designed to function within available resources of time, personnel, and money; and is responsive to the citizen participants (Davids, 2005). The involvement of the citizens by the county (local) and national governments in management of resources such as water has been a major source of conflict. This is because the management of water supply has often been depriving the local community a chance to access the resource. As a result, various attempts have been made to involve these citizens as a way of minimizing the conflicts. The theory has however been critiqued by previous scholars, claiming that the interests of the group are just too broad to realistically manage. Indeed you can't please everyone, and the needs of some stakeholders will naturally occupy a higher place than the interests of others. It's a balancing act to which there's no clear answer, but something called stakeholder mapping can help. In the same way, the interests of local communities in Murang'a County with regard to water supply management are diverse and stakeholders may not be able to meet all of them. Despite the weakness, however, the study adopted the theory because it appreciates the importance of

the role of local stakeholders' engagement in management of water supply in Murang'a County.

2.4.2 Cognitive Engagement Theory

Cognitive Engagement Theory is the brainchild of Bussey and Bandura (1999). Its central argument is that participation depends on citizens having access to information about politics and government and their desire to use that information in decision making. It is the increase in the levels of education that helps citizens to acquire and process large amounts of information, since it is generally assumed that education provides skills in many areas, like the area of technology, while at the same time it increases the individual's ability to analyze it further (Shea & Bidjerano, 2009), making the informed citizen to be a "critical citizen". However, education makes citizens' dissatisfaction with the state to manifest in forms of unconventional participation, such as protest (Ma, Wang, Wang, Kong, Wu & Yang, 2017).

The key themes that explain this theory are: education, use of media, interest in politics and political knowledge, and satisfaction/dissatisfaction policy. According to Garrison (2016), education is measured in levels from low to high; use of media determines the extent of the citizens' knowledge of how the political system works;; and satisfaction / dissatisfaction policy refers to public attitudes towards the performance of the system to deliver benefits to the citizens (Garfin *et al*, 2014). Critics to this theory suggest that this theory does not explain why once individuals have acquired all the information they would be motivated to use it to act in an informed manner.

In Murang'a County, water management organizations and institutions are facilitators of the project as they plan, design, implement and monitor maintenance through committees which are responsible for managing the schemes. The communities are most often engaged in the management of the supply systems at different levels as they participate through contributions either in cash or kind coordinated by members of the community, and also as they take part in decision making. Accordingly, citizens are able to acquire and process information, but in the absence of incentives, it is not clear why they would be motivated to participate.

Local stakeholders' engagement in water governance is more about interactive relationship between different actors to create opportunities and solve problems. However, the weakness of the theory is that not all the stakeholders who are involved in the manangemnt and decision making process have any political understanding of what is expected of them. Engagement in water supply management is also about the way in which actors see the water governance landscape and interpret what is happening and what the causal mechanisms is that influence the practice of water governance. This theory if applied in relation to community engagement in governance systems will highlight the knowledgeability of the local stakeholders and hence ability to make informed choices in water supply management.

2.4.3 Deliberative Policy Theory

Deliberative Policy Theory was proposed by Hajer and Wagenaar's (2003). The central idea behind the theory is that policy making requires spaces where different institutions, agencies, groups, activists and individual citizens will come together to deliberate on

pressing social issues. Such spaces might be spontaneous bottom-up networks (Hajer & Wagenaar's, 2003); sustained interactive arrangements, such as, collaborative dialogues and neighbourhood councils; or they might be highly structured deliberative designs such as citizens' juries or consensus conferences. What differentiates all these procedures from conventional consultation activities is that they typically strive for inclusive and deliberative goals. They are inclusive because they extend public involvement in policy development beyond bureaucrats and experts.

Deliberative Policy Theory has been emphasized in the work of Chang (2012) who argue that to promote public goods, deliberation should be used to connect the process of policy decision making along with reasoned-based discussion where members of society come together to make certain decisions. The central motivation here is a democratic one: that legitimate policy decisions should involve those affected by a decision, not just the specialists or the elite. There are also pragmatic reasons why we might want to involve the broader community in policy decisions, for example, to access their knowledge and resources, and to encourage cooperation and efficient implementation. The deliberative goal is perhaps even more ambitious.

According to Bohmann and Richardson (2009), deliberation is a communicative process in which actors are informed about a policy issue, consider its complexities, and reason together in view of the better argument. Ideally, deliberators hold open preferences and provide reasons for their arguments in terms that others may appreciate and accept. This is the deliberative ideal and in the rough and tumble of everyday policymaking, deliberative governance often falls short of these aspirations

A critical examination of the theory reveals that its tenets are so similar to the fundamentals on which public participation is anchored. practicing the theory seems to suggest that it leads to an accrual of greater performance benefits of organizations and a significantly improved work environment. This has been the case of management of water supply in developing countries like Kenya where the role of ensuring supply of water resource has drawn the attention of various actors. This theory, therefore, is a great anchor of this study in assessing the role of resource mobilization by local stakeholders on management of water supply in Murang'a County, Kenya.

In conclusion, this study was anchored on Stakeholder's Theory which holds that to promote public goods, deliberation should be used to connect the process of policy decision making along with reasoned-based discussion where members of society come together to make certain decisions. For local level residents and community groups, social interaction, gaining knowledge and skills, or ability to make a difference in the community can act as a motivation to take part in water resource management initiatives. The involvement of the citizens by the county (local) and national governments in the management of resources such as water has been a major source of conflict.

2.5 Summary and Gaps

The foregoing literature review is backed by numerous studies on the role of local stakeholder in the management of water supply in various settings. The gaps left out by the available literature are as summarized in Table 2.1.

Table 2.1: Summary of the Research Gaps

Author and Year	Title of the Study	Research methodology	Results/ Findings	Research Gaps
Dean, Fielding, Newton and Ross (2016)	Community knowledge about water: Who has better knowledge, and is this associated with water-related behaviour and support for water-related policies?	They surveyed a sample of 5172 Australian adults The study used a survey questionnaire.	Higher water knowledge was associated with older age, being male, higher education and living in non-urban areas. Their findings confirmed the importance of community knowledge and identifying potential subgroups who may require additional targeting to build knowledge and support for water management initiatives.	Their study was carried out in Australia, a developed economy setting as opposed to Kenya which is a developing nation
Ngilambi and McCubbin (2017)	Towards effective implementation of community-based water safety plans: Stakeholders engagement process in Afghanistan	Their study employed a desk search technique which involved a review of the available literature from various online sources.	Although the main challenges reside in obtaining a common understanding on a simplified community-based WSP concept and agree on a minimum package of activities under the rural water supply program, there are other underlying factors such as the structure of community	The methodology, the context and the concepts differ from the focus of this study; hence, it is insufficient for concluding the role of community engagement on management of water supply.

			leadership and stakeholder participation which has hampered the process since its inception.	
Ugbah, Meldrum and Ehiwario (2017)	Water access and community engagement: Creating the right environment for maximizing the benefits of community engagement processes and increasing water participation in Nigeria	This was a conference paper that involved a review of literature on the perennial problem of access to water in developing countries, with specific focus on the Federal republic of Nigeria.	Effective community engagement could be achieved through practical water management planning, awareness, consultation, collaboration and implementation. However, this is easier said than done. The practicality of engaging Nigerian communities in water management is highly challenging, with numerous barriers, including high rate of poverty, corruption and rapid population rise.	The study left both conceptual and methodological gaps owing to the fact that Kenya and Nigeria are countries with different socioeconomic aspects. In addition, the concept of community engagement was correlated against water access while the current study seeks to establish its relationship with management of water supply.
Ulrike, Derek, Chenai, Bianca, Mandisi, Jean-Paul and Chigona (2015)	Community Engagement in Drinking Water Supply Management: A Review	This was an analysis based on previous research on the status of water service delivery in South Africa and was presented using the Blue Drop reports on Drinking Water Quality of the Department of Water Affairs.	One of the hindrances to reporting water supply faults by community members has been the limited understanding of roles and responsibilities of local and district municipalities. Community	The study concentrated on community engagement in water supply management in South Africa, leaving a contextual gap, since South Africa is a developed country,

			members are unclear whom to call and are disillusioned when there is no response to their complaints. The impersonal management of complaints through call centres has resulted in citizens withdrawing from complaining altogether.	whereas Kenya is a developing one and therefore the results may not be taken to represent the Kenyan situation.
Kleemeier and Narkevic (2010)	A global review of private operator experiences in rural areas, Private Operator Models for Community Water Supply	Field Note highlighted findings from a global review of private operator experiences in rural areas.	Markets exist for high quality services in rural areas; policy changes in support of private operator models can follow from successful pilot projects, if at the outset there exists a legal basis for contracting a private operator to supply water services; contracts using local government and communities to monitor private operator compliance are a more practical approach to regulation than utilizing a dedicated regulatory body; and financing and subsidies would	The study highlights findings from various rural areas around the world with regard to private operator experiences as opposed to data management. The Catholic Diocese Project was the only Kenyan case used in the Field Note. These were contextual and conceptual gaps emanating from the study.

			almost Surely be necessary for capital investment in the short- to medium-term.	
Wehn and Evers (2015)	The social innovation potential of ICT-enabled citizen observatories to increase eParticipation in local flood risk management	The study employed empirical research in two case study locations (WeSenseIt - United Kingdom and The Netherlands) to highlight the divergent roles that authorities conceive for citizens and the role(s) that citizens in practice assign to themselves.	Citizens are considered as an important stakeholder in flood risk management and need to be engaged in the decision making process to reach consensus. There is limited ICT-enabled participation processes. EParticipation thus far seems to be used by the authorities to (merely) improve communication efficiency rather than as a social innovation for changing the relation (e.g. improved transparency, accountability, etc.) between authorities and citizens in flood risk management.	The study was focused on developed countries whose advancement in ICT especially in management of water supply dwarfs the Kenya's. This creates a contextual gap. In addition, the focus on flood risk management is a divergent concept from the water supply management, representing a conceptual gap.
Johannes and Sonja (2018)	From information to participation and self-organization: Visions for European river	The paper used case studies from Germany, England and Spain to explore the potential opportunities and challenges of different participatory management	Despite the non-profit organization being able to promote a highly participative form of information sharing and	The target population, the context and the concepts differ from the focus of this study.

	basin management.	approaches.	consultation, representativeness in participatory processes is not guaranteed because all the activities are volunteer-based.	
Endalcachew (2017)	Domestic Resource Mobilization in Ethiopia: An Assessment on Water Resources Mobilization	The researcher employed qualitative methodology. Data were gathered from both primary and secondary sources.	The effort of Ethiopian government to mobilize its domestic water resources to support the country's development initiatives as a better alternative to reliance on foreign aid.	The study had a contextual gap since it focused on the Ethiopian case as opposed to the current study which focuses on Murang'a County in Kenya.
Haiyan (2018)	Implementing water users' association (WUA) in Shiyang River Basin, China: a review from a local's perspective	The study was conducted in three WUAs in the arid and semi-arid regions of northwest China, drawing upon empirical evidence collected through mixed methodologies.	Their results showed significant discrepancies between understanding, motives and experiences regarding WUAs among different water stakeholders. The roles of social networks on water governance are not necessarily positive, including collective exploitation, corruption, especially rent-seeking and collusion.	The study was focused on investigating the role of water users' association, hence leaving a conceptual gap. In addition, the study focused on Shiyang River Basin, China, which presents a contextual gap owing to the fact that the Chinese setting is different from Kenya's.
Rolston *et al.* (2017)	Water matters: An assessment of opinion on	A survey of 37 questions was designed and launched through the	The study established that although	The study had conceptual and contextual gaps

	water management and community engagement in the Republic of Ireland and the United Kingdom	website www.surveymonkey.com. A total of 520 respondents were identified.	freshwater bodies are important in peoples' lives, respondents were typically unaware of global initiatives, such as Integrated Water Resources Management and Integrated Catchment Management.	since the findings may not be replicated in developing nations like Kenya, where management of most water utilities cannot meet the growing demand for water.
Rehema, Juliette, Mariella and Sharon (2018)	Prioritising stakeholder engagement for forest health across spatial, temporal and governance scales, in an era of austerity	They involved two tree health projects, carried out interviews and experiential interactive activities and ran workshops and collaborative field trips with a range of stakeholders.	Found out that mapping stakeholders (38) Identified a complex network of hybrid individuals and roles overlaid on a project scope that spanned multiple research and practice initiatives.	The methodology, the context and the concepts differ from the focus of this study hence inadequate for making deductions on management of water supply.
Spaling, Brouwer and Njoka (2014)	Factors Affecting the Sustainability of a Community Water Supply Project in Kenya	Qualitative research methods consisted of document review and semi-structured interviews of households, government officials, and water sector professionals. A total of 53 semi-structured interviews with beneficiary households (47), local officials (3), and representatives of water management agencies (3) were carried out in Umani Springs.	After 10 years the project is at a threshold of sustainability – it may yet fail. Changing rainfall patterns and additional withdrawals from new projects are threatening available water supply. The community is resisting compliance with water sector reforms, including those intended to	The methodology applied involved qualitative approach, leaving a methodological gap. The context covered is small and different from the focus of the current study, thus creating a contextual gap. The focus on sustainability

			benefit community-managed projects. Community management deficiencies and a lack of supportive external relationships are impeding project continuity and sustainable local water management.	of a community water supply project also creates a conceptual gap, as it could not shed light on the role of local stakeholders in the management of water supply.

In summary, the various studies that have been reviewed have left both contextual and conceptual gaps that ought to be filled. This is attributed to the different settings, socio economic differences and differences regarding livelihood and water management aspects. These are the gaps that the current study seeks to fill by investigating the role of local stakeholders in the management of water supply in Murang'a County, Kenya.

2.6 Summary of the Literature

In spite of billions being invested globally in rural water supply, the world's poorest people still lack reliable water supply systems (McNicholl *et al.*, 2017; Chepyegon & Kamiya, 2018). Moreover, the water crisis today is not just a matter of scarcity, but also a matter of accessibility. The majority of people in the world without improved water supply services have remained practically the same over the past five decades (Nyanchaga, 2016; Haiyan, 2018). This is as a result of governments' inability to supply and manage the resource in these areas, mostly because of financial constraints associated with the construction and management of systems as can be seen in most developing countries.

Though local stakeholders have been involved in the management of water supply through financing and implementing the construction of systems, operations and maintenance has been a serious issue because of lack of personnel to do repairs and maintenance, leading to long-term break down of systems. This chapter looks into the theoretical literature, conceptual framework and the empirical review relating to the objectives of this study. The chapter provides a general discussion on the literature reviewed, and this was necessary in order to see what had been done in this field and to assist in the attaining of the research objectives.

From the review, there is a growing need to understand the role of local stakeholders in the management of water supply. The literature reveals that there exists various studies relating to the role of local stakeholders in the management of water supply. However, there is a death in literature on the role of local stakeholders in the management of water supply in Murang'a County Kenya. The contextual, conceptual and methodological gaps left by the available studies prompt the researcher to embark on investigating the role of local stakeholders in the management of water supply in Murang'a County, Kenya.

2.7 Conceptual Framework

A conceptual framework has been defined by Leshem and Trafford (2007) as a hypothesized model identifying the concepts under study and their relationships. The purpose of conceptual frame work is to help the readers quickly see the proposed relationship between the variables in the study. In this study, the independent variables were community engagement, data management, decision making, technical support and resource mobilization, while the dependent variable was management of water supply. The moderating variables were the institutional and regulatory actors such as national

government policies, and the mediating variables were the supporters, such as non-state actors, consumers and associations. Figure 2.1 shows the conceptual framework.

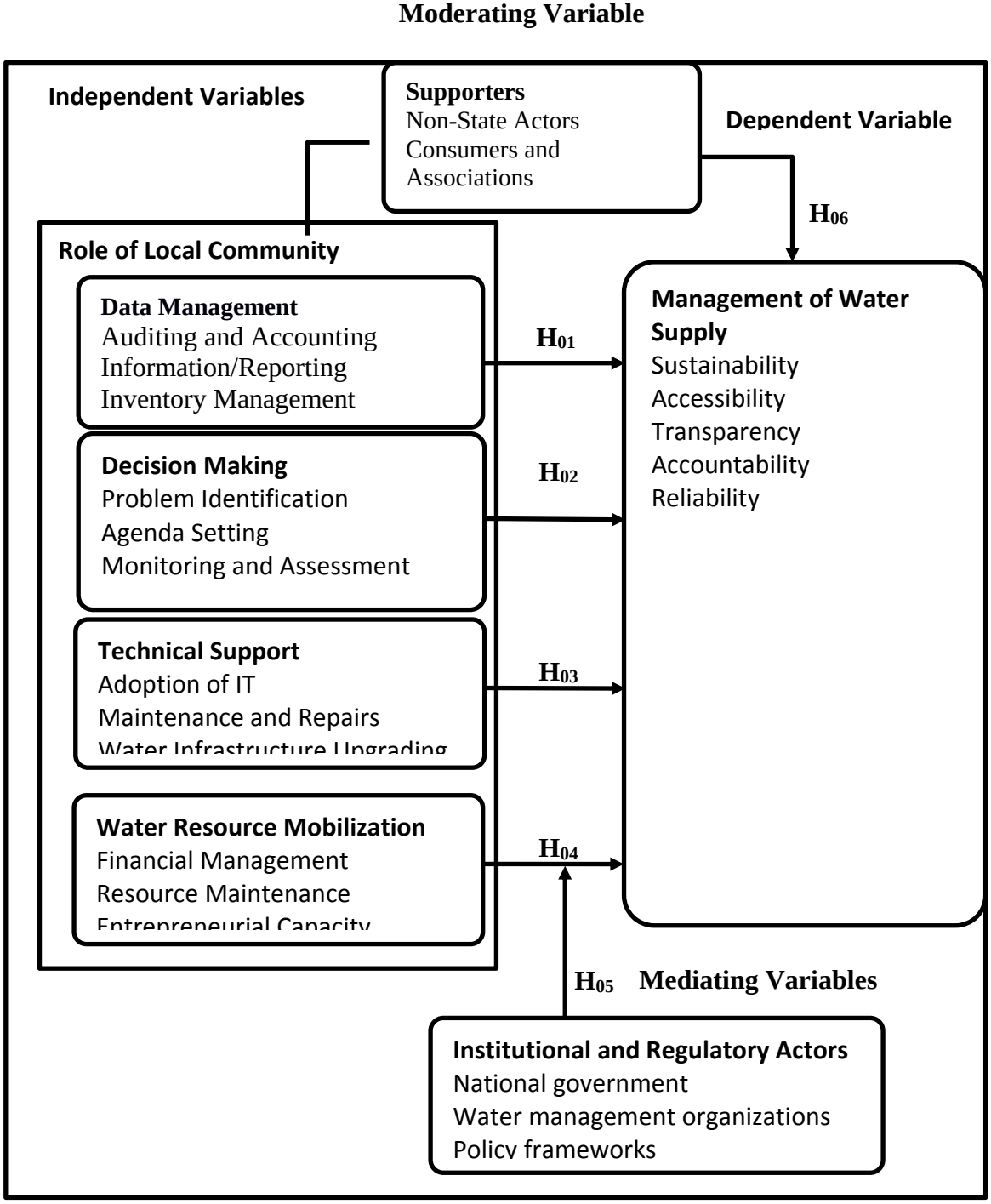

Figure 2.1: Conceptual Framework

Source: Researcher (2019)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the approaches, tools and methods that were used to gather and synthesize information on the area of the study. The chapter sets forth the research methodology and the populace used in carrying out the study. It discusses and describes the data collection instruments, data collection procedures, sampling, data gathering and analysis of the limitation of the method proposed.

3.2 Research Philosophy

The focus of this study is to evaluate the potential of the role of local stakeholders in the management of water supply in Murang'a County, Kenya. The main research philosophies are Positivism philosophy, Realism philosophy and Interpretivist philosophy. According to Positivism philosophy, research strategy is approached on the basis of data collection and hypothesis development (Von, Bernstein & Newton, 1951). The positivist researcher follows highly structured methodology in order to facilitate the hypothesis. Furthermore, positivism works on quantifiable observations and, accordingly, the statistical analysis is obtained. The core feature of realism pertains to disclosing the truth of the reality, and the existence of the objects are prevalent independently in the human mind (Dean, Joseph, Roberts & Wight, 2006). Realism is classified as direct realism and critical realism. Direct realism explains what is experienced by our senses and are attained by the researcher. On the other hand, critical realism expresses what is experienced by our sensations, that is, images of the real world, not the reality. Finally, according to Willis (1995), Interpretivist

is a branch of epistemology which is focused to the assessment of the difference between humans as social actors.

Accordingly, Interpretivist research philosophy is the best suited for accomplishing the objectives of this study. Interpretivist approach is based on naturalistic approach of data collection such as interviews and observations. Secondary data research is also popular with Interpretivist philosophy. In seeking the answers for research, the investigator, who follows interpretive paradigm uses those experiences to construct and interpret his understanding from the gathered data. There is consensus among scholars such as Yin (2014) and Cresswell (2013) that philosophically, the qualitative and quantitative paradigms are not as diverse or mutually incompatible as often made to appear.

In consistence with these two paradigms, this study utilized both the qualitative and quantitative methodology approach by using a deductive form of logic wherein concepts, variables and hypothesis are chosen *a priori* and remain fixed throughout the study. By adopting these views, this study focuses on theory testing whereby theory was first adopted as the framework for developing and testing the role of local stakeholders in management of water supply in Murang'a County.

3.3 Research Design

This study adopted a descriptive research design. Descriptive study establishes the correlation between variables, emphasizing studying a situation or a problem in order to explain the relationship between the variables (Saunder, Lewis & Adrian, 2009). The choice of descriptive research design approach enabled the researcher to deeply analyse the phenomena with a view to generalization about a wider population which was a suitable

approach for finding out the role of local stakeholders in management of water supply in Murang'a County, Kenya.

3.4 Study Area

The study was carried out in Murang'a County with special focus on the local stakeholders (the beneficiaries) and the management staff of the water resource projects in Murang'a County is one of the 47 counties in Kenya and one of the five counties in the Central region of the Republic of Kenya. It is bordered to the North by Nyeri, to the South by Kiambu, to the West by Nyandarua and to the East by Kirinyaga, Embu and Machakos counties. It lies between latitudes 0^{o} 34' South and 107' South and Longitudes 36^{o} East and 37^{o} 27' East. The county occupies a total area of 2,558.8Km^2. It is inhabited mainly by and is considered the home of the Gikuyu, the largest ethnic group in Kenya.

The county of Murang'a has a population of 1,056,640 (2019 census). Murang'a County has 8 sub-counties, which are decentralized units for the delivery of services. They are headed by a sub-county administrator appointed by the County Public Service. The sub-counties include Kiharu, Mathioya, Kangema, Gatanga, Kigumo, Kandara, Kahuro and Murang'a South. Murang'a is no mean county when it comes to water, since 90 percent of the water that is supplied to Nairobi comes from Murang'a. The government by way of compensation has started projects in all the eight sub-counties to ensure people get connected to clean water for domestic use. Through the various projects, the government aims at connecting more than 80% of the homesteads in the county with water by 2022.

In Murang'a County, only 41% of residents use improved sources of water, with the rest relying on unimproved sources (CHS, 2018). Use of improved sources is slightly higher in male-headed households, at 42%, as compared with female-headed households, at 40%.

Porous beds and disconformities within the volcanic rock system form important aquifers, collecting and moving ground water, thus regulating water supply from wells and boreholes. The county's rugged, dissected topography and geology is both an asset and a hindrance to the county's development. Murang'a County's water resources are rivers, shallow wells, springs, dams, boreholes and roof catchment. There are 10 permanent rivers, 400 shallow wells, 75 springs, 30 dams and 100 bore holes that supply water for domestic and agricultural use in the county. These sources supply 60 per cent of the county population with clean and safe drinking water (Mwobobia, 2013).

3.5 Target Population

This study followed the descriptive study design, with the objective populace comprising the local stakeholders (the beneficiaries) and the management staff of the water resource projects in Murang'a County. Owing to the vast nature of the area under study, the research was confined to the management staff and committee members of water supply organizations, national and county government officials from the Ministry of Water, staff of non-state actors dealing with water, local stakeholders (e.g. household heads) and beneficiaries of the water services as well as staff of the social amenities and corporate institutions in the county.

According to HR manual of the county, there are 46 managerial staff in the water and irrigation management department of the county. These members of staff are spread across various job groups, depending on their ranks in the organizational structure. They include one maintenance officer, one operational manager and one human resource manager. In addition, the study involved the staff working in with non-state actors (e.g. WRUA, World Bank, JICA and WSTF) in Murang'a County. Non-state actors offices in Murang'a County

have a total of 12 representatives in the county. This leads to the target population of 89,415, the breakdown of which is outlined in Table 3.1 .

Table 3.1: Target Population

Category	Organization	Target Population
Management staff and committee members of water supply organizations	MUWASCO	12
	GATAMATHI	12
	KATANGA	10
	MUSWASCO	10
	KAHUTI	10
National and County Government officials from the Ministry of Water	Officials from National Government	23
	Officials from National Government	23
Staff of non-state actors dealing with water	WRUA	3
	World Bank	3
	JICA	3
	WSTF	3
Local stakeholders and beneficiaries of the water services		89303
Total		**89,415**

Source: Murang'a County Directorate (2018)

3.6 Sampling Technique

This study used a mixture of sampling techniques due to the nature of the population involved. From the various categories of management staff and committee members of water supply organizations, national and County Government officials from the Ministry of Water and staff of non-state actors dealing with water, the study selected the sample using proportionate random sampling. To arrive at the study sample, Nassiuma (2000) formula was used:

$$n= NC^2/ [C^2+ (N-1) e^2]$$

Where

n represents sample size,

N is the population size,

C is the coefficient of variation at (95%) confidence limit,

e is the standard error of 5%.

$$= \frac{89415*.95*.95}{.95*.95+ (89415-1) (.05*.05)}$$

$$= 225$$

Guided by the above formula, a total of 225 respondents formed the sample size for this study. Table 3.2 shows the breakdown of the sample size for the study.

Table 3.2: Sample Size

Category	Organization	Sample Size
Management staff and committee members of water supply organizations	MUWASCO	12
	GATAMATHI	12
	GATANGA	10
	MUSWASCO	10
	KAHUTI	10
National and County Government officials from the Ministry of Water	Officials from National Government	23
	Officials from National Government	23
Staff of non-state actors dealing with water	WRUA	3
	World Bank	3
	JICA	3
	WSTF	3
Local stakeholders and beneficiaries of the water services		113
Total		**225**

Source: Murang'a County Directorate (2018)

3.7 Data Collection

3.7.1 Data Collection Instruments

This study used primary data which was collected using both semi-structured questionnaire and in depth interview schedule. Research questionnaire contained basic outline questions

that identified the role of local stakeholders in the management of water supply in Murang'a County. The questionnaire was structured to pick both qualitative and quantitative data on the role of local stakeholders in management of water supply in Murang'a County. This was done by engaging the participants with both open-ended and close-ended questions, seeking their response to the six (6) research questions of this study. For close-ended questions, the research tool included quantitative measures upon which the respondents were required to rate the extent and agreement levels with various statements provided. With regard to open ended questions, the researcher posed questions to the respondents without providing possible options. This was meant to leave enough room for the respondents to give detailed explanation of the enquired aspects. The relevance of the responses given was deemed to add value to the quantitative information gathered from the close-ended questions. The researcher maintained a register of the questionnaires that were sent and the ones that were received to ensure that all the questionnaires that were issued to the respondents were received back. In addition, an interview schedule was administered to the staff of non-state actors dealing with water. This study was carried out in the period between February and April 2020.

3.7.2 Data Collection Procedures

This study collected quantitative and qualitative data using a self-administered questionnaire and an in-depth interview schedule. The researcher dropped the questionnaires physically at the respondents' place of work or residence and picked them up once filled up. The structured questions were used in an effort to conserve time and money as well as to facilitate an easier analysis as they are in immediate usable form. The unstructured questions, on the other hand, were used so as to encourage the respondent to

give an in-depth response without being held back by the feeling of guilt in revealing information. Each questionnaire was coded and only the researcher knew which person responded. The coding technique was only used for the purpose of matching returned completed questionnaires with those delivered to the respondents.

3.8 Pilot Study

Pilot test is an activity that assists the researcher in determining if there are flaws, limitations, or other weaknesses within the interview design and allows him or her to make the necessary revisions prior to the implementation of the study (Adams *et al.*, 2007). The rule of the thumb is that 1% of the sample should constitute the pilot test. The study carried out pilot testing on the questionnaire involving 23 respondents, representing 10% of the sample size. The pilot sample was drawn from Meru County, since Murang'a and Meru County depict the same characteristics as regards local stakeholders and management of water supply.

Pilot Testing ensures that the field staff have a common understanding of the instrument and that guidelines are provided alongside the questionnaire (Creswell, 2003). Cooper and Schilder (2011) indicate that a pilot test is conducted to detect weaknesses in design and instrumentation and to provide proxy data for selection of a probability sample. According to Babbie (2004), a pilot study is conducted when a questionnaire is given to just a few people with an intention of pre-testing the questions. Tests for validity and reliabiliy was done as follows:

3.8.1 Validity

Creswell (2003) asserts that validity is the strength of qualitative research, although other researchers prefer to substitute validity with terms such as trustworthiness, credibility,

transferability, dependability, and conformability. Validity exists when the knowledge sought is arrived at through descriptions that make possible an understanding of the meanings and essences of experience (Sullivan, Riccio & Castillo, 2009).

This research study embraced content validity which is a descriptive type of reputation where the sphere of the principle is discussed along with the supervisor and peer to determine whether the construct totally stand for the domain. Creswell & Creswell (2017) explain validity to be the degree in which obtained outcomes from the test of an instrument in fact denote the reality under research study. Authenticity additionally describes the degree to which a tool establishes what it purports to determine (Creswell & Creswell, 2017). Validity, consequently, has an interest in the research components' meaning. Construct legitimacy explains simply how well one converted or changed a concept, tip or behaviour (a construct) right into an operating as well as running reality, the operationalization. Creswell & Creswell (2017) presumes that there typically exist two methods of evaluating content credibility: asking a range of inquiries regarding the tool or assessment, and/or inquiring the viewpoint of specialists in the field, especially supervisors and peers.

Construct validity was tested in the case of this research study using Exploratory Factor Analysis (EFA), Also checked were Bartlett's Sphericity and Kaiser-Meyer-Olkin (KMO) values. Decision Rule: KMO value higher than 0.5 and Barteley significance (less than 0.05) considers the construct suitable (Williams, Osnman & Brown, 2010)..

3.8.2 Reliability

Reliability is the extent to which a questionnaire tests observations or the extent to which any measurement procedure produces the same results. That is the stability or consistency

of scores over time or across raters (Malhotra, Chan, Malhotra & Østbye, 2012). Internal consistency of the research instrument was measured using Crobach's Alpha. It has been suggested that a reliability level of 0.70 is enough on predictor tests or hypothesized measures of a construct (Roberts & Priest, 2006). To be considered acceptable, this study therefore adopted a threshold of 0.7. That means values above 0.7 indicated presence of reliability, while values below indicated lack of reliability of the research instrument.

3.9 Data Analysis and Presentation

Descriptive statistics such as the mean scores, standard deviations, percentages and frequency distributions were computed to describe the characteristics of the variables of interest in the study. Descriptive statistics provide the basic features of the data collected on the variables under study and provides the impetus for conducting further analysis on the data (Mugenda, 2008). Strata version 12.0 was used to aid in data analysis, and the results were presented in form of tables and charts for easy understanding and interpretation. The qualitative data was analyzed using content analysis. This involved summarizing the relevant responses and presenting them in prose form.

To establish the nature and magnitude of the relationships between the variables and to test the hypothesized relationships, this study applied inferential statistics. The appropriate test applied was multiple regression analysis. The research hypothesis is tested at 95% level of confidence. To facilitate regression, the study used summations of research items in each section of the structured questionnaire. The generated sum was used as a proxy for the given variable. Therefore, each index for the role of local stakeholders' component was generated as follows:

3.9.1 Empirical Model

This section provides the empirical model that was estimated and used for inferential analysis, as informed by the conceptual framework. The relationship between independent variable (role of local stakeholders in management) and management of water supply (dependent variable) as well as the mediating effect by beneficiaries and supporters and moderating effect of institutional and regulatory actors was tested. Objectives one through four were addressed using multiple regression model 3.1.

$$MWS = \beta_0 + \beta_1 DT + \beta_2 DM + \beta_3 TS + \beta_4 RM + \varepsilon \text{...Model 1}$$

Where:

MWS=Management of water supply

DT =Data management

DM= Decision making

TS = Technical support

RM = Resource mobilization

ε = Error Term

The coefficients β_1, β_2, β_3, β_4 and ε measure the effect of DT, DM, TS and RM respectively. The significance of β's were used to test the corresponding hypotheses specified in Chapter One. The study sought to determine whether supporters have a mediating effect on the relationship between the role of local stakeholders and management of water supply in Murang'a County, Kenya. To determine whether supporters mediate the relationship between independent variables and the dependent variable, a four step approach as suggested by MacKinnon (2002) was employed. The multiple regression Model 1 was

estimated as the base model to determine the relationship between the dependent variable and the independent variables.

Testing for the Moderating Effect of Regulatory Actors

The study sought to determine moderating effect of institutions and regulatory actors on the relationship between RS and the management of water supply in Murang'a County, Kenya. According to Keppel and Zeddeck (2000), estimating moderation is a two-step procedure. The bi-variate regression Model 2 which includes the moderating variable Institutional and Regulatory Actors (IRA) as an explanatory variable was estimated as follows.

$$MWS = \beta_0 + \beta_1 RS + \beta_2 RA + \beta_3 RS*RA + \varepsilon \text{.....Model 2}$$

MWS=Management of Water Supply

RS =Role of Local Stakeholders

RA = Regulatory Actors (Moderating Variable)

ε = Error Term

Testing for the Intervening Effect of Supporters

The Baron and Kenny approach in testing for mediation was employed in this study. According to Baron and Kenny approach, complete mediation is present when the independent variable no longer influences the dependent variable after the mediator has been controlled and all of the four conditions of mediation are met. Partial mediation occurs when the independent variable's influence on the dependent variable is reduced after the mediator is controlled. According to Hayes (2009), for intervening effect to be considered positive, four conditions should be fulfilled as shown in Table 3.3:

Table 3.3: Intervening Effect of Supporters

Step	Model	Decision Criterion
1	**MWS= β_0+ β_1RS+ϵ ……..……Model 3**	The independent variable is significantly related to the dependent variable in the absence of the intervening variable. The decision criterion is that when the independent variable is significantly related to the dependent variable in the absence of the mediating variable, then there is mediation; if not, there is no mediation.
2	**I= β_0+ β_1RS+ϵ …….....Model 4**	The independent variable should be significantly related to the intervening variable. The decision criterion is that there is mediation when the independent variable is significantly related to the mediating variable; if not, there is no mediation.
3	**MWS= β_0+ β_1I+ϵ …….....Model 5**	The mediating variable is significantly related to the dependent variable. The decision criterion is that when the mediating variable is significantly related to the dependent variable in the absence of the independent variables, there is mediation; if not, there is no mediation.
4	**MWS= β_0+ β_1RS+ β_1I+ϵ …….……Model 6**	When exploring the effect of the intervening variable on the dependent variable, the effect of the independent variable on the dependent variable is insignificant in the presence of the intervening variable. The decision criterion is that

		when all the independent variables are insignificantly related to the dependent variable in the presence of the mediating variable, there is mediation; if not, there is no mediation.
Where; MWS=Management of Water Supply RS= Role of Local Stakeholders I=Supporters (Intervening/Mediating Variable)		

3.9.2 Diagnostic Tests

To ensure that the results of the multiple linear regression analysis are reliable, several tests were conducted on the basis of assumptions about the population from where the data was derived.

3.9.2.1 Normality Test

One of the most important assumption underlying multivariate analyses is the normality of data. Normality detemines whether the data is well modelled and normally distributed. It is used to measure how far data deviates from the Gaussian by looking at the graph and seeing if the distribution deviates excessively from a bell shaped normal distribution. It establishes the likelihood of a random variable of being normally distributed. If the tests are non-normal, then the data has outliers, multiple modes, incorrect measuring tools, incorrect distributions, zero /infinite limits, or scanty collections (Singh & Masuku, 2014). In order to fit a linear model, the dependent variable has to be normally distributed. This study used both Kolmogorov Smirnov and Shapiro-wilk tests to establish normality for the dependent variable.

3.9.2.2 Linearity Test

Linearity means that the relationship between the explanatory variables and the outcome variable is linear. In other words, each increase by one unit in an explanatory variable is associated with a fixed increase in the outcome variable. This study used scatter plots to test the linearity of the relationship between the variables as recommended by Wooldridge (2000).

3.9.2.3 Multicollinearity Test

Multicollinearity refers to the linear correlation between variables. To check for correlated variables, multicollinearity was tested using variance inflation factor (VIF). A VIF value of above 10 and a tolerance of less than 0.2 indicate presence of multicollinearity (Hair *et al*., 2010). Multicollinearity creates a problem for multiple regression models given that as collinearity increases the standard error of coefficients also increases making them less reliable.

3.9.2.4 Homoscedasticity Test

Homoscedasticity refers to the assumption that the dependent variable exhibits similar amounts of variance across the range of values for an independent variable (Hair *et al*., 2010). To test for the homogeneity of variance, the Breush-Pagan test was conducted as recommended, where the Breusch-Pagan null hypothesis shows that there is constant of error term (Warner, 2008). Warner (2008) recommends that the probability value should be greater than 0.05 in order to meet the homoscedasticity assumption and in order to allow the regression model for further analysis.

3.10 Research Ethics

The researcher sought approval from Graduate School Kenyatta University to enable collection of data. Further, the researcher obtained approval from the National Commission

for Science, Technology and Innovation (NACOSTI) to conduct the study in the area. In addition, the researcher obtained relevant authorization from Murang'a County Commissioner, Murang'a County Education Center and the respective organizations to conduct this research on the selected respondents.

Before the questionnaire was distributed, the participants were assured of confidentiality. Informed consent is said to have taken place when the participants of the study are made fully aware of the purposes of the study and how their information will be used. Upon understanding the purpose of the study, the participants had an option to agree to participate voluntarily with full understanding or decline. Upon understanding and agreeing to participate, the participants were requested to fill out the consent form before proceeding to answer the questions. There was no obligation to participate in the study; therefore, the participants could opt not to fill in the questionnaire.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.1 Introduction

The aim of this study was to establish the role of local stakeholders in the management of water supply in Murang'a County, Kenya. Interpretation and discussion of findings was done in this chapter, based on pragmatic research philosophy to best answer the study hypothesis and questions. Descriptive statistics were used to inform the characteristics of variables, while inferential statistics established the direction and magnitude of the relationship between variables and also tested the hypothesized relationships. Key findings under each objective were presented and compared or contrasted with theories and empirical findings in this study. Quantitative and qualitative findings were integrated in order to advance the understanding of the study variables in the management of water supply in Murang'a County. This could not have been done effectively by relying on one form of data analysis or findings.

4.2 Descriptive Statistics

4.2.1 Response Rate

In research, response rate, also known as completion rate or return rate, is the number of respondents who answered the survey/questionnaire divided by the number of people in the sample. Response rate is usually expressed in the form of a percentage. The response rate for the study was established in order to ascertain the representation and quality of responses for conclusion of the study. Questionnaires and interview schedules were administered to the sampled two hundred and twenty five (225) participants out of whom 54 were management staff and committee members of water supply organizations' top

executives, 46 were National and County Government officials from the Ministry of Water, 12 were staff of non-state actors dealing with water in Murang'a County, while 113 were local stakeholders and beneficiaries of the water services in Murang'a County. Table 4.1 shows a summary of response rate for questionnaires, interview schedules and frequency of responses.

Table 4.1: Response Rate

Response	Frequency	Percent
Returned questionnaires	185	82.22%
Unreturned questionnaires	40	17.78%
Total	**225**	**100%**

Source: Research Data (2021)

From the results in Table 4.1, out of the 225 questionnaires and interviews administered, 185 questionnaires were duly filled and returned, translating to a response rate of 82.22 percent. In addition, all the 12 interview schedules were responded to, giving a response rate of 100%. These response rates were way above the conventionally acceptable rate for surveys. In earlier local doctoral studies, Awino (2007), citing earlier scholars, stated that the average response rate for empirical studies was 65percent of the sample. This was corroborated by Orodho (2009) who observed that a response rate above 50 percent constitutes sufficient data that can represent the opinions of respondents about the study problem in the target population.

According to Mugenda (2008) and Kothari (2004), a response rate of 60 percent or more of the intended sample population should suffice. It is argued that a response rate exceeding 30 percent of the total sample size provides enough data that can be used to generalize the characteristics of a study problem as expressed by the opinions of few respondents in the

target population (Cooper & Schindler, 2003). The results can therefore be generalized and considered representative of the population.

4.2.2 Reliability Test

Pilot study was conducted using 22 respondents from the researchers' sample size and who were more than the recommended 10%. Reliability is broadly defined as the degree to which measures are free from error and therefore yield consistent results (Zikmund, Babin, Carr, & Griffin, 2003). Reliability is the consistency of responses, the degree to which an instrument measures in the same way each time under the same conditions. Cronbach Alpha was calculated for all statements in the questionnaire. Cronbach Alpha is a correlation coefficient between two sets of data. Field (2013) posits that scores of between 0.4 and 0.7 are considered to be of normal consistency, while scores higher than 0.7 are considered of high consistency. For this study, reliability was calculated using Cronbach's Alpha formula and results generated with the aid of SPSS. The findings in Table 4.2 show that Cronbach's Alpha for all the items was always above 0.7, indicating that the instrument was adequately reliable for measurement and therefore acceptable. Since all the variables measured had a Cronbach's Alpha above 0.7, they were all reliable and thus accepted.

Table 4.2: Reliability Analysis

Variable	Number of items	Cronbach alpha	Comments
Data Management	8	0.779	Acceptable
Decision Making	10	0.827	Acceptable
Technical Support	11	0.887	Acceptable
Resource Mobilization	7	0.857	Acceptable
Regulatory Actors	8	0.784	Acceptable
Supporters	7	0.715	Acceptable
Management of Water Supply	6	0.740	Acceptable

Source: Research Data (2021)

4.2.3 Validity Testing

Validity testing is done to find out whether a research tool can measure what it aims to measure or not (Borg & Gall, 2003). In this study, pre-test validity of the questionnaire was done, whereby water supply management specialists and research supervisors scrutinized interview guide questions. Expert judgment was given on level of clarity and relevance to the study objectives and interview queries adjusted accordingly. Validity is a measure that determines how well an instrument accomplishes its goal. According to Creswell (2009); Mohajan (2017) a valid study is one in which the findings can be generalized to subjects and situations other than the specific ones which are being studied. This is ascertained through scrutiny and careful designing of items of the tools, with focus on research objectives (Creswell, 2009). The validity of the tools was thus determined by submitting the questionnaires to a contingent of experts who examined the instruments' questions and statements that determined their relation to the study goals in each sub-section. Both content constructs were tested for validity and used in this study.

Content validity was tested by submitting the questionnaires to experts and supervisors in charge of proposal development, who subjected the questions and statements to a rigorous scrutiny. Construct validity was, on the other hand, tested using KMO and factor analysis. The validity of the responses was tested statistically using Kaiser-Meyer-Olkin (KMO), which was used to establish whether the responses were valid, based on their values. The value of KMO had to be greater than 0.5 for a data set to be regarded as valid and suitable for statistical analysis (Field, 2013). The findings of the KMO and Bartlett's Test of Sphericity (significance) for the questionnaire was computed and presented as in Table 4.3.

Table 4.3: Validity Test using KMO and Bartlett's Test

Variable	KMO	Significance
Water Supply Management	.659	.000
Data Management	.833	.000
Decision Making	.837	.000
Technical Support	.831	.000
Resource Mobilization	.678	.000
Supporters	.714	.000
Regulatory Actors	.589	.000

Source: Research Data, 2021

Results in Table 4.3 indicate that the KMO statistic for all variables were above 0.5, with critical level of significance which was set at 0.5 (Field, 2013). Besides the KMO test, the Sphericality test of Bartlett was significant (0.00, at $p<.05$) for all the variables of the study. These results provided an excellent confirmation that the study variables passed the test for further statistical analysis.

4.3 Demographic Profile of Respondents

The respondents' demographic information was captured in the first section of data collection instrument. The main aspects of the respondents' background information

included gender, age, category, highest academic qualification, work experience, duration of residence, persons in his or her household and monthly income.

4.3.1 Gender of Respondents

Management staff and committee members of water supply organizations' top executives, National and County Government officials from the Ministry of Water and the local stakeholders and beneficiaries of the water services in Murang'a County were asked to indicate their gender so as to determine the relationship between gender and management of water supply in the county. Their responses were presented in Figure 4.1.

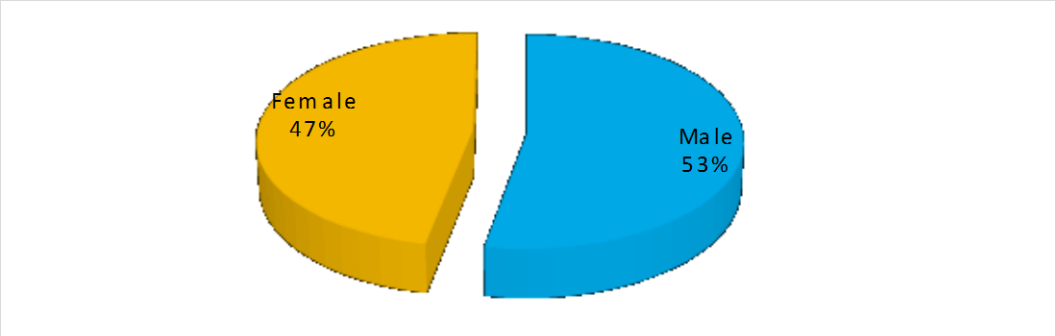

Figure 4.1: Gender of Respondent

Source: Research Data (2021)

The results in Figure 4.1 show that slightly more than a half of the management staff and committee members of water supply organizations' top executives, National and County Government officials were males, while 47% others were females. In addition, most (63%) of local stakeholders and beneficiaries of the water services in Murang'a County were males, while 37% were females. The results imply that most of the management staff and committee members of water supply organizations' top executives, National and County Government officials from the Ministry of Water and the local stakeholders and beneficiaries of the water services in Murang'a County are males.

4.3.2 Age of Respondents

The management staff and committee members of water supply organizations' top executives, National and County Government officials were asked to indicate their ages. This was meant to assist the researcher in assessing the connection between age and involvement in management of water supply in Murang'a County. The responses are presented in Figure 4.2

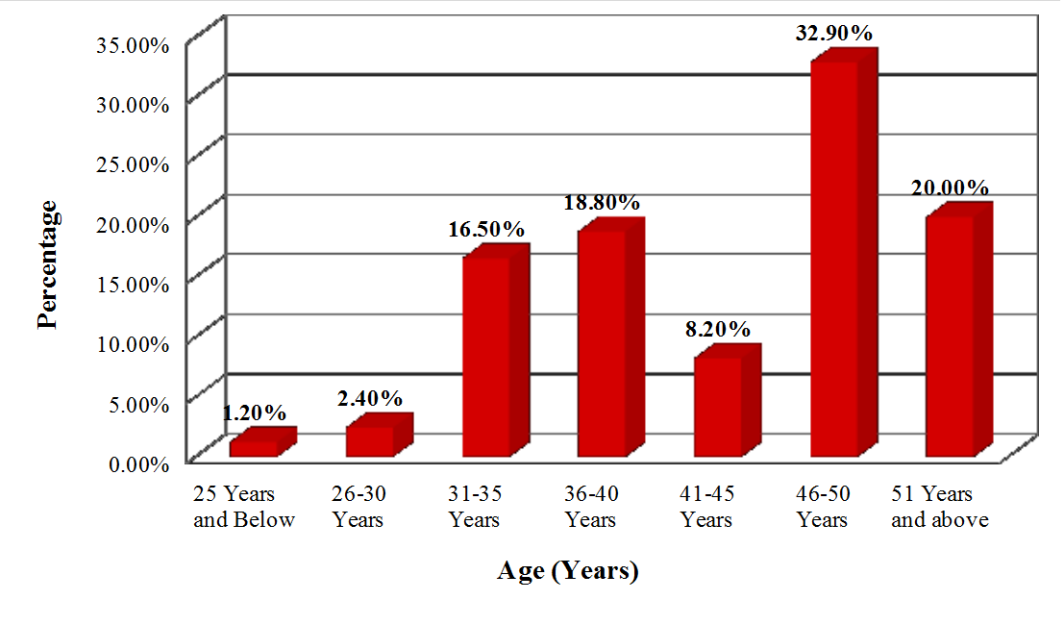

Figure 4.2: Age of the Respondent

Source: Research Data (2021)

As shown in Figure 4.2, most (32.90%) of the respondents were between the ages of 46 to 50 years, 20% indicated that they were aged 51 years and above. The results also show that 18.80% of the respondents were between 36-40 years, 16.50% were between 31-35 years, and 8.20% of the respondents indicated that they were aged between 41-45 years. In addition, the results revealed that 2.40% of the respondents were aged between 26-30 years, while only 1.20% were aged 25 years and below. The results imply that most of the

respondents were 46 years and above, showing that they had experience in matters of management of water supply in Murang'a County. The results also show that the youth were not as involved in the management of water supply as the senior citizens, people aged above 45 years.

4.3.3 Category

It was necessary to categorise the respondents according to where they worked and the role they played in the management of water supply in the County. As a result, the respondents were asked to indicate whether they belonged to any of the following categories: management staff and committee members of water supply organizations' top executives, national or county government officials from the Ministry of Water. The response was as shown in Table 4.4.

Table 4.4: Category

Category	Frequency	Percentage
County Government Officials from the Ministry of Water	24	13.0
Staff in Water Supply Organizations	45	24.3
National Officials from Ministry of Water	16	8.6
Local Stakeholders and Beneficiaries of the Water Services	100	54.1
Total	**185**	**100**

Source: Research Data (2021)

The results in Table 4.4 show that more than a half (54.1%) of the study participants were local stakeholders and beneficiaries of the water services in Murang'a County, 45(24.3%) were management staff and committee members of water supply organizations in Murang'a County, while 24(13%) of the study participants were county government officials from the Ministry of Water. The results show that only 16(8.6%) of the study participants were national officials from Ministry of Water. The results imply that most of

the respondents involved in this study were local stakeholders and beneficiaries of the water services, since they were more involved in matters of management of water supply in the county and were therefore relevant persons to obtain information from, concerning management of water supply.

4.3.4 Highest Academic Qualification

The researcher was concerned about capturing the information concerning the highest academic achievements of the respondents, and so they were asked to indicate their highest academic qualifications. Their responses were as in Figure 4.3

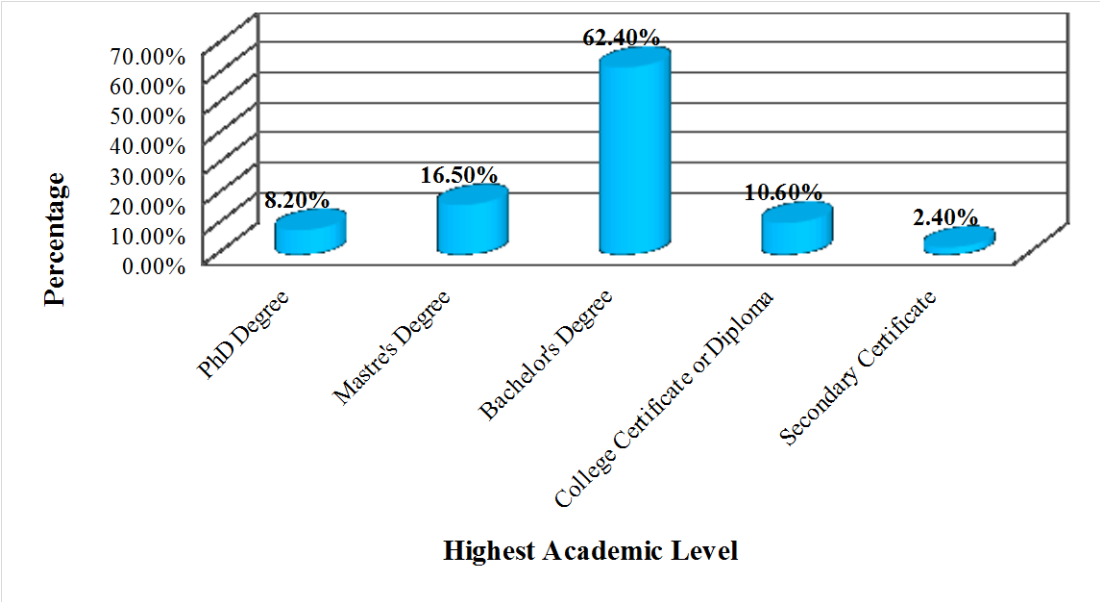

Figure 4.3: Highest Academic Qualification

Source: Research Data (2021)

As indicated in Figure 4.3, majority (62.40%) of the respondents were bachelor's degree holders, 16.50% of the respondents indicated that their highest academic qualification was a master's degree. This implies that most of the staff of these management organizations and government agencies are well educated and therefore have the necessary skills needed

in the management of water supply in Murang'a County. The results also show that 10.60% of the respondents were college certificate or diploma holders, 8.20% of the respondents were PhD holders, while only 2.40% of the respondents were secondary certificate holders. These results imply that most of the staff of these water management agencies involved in the study were well educated and were the relevant people to provide the needed information concerning management of water supply in the county.

The local stakeholders and beneficiaries of the water services in Murang'a County were asked to indicate their academic qualifications, and they responded as shown in Figure 4.4.

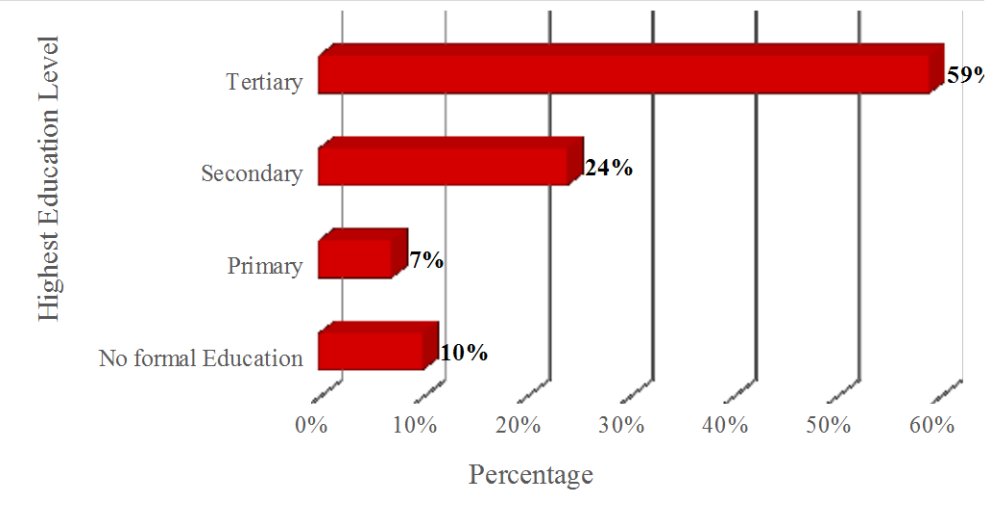

Figure 4.4: Education Level of Stakeholders and Beneficiaries

Source: Research Data (2021)

The results in Figure 4.4 show that most (59%) of the respondents had tertiary level of education, 24% had secondary level of education, 10% had no formal education, while 7% of the stakeholders indicated that they had gone up to primary school level. The results imply that most of the stakeholders and beneficiaries of water services in Murang's County are educated and are in a position to understand what management of water supply entails.

4.3.5 Work Experience

The respondents were asked to indicate their work experience in the county of Murang'a with regard to management of water supply in the county. Their responses were as recorded in Table 4.5.

Table 4.5: Work Experience

Experience	Frequency	Percentage
0-5 Years	20	23.5
6-10 Years	26	30.6
11-15 Years	20	23.5
16-20 Years	12	14.1
Above 20 Years	7	8.2
Total	**85**	**100**

Source: Research Data (2021)

The results in Table 4.5 show that most (30.6%) of the respondents had a working experience of between 6-10 years, while 23.5% of the respondents had between 0-5 years working experience. The results further show that another 23.5% of the respondents had a working experience of between 11-15 years, 14.1% of the respondents indicated that they had a working experience of between 16-20 years. According to the results, only 8.2% of the respondents had more than 20 years working experience in the management of water supply in Murang'a County.

4.3.6 Length of Residence

The respondents were asked to indicate how long they had been residing in Murang'a County, and they responded as shown in Table 4.6.

Table 4.6: Length of Residence in Murang'a County

Length	Frequency	Percentage
0-5 Years	43	50.6
6-10 Years	25	29.4
11-15 Years	10	11.8
16-20 Years	5	5.9
Above 20 Years	2	2.4
Total	**85**	**100**

Source: Research Data (2021)

Based on the results in Table 4.6, most of the respondents (50.6%) indicated that they had lived in Murang'a County for between 0-5 years, 29.4% indicated that they had lived in the area for a period of between 6-10 years. In addition, the results revealed that 11.8% of the respondents had lived in the area for between 11-15 years. According to the results, 5.9% of the respondents had lived in Murang'a County for between 16-20 years, while only 2.4% had been residents in the county for more than 20 years. The results imply that most of the respondents were not regular residents of Murang'a County but probably just went there to work.

4.3.7 Residents in Household

The local stakeholders and beneficiaries of the water services in Murang'a County were asked to indicate the number of members in their households and they responded as shown in Table 4.7.

Table 4.7: Size of Household

Size	Frequency	Percentage	
1 to 3	32		31.60.
4 to 6	55		55.30
7 and Above	13		13.10
Total	**100**		**100**

Source: Research Data (2021)

Based on the results in Table 4.7, majority (55.30%) indicated that they had between 4 and 6 persons in their households. The results also show that 31.60% of the respondents indicated that their households has between 1 and 3 members. Only 13.10% of the respondents indicated their households had 7 members and above. The results imply that most of the families or local stakeholders in Murang'a County have at least four members, meaning their demand for water is high and therefore there in need for reliable and clean water for the households.

4.3.8 Monthly Income

The researcher was interested in obtaining the information about the monthly income of the local stakeholders and the beneficiaries of water services in Murang'a County so as to be able to assess the capability of the households to afford clean water. The responses were as shown in Table 4.8.

Table 4.8: Monthly Income

Income (Ksh)	Frequency	Percentage
Less than 10,000	53	53.0
10,001-20,000	24	24.0
20,001-40,000	18	18.0
40,001-60,000	3	3.0
60,001-100,000	2	2.0
Total	**100**	**100**

Source: Research Data (2021)

The results in Table 4.8 show that most of the local stakeholders (53.0%) indicated that they earned an average monthly income of less than Ksh. 10,000; 24.00% of the respondents indicated that they were earning a monthly income of between 10,001 and 20,000 Kenya shillings; 18.0% of the respondents were earning a monthly income of between Ksh. 20,001 and 40,000; 3.0% of the local stakeholders indicated that they were getting a monthly income of between 40,001 and 60,000; and 2.0% indicated that they were earning an average monthly income of between 60,001 and 100,000. The fact that most of the local stakeholders in Murang'a earn less than Ksh. 10,000 a month means that most of them may not be able to afford to buy water. This means that there is need for affordable and reliable water in the County for such families.

4.4 Role of Local Stakeholders and Management of Water Supply

This subsection presents the results, interpretations and discussions of the findings regarding the role of local stakeholders in the management of water supply in Murang's County. In this section, the keys used were 1 to 5 such that 1 = Strongly Agree (SA); 2 = Agree (A); 3= Undecided (U); 4=Disagree (D); 5= Strongly Disagree (SD).

4.4.1 Management of Water Supply

The dependent variable for this study was management of water supply. Table 4.9 shows the descriptive statistics on management of water supply in Murang'a County.

Table 4.9: Descriptive Statistics for Management of Water Supply (Results in %)

Statement	SA	A	U	D	SD	Mean	SD
Sustainability (continued availability and supply of water for consumption and other uses) has been realized in Murang'a County to a great extent.	2.40	1.20	3.50	31.80	61.20	4.482	0.825
Accessibility (capacity to get water supply with little effort or limited difficulties) has been realized in Murang'a County to a great extent.	2.40	2.40	2.40	34.10	58.80	4.447	0.852
Accountability (fairness and accuracy of the information provided on the costs involved in water supply) has been realized in Murang'a County to a great extent.	1.20	0.00	3.50	31.80%	63.50	4.565	0.680
Reliability (timeliness and appropriateness of the water supplied) has been realized in Murang'a County to a great extent.	2.40	2.40	2.40	29.40	63.50	4.494	0.854
Affordability (how cheap or expensive the water supplied is) has been realized in Murang'a County to a great extent.	3.50	5.90	1.20	24.70	64.70	4.412	1.027
Quality (the nature of water supplied) has been realized in Murang'a County to a great extent.	3.50	2.40	3.50	21.20	69.40	4.506	0.946
Average						**4.484**	**0.864**

Source: Research Data (2021)

Based on the results in Table 4.9, majority of the respondents (61.20%) strongly disagreed with the statement that sustainability, which is about continued availability and supply of water for consumption and other uses, had been realized in Murang'a County to a great extent. This was affirmed by a mean response and standard deviation of 4.482 and 0.825 respectively, implying that most of the respondents were disagreeing with the statement and their response slightly deviated from the mean position of the participants. This further implies that most of the respondents believed sustainability of water management in Murang'a County had been realized to a small extent and the respondents needed more to be done in the realization of sustainability of water supply management in the county. The responses were found to be contrary to the assertions by Respondent N1 who said the following in an interview:

> JICA not only expands access to safe drinking water but also raises service levels to provide drinking water sustainably and at an affordable price from an improved water source which is located on premises, available when needed and free of faecal traces, doing it as a priority within Murang'a County. JICA Kenya Office has been trying its best to attain the development goals in line with the Nairobi Declaration of TICAD VI in 2016, Yokohama Declaration of TICAD7 in 2019, and the respective development plans and strategies of the Government of Kenya, such as Vision 2030 and the Big Four Agenda.

In addition, majority (58.80%) of the respondents strongly disagreed with the statement that accessibility (capacity to get water supply with little effort or limited difficulties) had been realized in Murang'a County to a great extent, with a mean and standard deviation of the response being 4.447 and 0.852 respectively. This points to the fact that water is not accessible in the county, meaning accessibility of water in Murang'a County has not been realized as expected where most of the local community can access water easily. However, this was found to be contrary to what respondent N1 indicated about the state of management of water supply in the county:

> The dynamic nature of JICA's cooperation activities has contributed to transforming the societies and actually improved the people's lives and livelihood and management of water supply in Murang'a County. However, the world surrounding us is in fragility, caused by threats of unsustainable economies, including unsustainable debt, climate change, terrorism and, more recently, COVID-19. It is therefore my sincere hope that JICA Kenya office continues working together with the Murang'a people on the ground for continuous improvement and development and management of water supply.

According to respondent N2:

> Efforts have been made to improve water accessibility in the county. However, a lot of challenges hinder the progress. These include inadequate and unreliable data; inadequate transport system; high non-revenue water levels (NRW); lack of sanitation and sewerage system infrustucture in our urban and peri urban centres; ageing and dilapidated infrastructure; lack of sufficient funds to expand the water reticulation system (the company does not have the capacity to finance expansion of major undertaking from internal funds); unavailability of public land/resources for infrastructure development; political dynamics arising from water sector reforms; implementation of water supply projects by other players without adhering to the company's set standards; destruction of company pipe networks by road/KPLC contractors without due notice and funds for relocation; multiple statutory requirements that are difficult and costly; natural disasters that lead to disruption of operations; lack of storage capacity for raw water like upstream dam, leaving the company vulnerable to fluctuations of the river flow; emerging irrigation projects which eventually use water meant for domestic purposes; and business interference (company experiencing threat of encroachment to its defined water service provision area).

The results further indicate that majority of the respondents (63.50%) strongly disagreed that accountability (fairness and accuracy of the information provided on the costs involved in water supply) had been realized in Murang'a County to a great extent. The results had a mean and standard deviation of 4.565 and 0.680. This implies that most of the residence of Murang'a County believe that there is no accountability in the management of water supply in the county. This was contrary to the assertion by respondent N3, a staff of non-state actors dealing with water in Murang'a County who argued as follows:

> We have been partnering with a number of community-based water supply management groups in Murang'a County, including CBO, NGO, WRUA, TSHCRRMA and SHG to enhance accountability in the management of water

> supply within the county. In addition, we provide training to the local community on better ways of harvesting and storing water for future use and to ensure accountability in the way they use water.

Additionally, majority of the respondents (63.50%) were strongly convinced that reliability (timeliness and appropriateness of the water supplied) had not been realized in Murang'a County to a great extent. The responses had a mean and standard deviation of 4.494 and 0.854. This implies that the residents of Murang'a feel that more effort is needed to ensure reliability in the management of water supply in the county. This was found to be contrary to the opinion of Respondent N2:

> Our main mandate is to manage the forest and water as a resource, and in the past, we have been trying to enhance reliability in the management of water supply in Murang'a County. We have been partnering with County Government of Murang'a where we have to consult the county government on what we need to do including CECs and other departments, to ensure reliability in water supply. We also partner with Kenya Forest Service, Murang'a Offices, and WARMA and UPPER TANA since they provides us with funds as our main donor organizations. We are also working with Ministry of Agriculture which helps with assessing the riparian areas.

Similarly, majority (64.70%) of the respondents strongly disagreed with the statement that affordability (how cheap or expensive the water supplied is) had been realized in Murang'a County to a great extent; the mean and standard deviation of responses was 4.412 and 1.027 respectively. This points to the fact that in most of Murang'a County, water is still a very expensive commodity which they have to spend a lot of money to acquire. Finally, the results showed that most of the respondents (69.40%) believed that good quality of the water supplied had not been realized in most parts of Murang'a County. The results had a mean and standard deviation of 4.506 and 0.946 respectively. This implies that most of the residents of Murang'a County believe the water being supplied for use in the county is of very low quality, a view which according to Respondent N2 is true. In an interview the respondent said as follows:

> Many local people in Murang'a County lack access to a water supply that is safe, close to home and that is available all year round. People frequently travel long distances to unprotected, contaminated and seasonally unreliable water sources in order to meet their daily needs. Those living in crowded, informal urban settlements often depend on water vendors and water of dubious quality bought

from trucks at relatively high price. This is because water supply services, which are required to facilitate access, store and convey available water to communities, are unequally distributed and water resources largely go unmanaged. This is not a technical problem that can be solved with technical means alone. It is a problem that relates to the way that water resources and water supply services are governed.

4.4.2 Descriptive Statistics for Data Management

The first independent variable for this study was data management. The study sought to determine the role of data management on the management of water supply in Murang'a County, Kenya. The descriptive statistics results for data management are as presented in Table 4.10 and 4.11.

Table 4.10: Descriptive Statistics for Data Management (Results in %)

Statement	SA	A	U	D	SD	Mean	SD
Data management has affected the management of water supply in Murang'a County to a great extent.	0.00	2.40	9.40	36.50	51.80	4.376	0.756
Auditing affects the management of water supply in Murang'a County significantly.	0.00	5.90	2.40	23.50	68.20	4.541	0.810
Accounting affects the management of water supply in Murang'a County to a great extent.	0.00	4.70	2.40	16.50	76.50	4.647	0.751
Information dissemination affects the management of water supply in Murang'a County to a great extent.	0.00	5.90	2.40	20.00	71.80	4.576	0.807
Stock management affects the management of water supply in Murang'a County significantly.	0.00	5.90	2.40	18.80	72.90%	4.588	0.806
Average						**4.546**	**0.786**

Source: Research Data (2021)

The results presented in Table 4.10 show that data management was not affecting the management of water supply in Murang'a County to a great extent as claimed by majority (51.80%) of the respondents who strongly disagreed. The results had a mean and standard deviation of 4.376 and 0.756 respectivey. The results imply that data management affects the management of water supply in a very small way; however, the responses are sharply varied. This was affirmed by Respondent N1 who indicated the following:

> The bottom line is, if we remain on the same path, the world is facing a 40 percent shortfall in freshwater resources by 2030, according to the United Nations. So, it's no surprise that the World Economic Forum ranked the water crisis in the top 5 of global risks for the eighth consecutive year. Therefore, there is need for proper management of data with regards to the management of water supply, which is a serious challenge in Murang'a County. As JICA partner with the local government and other water agencies and even local groups involved in the management of data to enhance water supply in the county, we also partner with other stakeholders in drilling of boreholes, installation of pumps and construction of storage tanks and public tap-stands. All the on-going projects in these regions target a total of 326 boreholes to be drilled and developed together with water supply facilities, including reservoirs, elevated tanks, and transmission and distribution pipelines. In Murang'a County, the project to improve rural water supply from surface sources is currently under construction, besides improving data management.

According to Respondent K:

> Regarding water security in Murang'a County, a lot has been done but there is need for more partners to join in improving the situation in the county. However, the main challenge when it comes to water supply management is that Kenya is generally a dry country, as about 80% of the country is arid or semi-arid. The high potential agricultural land amounts to 17% which sustains 75% of the population.The average annual rainfall in Kenya is 630 millimeters(mm) with a variation from less than 200mm in Northern kenya to over 1800mm on the slopes of Mt Kenya, which Murang'a is a part of. Kenya's economy is agricultural based. When drought occurs, it tends to have severe implications on the entire economy and the peoples' livehood. The high volatility of the agricultural share of GDP is mostly reflecting weather-related impact on Kenya's agricultural productivity. In other words, drought and political interferences are serious challenges to water management in Murang'a County.

Most of the respondents (68.20%) strongly disagreed with the statement that auditing affected the management of water supply in Murang'a County significantly. The responses

had a mean and standard deviation of 4.541 and 0.810 respectively. The results imply that most of the residents of Murang'a recognize the fact that auditing is an important aspect of data management and the management of water supply; however, its realization is still not up to the required level in the county. Respondent N4 while reacting to the same statement added:

> We as world bank have been partners with all the stakeholders involved in the management of water supply such as the county government of Murang'a, Athi Water Works Development Agency, Tana Water Works Development Agency, Murang'a County Government, Water Resource Authority (WRA), Water Sector Trust Fund(WSTF), World Bank, Kenya Forest Service (KFS) and WASREB, and the aim of these partnerships have always been to bring accountability in the management of funds set aside for the management of water supply within the county. We have been pushing for regular audits to ensure the amount allocated towards the supply of water within the county is well utilized for the betterment of all the citizens of the county.

Majority (76.50%) of the respondents strongly disagreed with the statement that accounting, which means explanation of the resources obtained and how they have been spent, was affecting the management of water supply in Murang'a county to great extent. The results had a mean of 4.647 and standard deviation of 0.751. The results imply that most of the residents of Murang'a County disagreed with the statement that accounting affects management of water supply to a great extent. Also the results show that majority (71.80%) of the respondents strongly disagreed that information dissemination, which involves spreading of the relevant information to the stakeholders, affected management of water supply to a great extent. This was confirmed by the mean and standard deviation of 4.576 and 0.807 respectively. This was contrary to the assertions by respondent N5, who added:

> WRUA is covering a total of eleven (11) locations spread across two sub-counties in Murang'a County, namely, Kahuro Sub County and Muranga East Sub County. One of our priorities is to disseminate information with regard to the importance of

> water management in Murang'a County. Additionally, our role is the management of water at the source and handling the conflicts emanating from the limited supply of water. We are currently working together with Water Resource Authority, and since the water resource authority is not always on the ground, our major role is to try and manage the conflicts that are brought about by scarcity of water at the catchment area. I wish to state categorically that some of the sources of conflict with regards to water management in this county were compounded by animals using the same water resources as humans, resultingin pollution, which we are charged with the role of reducing.

Finally, majority (72.90%) of the respondents strongly disagreed with the statement that stock management as an aspect of data management had significant effect on the management of water supply in Murang'a County. The results had a mean and standard deviation of 4.588 and 0.806 respectively, implying that most of the respondents were disagreeing with the statement. The findings was corroborated by the argument of Respondent N5 who said as follows:

> We have some ongoing activities, one of which is stock management in as far as the management of water supply is concerned. This is an area that has been poorly handled in this county in the past, and it is the reason behind the poor management of water supply management in this County. In addition, we have tree nursery from which we are getting trees to plant in riparian areas. The second activity that we are currently engaged in is offering advice to the farmers in Murang'a County though the public barazas on the right farming methods because poor farming methods contribute a lot to erosion, and when there is a lot of erosion, it has adverse effect on water through pollution and service runoff of water. In addition, we are sensitizing farmers on the need for contour farming to reduce flow of water towards rivers.

These findings are consistent with the assertions by Kleemeier and Narkevic (2010) that, data management aims at strengthening the community's capability so as to find out and endorse the community's interest. It maintains control on development and running of systems by community members themselves and for such goals to be attained, it requires community to be trained and empowered so as to take on its role in collaboration with its partners. They indicated that among significant problems include the inability to predict funding from one year to the next. As a result, it becomes very difficult to make even

short-term sector planning, leading to poorer, dispersed, and less organized projects, often with minimal or no follow up after construction.

Table 4.11: Descriptive Statistics for Data Management (Results in %)

Statement	SA	A	U	D	SD	Mean	SD
Community engagement in the management of information on water supply leads to improvement of reliability in management of water supply.	4.70	1.20	2.40	24.70	67.10	4.482	0.971
Effective communication leads to increased lowering of costs involved in water supply.	2.40	0.00	1.20	30.60	65.90	4.576	0.746
Through water interaction forums, the local community get control over water supply and makes decisions in line with the organization of water issues.	2.40	0.00	1.20	40.00	56.50	4.482	0.750
ICT skills in water management have helped us strengthen the local community's capability to manage water supply in Murang'a.	2.40	0.00	1.20	38.80	57.60	4.494	0.750
It has been easy for the community to integrate the use of ICT in ensuring sustainability of water supply in Murang'a County.	2.40	0.00	1.20	28.20	68.20	4.600	0.743
Average						**4.527**	**0.792**

Source: Research Data (2021)

Concerning the role played by community engagement, the respondents were asked to indicate their level of agreement with the statement that community engagement in the management of information on water supply leads to improved reliability in the management of water supply. Majority (67.10%) of the respondents strongly disagreed

with the statement, implying that most of the respondents were in disagreement with the statement, but the responses were sharply varied. This was affirmed by a mean and standard deviation of 4.482 and 0.971 respectively. This implies that most of the respondents were disagreeing with the statement and their responses did not deviate from the mean response. While making reference to the same statement, Respondents N5 added:

> We have some activities ongoing, and one of them is a tree nursery from which we are getting trees to plant in riparian areas. The second activity we are currently engaged in is offering advice to the farmers in Muranga County through public barazas on the right farming methods because poor farming methods contribute a lot to erosion, and has adverse effect on water through pollution and surface runoff. In addition, we are sensitizing farmers on the need for contour farming to reduce flow of water towards rivers.

Majority (65.90%) of the respondents strongly felt that effective communication does not lead to increased lowering of costs involved in water supply in Murang'a Countyas affirmed by a mean and standard deviation of 4.576 and 0.746 respectively. The result confirms the fact that most of the respondents were not of the opinion that effective communication leads to increased lowering of costs involved in water supply. Respondent N5 while giving his input on the same continued:

> We have made a lot of progress in trying to improve the level of communication of important information touching on water supply management in Murang'a County. I must state that there has been a lot of political statements on the issue of water in this county and some of the key roles that were being played by water management organizations were transferred to the county government and so, the county government led by the governor always interfere in our operations. So according to me, the biggest challenge we are facing currently in the management of water supply in this county is politicizing issues. However, I am convinced that there is a lot of water resources in Murang'a County.

Further, the results show that majority (56.50%) of the respondents disagreed with the statement that through water interaction forums, the local community exercises control over water supply and makes decisions on matters of water in line with the organization's

objective. The results had a mean and standard devition of 4.482 and 0.750 respectively, being evidence that majority of the respondents disagreed with the statement. In addition, majority (57.60%) of the respondents strongly disagreed with the fact that ICT skills in water management had helped them strengthen the local community's capability to manage water supply in Murang'a. The responses had a mean and standard deviation of 4.494 and 0.750 respectively, implying that most of the participants were in disagreement and their responses were uniformly spread about the mean response. This was however contrary to the assertion by respondent N6:

> WaterAid is an international NGO focused exclusively on ensuring equitable access to safe water, sanitation and hygiene education (WASH) for the world's poorest communities, and this is what we are doing in Murang'a County as well. Our other duties are to promote and secure poor people's rights and access to safe water, improved hygiene and sanitation, support governments and service providers in developing their capacity to deliver safe water and improved hygiene and sanitation by involving the community in decision making process by presenting their suggestions for action by our team and to advocate for the essential role of safe water, improved hygiene. In doing all these, the adoption of ICT in the management of water supply has been our top priority.

Finally, the results show that majority (96.40%) of the respondents disagreed that it has been easy for the community to integrate the use of ICT in ensuring sustainability of water supply in Murang'a County implying that most of the respondents were in disagreement. The overall results imply that most of the respondents disagreed with the statements on data management, implying that data management was not an important aspect in the management of water supply in Murang'a County. In general, the responses had an average mean and standard deviation of 4.527 and 0.792. This is to say that majority of the study participants did not agree with the statements regarding data management as a variable in water supply management.

These findings are consistent with the assertions by Kleemeier and Narkevic (2010) that data management aims at strengthening the community's capability so as to find out and endorse the community's interest. Its objective is to maintain control on the development and running of systems by the community themselves, and for such goals to be attained it requires that the community be trained and empowered so as to take on its role in collaboration with its partners. They indicated that significant problems include the impossibility of being able to predict funding from one year to the next. As a result, it becomes very difficult to make even short-term sector planning, leading to poorer, dispersed, and less organized projects, often with minimal or no follow up after construction.

4.4.3 Descriptive Statistics for Decision Making

The second independent variable for this study was decision making. The study sought to establish the role of decision making on the management of water supply in Murang'a County, Kenya. The results of descriptive statistics of this variable are as presented in Table 4.12 and 4.13.

Table 4.12: Descriptive Statistics for Decision Making (Results in %)

Statement	SA	A	U	D	SD	Mean	SD
Decision making affects the management of water supply in Murang'a County to a great extent.	2.40	2.40	0.00	47.10	48.20	4.365	0.814
Identification of water issues affects management of water supply in Murang'a County to a great extent.	2.40	1.20	0.00	44.70	51.80	4.424	0.777

Prioritization of set goals/objectives affects the management of water supply in Murang'a County to a great extent.	2.40	1.20	0.00	54.10	42.40	4.329	0.762
Monitoring and assessment of water projects affects the management of water supply in Murang'a County to a great extent.	2.40	2.40	0.00	41.20	54.10	4.424	0.822
Proposal of alternative solutions affects the management of water supply in Murang'a County to a great extent.	2.40	2.40	0.00	37.60	57.60	4.459	0.825
Consultations on water projects to be initiated is important in the management of water supply in Murang'a County.	2.40	1.20	0.00	40.00	56.50	4.471	0.781
Average						**4.412**	**0.797**

Source: Research Data (2021)

As indicated in Table 4.12, majority (48.20%) of the respondents strongly disagreed that decision making was affecting the management of water supply in Murang'a County to a great extent. The responses had a mean of 4.365 and standard deviation of 0.814, implying that decision making was considered to have no effect on management of water supply in Murang'a County by majority of the respondents. However, their responses were varied as shown by the standard deviation. This was against the view of Respondent N6 who said:

> Currently the biggest challenge is convincing the community that they are encroaching on riparian land. They usually uproot the trees that the agency plant. There is lack of young people who are willing to join the management of water

> supply initiative. No matter how much we try to encourage them to join the initiative, only a few of them are willing to join despite being majority in the population.

The results also show that majority (51.80%) of the respondents strongly disagreed that identification of water issues was an important aspect of decision making, saying it was not affecting the management of water supply in Murang'a County to a great extent. The results had a mean and standard deviation of 4.365 and 0.814 respectively, implying that most of the respondents were in disagreement with the statement and their responses did not deviate from the mean response. However, Respondent N7 had the following assertion:

> Currently we partner with the local government and other water agencies and even local groups involved in the management of water supply through identification of water issues. The objectives of our partnerships are drilling of boreholes, installation of pumps and construction of storage tanks and public tap-stands. There are on-going projects in this region that will result in drilling and developing a total of 326 boreholes together with water supply facilities, including reservoirs, elevated tanks, and transmission and distribution pipelines. In Murang'a County, the project to improve rural water supply from surface sources is currently under construction. In addition, major water supply projects are being undertaken in the area to augment water supply in Mount Kenya regions.

The results further show that 42.40% of the respondents strongly disagreed with the statement that prioritization of set goals/objectives affected the management of water supply to a great extent. The responses had a mean and standard deviation of 4.329 and 0.762 respectively, implying that most of the respondents were disagreeing with the statement and their responses were slightly varied. In addition, the results reveal that 54.10% of the respondents strongly disagreed with the fact that monitoring and assessment of water projects was affecting the management of water supply in Murang'a County to a great extent, with a mean and standard deviations of 4.424 and 0.822 respectively. This implies that most of the participants disagreed with the statement and their responses were slightly varied from the mean response. The result imply that most of the respondents

believed that this aspect of decision making was to a great extent important in the management of water supply in Murang'a County. Similarly, the results show that majority (57.60%) of the respondents were strongly in disagreement with the statement that proposal of alternative solutions was affecting the management of water supply in Murang'a County to a great extent, with mean response and standard deviation of 4.459 and 0.825, implying that most of the study participants were not in support of the statement since their responses did not deviate so much from the mean response. While reacting to the same statement, Respondent N5 in an interview said:

> We are working in every major area of development, providing a wide array of financial products and technical assistance, and we help countries share and apply innovative knowledge and solutions to the challenges they face. The World Bank's work in Kenya supports the government's Vision 2030 development strategy, which aims to accelerate sustainable growth, reduce inequality, and manage resource scarcity. Water is at the center of economic and social development; it is vital to maintaining health, growing food, generating power, managing the environment, and creating jobs. Water availability and management determines whether poor girls are educated, whether cities become healthy places to live in, and water management determines whether growing industries or poor villages can withstand the impact of floods or droughts.

This implies that much as there are proposals of alternative solutions in the management of water supply in Murang'a County, they are not influencing the management of water supply to the extent they would be expected to. Finally, majority (56.50%) of the respondents were strongly of the opinion that consultations on water projects to be initiated was not important in the management of water supply in Murang'a County. The responses had a mean and standard deviation of 4.471 and 0.781, implying that most of the study participants were in disagreement with the statements and their responses were spread about the mean position. The responses had an overall mean and standard deviation of 4.412 and 0.797, implying that most of the study participnats were not agreeing with the

statements on decision making as a study variable. The results imply that most of the Murang'a County residents believe this aspect of decision making affected management of water supply to a little or to no extent which was inconsistent with the assertion by Respondent N4 who argued as follows:

> We are fully focused on ensuring equitable access to safe water, sanitation and hygiene education (WASH) for the world's poorest communities, and this is what we are doing in Murang'a County as well. Our other duties are to promote and secure poor people's rights and access to safe water, improved hygiene and sanitation, support governments and service providers in developing their capacity to deliver safe water, improved hygiene and sanitation, involve the community in decision making process in which they are supposed to present their suggestions for action by our team and to advocate for the essential role of safe water, improved hygiene. Since 2009, our supporters have helped WaterAid and our partners to successfully deliver our previous Global Strategy of reaching over 10 million people with safe water and 13 million people with sanitation, with a focus on sustainability and reaching the poorest and most marginalised people. Our evidence-based policy and campaigns work has influenced and inspired others to reach many millions more.

Table 4.13: Descriptive Statistics for Decision Making (Results in %)

Statement	SA	A	U	D	SD	Mean	SD
We find it difficult to engage local community in decision making process.	3.50	1.20	2.40	27.10	65.90	4.506	0.895
We find it difficult in conducting consultative meeting between us and the local community.	1.20	0.00	2.40	40.00	56.50	4.506	0.666
The local community finds it difficult to cope with the policies for water supplies.	3.50	0.00	1.20	36.50	58.80	4.471	0.839
We always get support from the local community while conducting capacity building in water supply management.	2.40	1.20	1.20	41.20	54.10	4.435	0.794
						4.479	**0.798**

Source: Research Data (2021)

According to the results in Table 4.13, majority (65.90%) of the respondents strongly disagreed with the fact that they find it difficult to engage local community in decision making process. This was affirmed by a mean and standard deviation of 4.506 and 0.895 respectively. The results show that most of the respondents disagreed with the statement, even though their responses sharply varied. In addition, majority (56.50%) of the respondents strongly disagreed with the fact that they found it difficult in conducting consultative meeting between them and the local community in Murang'a County, with a mean and standard deviation of reposes being 4.506 and 0.666. However, Respondent N7 had the following to say:

> Regarding water security, the lower zone neighbouring Ukambani has are insufficient water resources since most of the springs in the zone have dried up. Therefore the lower zone needs more attention and financing. However, the issue of water storage should be advocated for and there is need to encourage the creation of other groups that can push for water resource management in the lower zone.

Majority (58.80%) of the respondents were strongly in disagreement with the fact that the local community was finding it difficult to cope with the policies for water supplies which they found to have effect on management of water supply in Murang'a County, as shown by a mean response and standard deviation of 4.471 and 0.839 respectively. The results imply that most of the respondents disagreed, which was inconsistent with the assertion by Respondent N4 who said:

> We are fully focused on ensuring equitable access to safe water, sanitation and hygiene education (WASH) for the world's poorest communities, and this is what we are doing in Murang'a County as well. Our other duties are to promote and secure poor people's rights and access to safe water, improved hygiene and sanitation; we also support governments and service providers in developing their capacity to deliver safe water, improved hygiene and sanitation, involving the community in decision making process by presenting their suggestions for action by our team and to advocate for the essential role of safe water, improved hygiene. Since 2009 our supporters have helped WaterAid and our partners to successfully deliver our previous Global Strategy: reaching over 10 million people with safe

> water and 13 million people with sanitation, with a focus on sustainability and reaching the poorest and most marginalised people. Our evidence-based policy and campaigns work has influenced and inspired others to reach many millions more.

Finally, majority (54.10%) of the respondents strongly disagreed with the statement that they always got support from the local community while conducting capacity building in water supply management, support they believed was vital in the management of water supply in Murang'a County. The responses on the variable had an average mean and standard deviation of 4.479 and 0.798 respectively. The results affirmed that the fact that most of the respondents were in disagreement with the statement. Respondent N5 however said:

> Some projects are ongoing, and one of them is tree nursery from which we are getting trees to plant in riparian areas. Secondly, we are engaged in offering advice to farmers in Murang'a County in public barazas on the right farming methods to use because poor farming methods contribute to soil erosion thus pollute rivers through runoff water. We are also sensitizing farmers in the area on the need for contour farming to reduce flow of water towards the river.

The findings are consistent with the arguments of Thomas (2016) who revealed that with increasing water stress and water scarcity, information requirements and data collection needs increase dramatically. The rapid growth of computerized information systems has had a major influence on data acquisition in general and on the utility of information. Trenberth (2010) has warned that greater knowledge about climate system with respect to important relationships and feedbacks and the use of empirical data to initialize system conditions may have the paradoxical effect of increasing, not decreasing, uncertainty for certain system parameters and dynamics, which is problematic for decision makers.

4.4.4 Descriptive Statistics for Technical Support

The third independent variable for this study was technical support. The study sought to establish the role of technical support on the management of water supply in Murang'a

County, Kenya. The results of descriptive statistics of this variable are as presented in Table 4.14 and 4.15.

Table 4.14: Descriptive Statistics for Technical Support (Resultss in %)

Statement	SA	A	U	D	SD	Mean	SD
Technical support affects the management of water supply in Murang'a County to a great extent.	0.00	2.40	7.10	35.30	55.30	4.435	0.731
Using solar power in pumping water significantly influence the management of water supply in Murang'a County significantly.	0.00	1.20	7.10	32.90	58.80	4.494	0.684
Use of modern purification systems has improved the management of water supply in Murang'a County.	0.00	0.00	7.10	28.20	64.70	4.576	0.624
Use of modern water storage facilities plays a key role in the management of water supply in Murang'a County.	0.00	2.40	5.90	28.20	63.50	4.529	0.717
Leakage detections is an important aspect in the management of water supply in Murang'a County.	0.00	2.40	7.10	28.20	62.40	4.506	0.734
Maintenance and repairs affect the management of water supply in Murang'a County to a great extent.	0.00	2.40	3.50	20.00	74.10	4.659	0.665
Water infrastructure upgrading is a vital aspect in the management of water supply in Murang'a County.	0.00	1.20	7.10	28.20	63.50	4.541	0.682
Training and workshops for the technical support team greatly influences the management of water supply in Murang'a County.	0.00	2.40	5.90	25.90	65.90	4.553	0.716
Average						**4.537**	**0.694**

Source: Research Data (2021)

Based on the results of descriptive statistics presented in Table 4.14, majority (55.30%) of the respondents strongly disagreed that technical support was affecting the management of water supply in Murang'a County to a great extent. The responses had a mean and standard deviation of 4.435 and 0.731 respectively. This implies that most of the study participants were not agreeing with the statements and their respinses were varied. This was contrary to what was said by Respondent N3:

> Our institution offers support towards the management of water supply in Murang'a County and many other counties in Kenya through loans, grants, and technical assistance to governments to support expanding or improving water infrastructure, improving management practices and ensuring community engagement in the management of water supply. The World Bank Group is the largest single investor in water projects globally. In Murang'a County we have been partnering with the county government to ensure we provide the necessary financial assistance in addressing the water challenges in the county.

The study in addition shows that most of the respondents (58.80%) strongly disagreed with the fact that using solar power in pumping water significantly influenced the management of water supply in Murang'a County, with a mean and standard deviation of 4.494 and 0.684 respectively. This implies that most of the respondents felt the effect of using solar power in pumping water did not have much effect in the management of water supply in Murang'a County. The results further show that majority of the respondents (64.70%) believed that the use of modern purification systems did not have significant effect in the management of water supply in Murang'a County since according to them as was affirmed by the mean and standard deviation.

Most of the respondents (63.50%) were strongly in disagreement with the statement that the use of modern water storage facilities affected the management of water supply in Murang'a County to a great extent. The responses imply that majority of the respondents were completely not convinced that this aspect of technical support was actually vital in so

far as management of water supply in the county is concerned. Additionally, Respondent N4 while giving his opinion on the same added:

Our role is to offer the necessary support required in the management of water at the source and handling the conflicts emanating from the limited supply of water and we believe this support is important in the management of water supply. We are currently working together with Water Resource Authority, and since the water resource authority is not always on the ground, our major role is to try and manage the conflicts that are brought about by scarcity of water at the catchment area. I wish to state that some of the sources of conflict with regards to water management in this county included conflicts between humans and animals using water resources and the attendant issues of pollution which we have taken upon ourselves the role of trying to reduce. In general, our mandate entails the management of water to ensure continuous flow, its capacity, quality and quantity.

Further, the study shows that majority (62.40%) strongly believed leakage detections had little effect on the management of water supply in Murang'a County and were therefore not an important aspect in the management of water supply in Murang'a County.

According to these results, majority (74.10%) of the respondents strongly disagreed that maintenance and repairs affected the management of water supply in Murang'a County to a great extent. The results imply that most of the respondents believed maintenance and repairs effect management of water supply to a little extent. Respondent N6 however asserted as follows:

> In Murang'a County, we play the role of offering consultancy services. Additionally, the community water management groups in the area are relying on our organization for licensing and we also act as the source of information and advice to the water resources authority since we are the ones on the ground. WRUA has enormously contributed to economic productivity and improvement of

livehoods, both social and economic activities, which rely heavily on the quality and quantity of fresh water supply. Nevertheless, the demand for water is increasing rapidly and needs a high level of infrastructure development.

Similarly, 63.50 % of the respondents indicated that water infrastructure upgrading had little effect on the management of water supply in Murang'a County, with a mean and standard deviation of 4.541 and 0.682 resepectively. Finally, based on the results, majority (65.90%) of the respondents strongly pointed out that training and workshops for the technical support team were not necessary in the management of water supply in Murang'a County, since they had little or no effect on the management of water supply. The responses had an average mean and standard deviation of 4.537 and 0.694, a clear indication that most of the study participants were not agreeing with the statement on the variable. The results imply that most of the respondents believed training and workshops for the technical support team were not important in the management of water supply in Murang'a County.

Table 4.15: Descriptive Statistics for Technical Support (Results in %)

Statement	SA	A	U	D	SD	Mean	SD
Communities are engaged in the design of water supply facilities.	4.70	2.40	0.00	29.40	63.50	4.447	0.982
The local community supports our work through provision of standardized equipment facilities to ensure sustainability of water supply.	2.40	2.40	0.00	47.10	48.20	4.365	0.814
Local community in collaboration with our teams are fully involved in the responsibility of maintenance and repairs of water supply systems.	3.50	1.20	0.00	40.00	55.30	4.424	0.864

The community helps in training the local community on how to use the taps, springs and hand pumps to enhance management of water supply.	2.40	0.00	0.00	11.80	85.90	4.788	0.674
Average						**4.506**	**0.834**

Source: Research Data (2021)

The respondents were, in addition, asked to indicate their level of agreement with four aspects of technical support on the management of water supply in Murang'a County. Based on the results in Table 15, majority (63.50%) of them strongly disagreed that communities were engaged in design of water supply facilities, and this was important in the management of water supply, with a mean response and standard deviation of 4.447 and 0.982 respectively. In addition, majority (48.20%) of the respondents strongly disagreed with the fact that the local community supported their work through provision of standardized equipment facilities to ensure sustainability of water supply. The mean and standard deviation were 4.365 and 0.814 respectively. This confirmed that most of the respondents disagreed with the statement.

Majority (55.30%) of the respondents strongly disagreed with the statement that local community in collaboration with their teams were fully involved in the responsibility of maintenance and repairs of water supply system as a way of improving management of water supply in Murang'a County. The responses had mean and standard deviation of 4.424 and 0.864 respectively. The results meant most of the respondents were in disagreement with the statement. Finally, the respondents were asked to indicate their level of agreement with the statement that the community helped in training the local community on how to use the taps, springs and hand pumps to enhance management of

water supply and majority (85.90%) of them strongly disagreed with the statement. Overall, the statements indicate a mean and standard deviation of 4.788 and 0.674, implying that most of the respondents were in disagreement with the statement on technical support, even though the responses sharply differed.

4.4.5 Descriptive Statistics for Resource Mobilization

The fourth independent variable for this study was resource mobilization. The study sought to assess the role of resource mobilization on the management of water supply in Murang'a County, Kenya. The results of descriptive statistics of this variable are as presented in Table 4.16.

Table 4.16: Descriptive Statistics for Resource Mobilization (Results in %)

Statement	SA	A	U	D	SD	Mean	SD
Resource mobilization affects the management of water supply in Murang'a County to a great extent.	3.50	2.40	5.90	27.10	61.20	4.400	0.966
Planning the money or finances for water supply affects the management of water supply in Murang'a County to a great extent.	2.40	8.20	5.90	15.30	68.20	4.388	1.070
Capability to protect the water resources greatly influences the management of water supply in Murang'a County.	2.40	3.50	3.50	49.40	41.20	4.235	0.868
Capacity to regenerate revenue through water supply services plays key role in the management of water supply in Murang'a County.	2.40	2.40	3.50	17.60	74.10	4.588	0.863
Average						**4.403**	**0.942**

Source: Research Data (2021)

The results in Table 4.16 show that majority (61.20%) of the respondents strongly disagreed with the statement that resource mobilization was affecting the management of water supply in Murang'a County to a great extent, with a mean and stanadred deviation of 4.400 and 0.966 respectively. The results imply that most of Murang'a County residents believe that resource mobilization has little effect on the management of water supply in Murang'a County. The study found out that majority (68.20%) of the respondents were of the opinion that planning the money or finances for water supply was not affecting the management of water supply in Murang'a County to agreat extent. The responses had a mean and stanadrd deviation 4.388 and 1.070 respectively.

Majority (41.20%) of the respondents strongly indicated that capability to protect the water resources was not greatly influencing the management of water supply in Murang'a County. This means that majority of the respondents felt this aspect of resource mobilization had no effect on the management of water supply in Murang'a County. In addition, the results show that majority (74.10%) of the respondents strongly disagreed with the statement that capacity to generate revenue through charging water supply services was playing significant role in the management of water supply in Murang'a County. The responses had a mean of 4.588 and 0.863, implying that most of the study participants were disagreeing with the statement and their responses were uniformly spread around the mean response.

Table 4.17: Descriptive Statistics for Resource Mobilization (Results in %)

Statement	SA	A	U	D	SD	Mean	SD
The community here contributes towards water supply management through cash and provision of labour.	2.40	3.50	1.20	25.90	67.10	4.518	0.881
Local community are involved in resource mobilization to match the demand with the supply of water.	0.00	4.70	1.20	47.10	47.10	4.365	0.738
We collaborate with the community in sourcing for civic organizations and donors to encourage existing incentives for shared action or co-production of water services.	2.40	8.20	1.20	44.70	43.50	4.188	0.982
The level of willingness of users to provide the necessary resources for keeping the water system functioning affects the level of sustainability of water supply.	1.20	1.20	1.20	52.90	43.50	4.365	0.687
Average						**4.359**	**0.822**

Source: Research Data (2021)

The respondents were in addition asked to indicate their level of agreement with statements on resource mobilization. The results in the table 4.17 indicate that majority (67.10%) of the respondents strongly disagreed with the statement that the community in Murang'a County contributed towards water supply management through cash and provision of labour. The results showed a mean and standard deviation of 4.518 and 0.881 respectively. This implies that most of the respondents who took part in the study were in disagreement

with the statement, though their responses were varied. In addition, Respondent N3 indicated as follows:

> The World Bank's work in Kenya supports the government's Vision 2030 development strategy, which aims to accelerate sustainable growth, reduce inequality, and manage resource scarcity. Water is at the center of economic and social development; it is vital to the maintainance of health, growing food, generating electric power, managing the environment, and creating jobs. Water availability and management determines whether poor girls are educated, whether cities are healthy places to live, and whether growing industries or poor villages can withstand the impacts of floods or droughts. The role of the World Bank when it comes to the management of water supply in Murang'a County and Kenya at large is to provide funding to various partners involved in the management of water supply.

Majority of the respondents (47.10%) strongly disagreed that local community were fully involved in resource mobilization to match the demand with the supply of water. Respondent N6 added:

> We have always strived to make clean water available to the residents of Murang'a County and we will not tire till the time we attain 100% clean water supply in the county. Currently we are working closely with the county government of Murang'a under the leadership of governor Mwangi wa Iria in ensuring more boreholes are sunk in every village in the county to address the persistent water shortage that has been experienced in the area for many years.

The results show that majority (43.50%) of the respondents strongly disagreed with the fact that there was community collaboration in sourcing for civic organizations and donors to encourage existing incentives for shared action or co-production of water, as evidenced by the mean and standard deviation of 4.188 and 0.982 respectively. The results imply that most of the respondents were in disagreement with the statement. Finally, the results show that most of the respondents (43.50%) were strongly in disagreement with the fact that the level of willingness of users to provide the necessary resources for keeping the water system functioning affected the level of sustainability of water supply in Murang'a County. The results had a mean and standard deviation of 4.365 and 0.687 respectively, further

confirming the level of disagreement. Respondent N7 while making suggestions on the same indicated as follows:

> I would say that there is serious water insecurity in Murang'a and its environs. Therefore, there is need for more effort to be put in ensuring the state of water supply in the county is improved. As far as challenges are concerned, the biggest stumbling block in the management of water supply in Murang'a County is political interference. The national and county governments are always at loggerheads with each other, hampering the management of water supply. As a counter measure against the Coronavirus (COVID 19) in Kenya, and in response to urgent request by Kenya's Ministry of Water and Sanitation, JICA has plans of providing water treatment chemicals (worth the equivalent of 45,000,000 Japanese yen) to the water service providers in Murang'a County.

4.4.6 Descriptive Statistics for Regulatory Actors

The fifth variable of the study was regulatory actors. The study sought to assess the moderating role of regulatory actors on the relationship between local stakeholders and management of water supply in Murang'a County, Kenya. The results of descriptive statistics of this variable are as presented in Table 4.18.

Table 4.18: Descriptive Statistics for Regulatory Actors (Results in %)

Statement	SA	A	U	D	SD	Mean	SD
Advocacy agencies (e.g. World Bank, FAO) influence management of water supply in Murang'a County to a great extent.	1.20	9.40	7.10	37.60	44.70	4.153	0.994
National Government policies to some extent affect management of water supply in Murang'a County.	9.40	4.70	3.50	42.40	40.00	3.988	1.220
Water Services Regulatory Board (WASRB) greatly influences management of water supply in Murang'a County.	0.00	2.40	1.20	27.10	69.40	4.635	0.633

National Environment Management Authority (NEMA) plays key role in regulating water supply in Murang'a County.	1.20	4.70	7.10	22.40	64.70	4.447	0.906
The Kenya Water and Sanitation Network (KEWASNET) is actively involved in the management of water supply in Murang'a County.	1.30	9.30	9.10	39.60	40.70	4.453	0.987
Ministry of Water and Irrigation (MWI) plays its regulatory role effectively in the management of water supply in Murang'a County.	10.40	3.70	5.50	39.40	41.00	3.788	1.020
Catchment Area Advisory Committee (CAAC) is fully involved in the management of water supply in Murang'a County.	1.00	1.40	1.20	30.10	66.40	4.535	0.533
National Water Conservation and Pipeline Corporation (NWCPC) plays key role in the management of water supply in Murang'a County.	1.20	3.70	8.10	20.40	66.70	3.447	0.806
Water Appeal Board (WAB) is actively involved in the management of water supply in Murang'a County.	9.30	4.80	4.50	39.40	42.00	4.001	0.912
Average						**4.506**	**0.838**

Source: Research Data (2021)

Based on the results in Table 4.18 majority (44.70%) of the respondents were not convinced that advocacy agencies (e.g. World Bank, FAO) had influence on the management of water supply in Murang'a County to a great extent. The results imply that most of the residents of Murang'a county believe these advocacy agencies (e.g. World Bank, FAO) are not doing enough in the the management of water supply in the county. The results had a mean and standard deviation of 4.153 and 0.994 respectively. This is evidence that most of the respondents strongly disagreed with the fact that national government policies to some extent had effect on the management of water supply in Murang'a County. The results imply that most of the residents of Murang'a County believe national government policies are not playing any role in the management of water supply in the County to any extent. The argument of Respondent N5 was as follows:

> We are covering a total of eleven (11) locations spread across two sub counties in Murang'a County, namely Kahuro Sub County and Murang'a East Sub County. Our role is the management of water at the source and handling the conflicts emanating from the limited supply of water. We are currently working together with Water Resource Authority, and since the water resource authority is not always on the ground, our major role is to try and manage the conflicts that are brought about by scarcity of water at the catchment area. I wish to state that some of the sources of conflict with regards to water management in this County include conflicts between humans and animals using water resources and the attendant issues of pollution which we are charged with the role reducing. So Mr. Njagi, in general our mandate entails management of water to ensure continuous flow, its capacity, quality and quantity.

The other thing that the results show is that majority (40.00%) of the respondents strongly disagreed with the statement that Water Services Regulatory Board (WASRB) was greatly influencing management of water supply in Murang'a County. This implies that most of the residents of Murang'a County are not convinced that Water Services Regulatory Board (WASRB) has significant impact in the management of water supply in the County. Based on the results, majority (69.40%) of the respondents strongly disagreed with the statement

that National Environment Management Authority (NEMA) was playing key role in regulating water supply in Murang'a County. Respondent N6 while contributing on the same indicated as follows:

> We partner with County Government of Murang'a, consulting the county government, CECs and other departments on what we need to do. We also partner with Kenya Forest Service Murang'a Offices, WARMA and UPPER TANA, since they provide us with funds as our main donor organizations. We are also working with Ministry of Agriculture which helps with assessing the riparian areas. Additionally, we do our agency work with the administration officials, such as chiefs and assistant chiefs who assist the Agency during Barazas in organizing the meetings. The chiefs are also used in accompanying the Agency members when they are going to plan trees. Further, we are involved in harvesting of water which is the role of Rowers; however, the Agency is not involved in drilling boreholes.

Most (40.70%) of the respondents strongly believed the The Kenya Water and Sanitation Network (KEWASNET) was not actively involved in the management of water supply in Murang'a County. This implies that Kenya Water and Sanitation Network (KEWASNET) was not contributing enough to the management of water supply management in Murang'a County. Most (41.00%) of the respondents strongly disagreed with the fact that Ministry of Water and Irrigation (MWI) was playing its regulatory role effectively in the management of water supply in Murang'a County, with a mean response and standard deviation of 3.788 and 1.020 respectively. The results point to the fact that there is need for the Ministry of Water and Irrigation (MWI)to commit itself and play its regulatory role effectively in the management of water supply in Murang'a County. Additionally, most of the respondents (66.40%) strongly disagreed with the statement that Catchment Area Advisory Committee (CAAC) was fully involved in the management of water supply in Murang'a County. National Water Conservation and Pipeline Corporation (NWCPC) was regarded as not playing a key role in the management of water supply in Murang'a County as indicated by majority of the respondents (66.70%) who strongly disagreed with the

statement. Finally, most (42.00%) of the respondents strongly disagreed that Water Appeal Board (WAB) was actively involved in the management of water supply in Murang'a County, which then call for the board to ctively participate in the management of water supply in the county. The responses had an average mean and standard deviation of 4.506 and 0.838 respectively. This implies that most of the study participants did not agree with the statements relating to this variable and their responses were slightly diverse. Respondent N2 added:

> A lot has been done in Murang'a County, but there is need for more partners to come together to improve the situation in the county. Regarding challenges of water supply management in Kenya in general, I would say that Kenya is generally a dry country, as about 80 percent of the country is arid and semi-arid. The high potential agricultural land amounts to only 17 percent, which sustains 75 percent of the population. The average annual rainfall in Kenya is 630 millimeters (mm) with a variation from less than 200 mm in Northern Kenya to over 1,800 mm on the slopes of Mt. Kenya which Murang'a is part of. Kenya's economy is based on agriculture, with the latter providing about one third of the country's income. That is why whenever a drought occurs, it has severe implications on the entire economy and the people's livelihood. Agriculture, which forms a big share of GDP is vulnerable to the unpredictable weather. Therefore, drought and political interference are serious challenges to water supply management in Murang'a County.

4.4.7 Descriptive Statistics for Supporters

This study sought to establish the mediating role of supporters on the management of water supply in Murang'a County, Kenya. The results of descriptive statistics relating to the role of supporters are presented in Table 4.19.

Table 4.19: Descriptive Statistics for Supporters (Results in %)

Statement	SA	A	U	D	SD	Mean	SD
Sponsorship associations (e.g. JICA) influence the management of water supply in Murang'a County to a great extent.	8.20	4.70	1.20	35.30	50.60	4.153	1.200

Water management organizations (e.g. MUWASCO) are key in the management of water supply in Murang'a County.	7.10	8.20	1.20	24.70	58.80	4.200	1.242
Non-Governmental Organizations support the management of water supply in Murang'a County to a great extent.	5.90	3.50	1.20	32.90	56.50	4.306	1.080
Private partners contribute significantly to the management of water supply in Murang'a County.	1.20	1.20	1.20	24.70	71.80	4.647	0.685
Kenya Water Aid has been supporting the management of water supply in Murang'a County to a great extent.	10.20	2.70	1.20	40.40	45.50	3.853	1.301
Kenya Water for Health Organization (KWAHO) has been a key player in the management of water supply in Murang'a County.	5.10	10.20	2.20	20.70	61.80	4.000	1.142
The Water Services Trust Fund (WSTF) has over the years supported the management of water supply in Murang'a County to a great extent.	8.90	0.50	3.20	35.80	51.60	4.007	1.110
Average						**4.426**	**1.252**

Source: Research Data (2021)

The results in Table 4.19 depict that majority (50.60%) of the respondents strongly disagreed with the statement that Sponsorship Associations (e.g. JICA) were influencing the management of water supply in Murang'a County to a great extent. The responses had a mean and standard deviation of 4.153 and 1.200 respectively, implying that most of the participants were disagreeing with the statement and their responses were uniformly spread around the mean response. The results also show that majority (58.80%) of the respondents strongly disagreed with the statement that Water management organizations (e.g. MUWASCO) were key in the management of water supply in Murang'a County, with a mean and standard deviation of 4.200 and 1.242 respectively. This implies that most of the residents of Murang'a County are not convinced that Water management organizations (e.g. MUWASCO) actually have any significant role in the management of water supply in the county. Supporting the statement, respondent N1 argued as follows:

> As JICA Kenya Office, we have been trying our best to attain the development goals in line with the Nairobi Declaration of TICAD VI in 2016, Yokohama Declaration of TICAD7 in 2019, and the respective development plans and strategies of the Government of Kenya, such as Vision 2030 and the Big Four Agenda. I'm confident that the dynamic nature of JICA's cooperation activities have contributed to transforming societies and actually improved the people's lives and livelihood in Murang'a County. However, the world surrounding us is experiencing fragility caused by threats of unsustainable economies, including debt-sustainability, climate change, terrorism and, more recently, COVID-19. It is therefore my sincere hope that JICA Kenya Office continues working together with the Murang'a people on the ground for continued improvement in the development of water supply.

Majority (56.50%) of the respondents strongly indicated that Non-Governmental Organizations were not supporting the management of water supply in Murang'a County to a great extent. The study also found out that most of the respondents (71.80%) were strongly not convinced that private partners were contributing significantly to the management of water supply in Murang'a County. The results affirmed that most of the

respondents were actually of the opinion that private partners did not affect the management of water supply in Murang'a County significantly. The results in general imply that most of the respondents did not believe that supporters affected management of water supply in Murang'a County. Respondent N5 however argued as follows:

> We partner with the local government and other water agencies and even local groups involved in the management of water supply. The objectives of our partnerships are drilling of boreholes, installation of pumps and construction of storage tanks and public tap stands. All the on-going projects in these regions target a total of 326 boreholes to be drilled and developed together with water supply facilities, including reservoirs, elevated tanks, and transmission and distribution pipelines. Murang'a County project aimed at improving rural water supply from surface sources is currently under construction.

The results further depict that majority (45.50%) of the respondents strongly disagreed with the statement that Kenya Water Aid had been supporting the management of water supply in Murang'a County to a great extent, with the mean and standard deviation being 3.853 and 1.301 respectively. This implies that the residents of Murang'a County believe Kenya Water Aid has not been supporting the management of water supply in Murang'a County to the level they would expect. The results additionally show that most (61.80%) of the respondents strongly disagreed with the statement that Kenya Water for Health Organization (KWAHO) had been a key player in the management of water supply in Murang'a County. Respondent N7 argued as follows:

> Major water supply projects are being undertaken in the area to augment water supply in Mount Kenya regions. A lot of progress has been made, but I must state that there has been a lot of political interference in the issue of water in this county and some of the key roles that were being played by water management organizations were transferred to the county government and so, the county government led by the governor must always interfere in our operations. So according to me the biggest challenge we are facing currently in the management of water supply in this County is political issue. However am convinced that there is a lot of water resource in Murang'a County.

Finally, majority (51.60%) of the respondents strongly disagreed that The Water Services Trust Fund (WSTF) had supported the management of water supply in Murang'a County to a great extent. The responses had a mean of 4.426 and an average standard deviation of 1.252, implying that most of the respondents disagreed with the statements on the role of supporters on the management of water supply in Murang'a County, Kenya, and that their responses did not vary so much from the mean response.

4.5 Correlation Analysis

Correlation is a term used to denote the association between two (or more) quantitative variables. This analysis is fundamentally based on the assumption of a straight line linear relationship between the quantitative variables and it measures the "strength" or the "extent" of the association between the variables and also its direction. The end result of a correlation analysis is a Correlation coefficient whose values range from -1 to +1. A correlation coefficient of +1 indicates that the two variables are perfectly related in a positive (linear) manner; a correlation coefficient of -1 indicates that two variables are perfectly related in a negative [linear] manner; while a correlation coefficient of zero indicates that there is no linear relationship between the two variables being studied (Gogtay & Thatte, 2017). The study conducted correlation analysis to establish the statistical significance of the association between the independent variables and management of water supply in Murang'a County. The results in Table 4.20 show the multiple correlation matrix.

Table 4.20: Correlation Matrix

	Water Supply Management	Data Management	Decision Making	Technical Support	Resource Mobilization	Supporters	Regulatory Actors
Water Supply Management	1.000						
Data Management	.841**	1.000					
Decision Making	.765**	.694**	1.000				
Technical Support	.877**	.772**	.706**	1.000			
Resource Mobilization	.852**	.751**	.699**	.797**	1.000		
Supporters	.789**	.678**	.574**	.698**	.603**	1.000	
Regulatory Actors	.895**	.807**	.664**	.779**	.760**	.699**	1.000

**Correlation is significant at the 0.01 level (2-tailed).

Source: Research Data (2021)

The correlation results show that data management had a strong positive and significant association with management of water supply in Murang'a County (r=0.841, P=000<.05). The result implies that data management influences management of water supply in Murang'a County positively. The results also show that decision making had a strong positive and significant association with management of water supply in Murang'a County (r=0.765, P=000<.05). The result implies that decision making influences management of water supply in Murang'a County positively. The correlation results further show that the variable technical support had a strong positive and significant association with management of water supply in Murang'a County (r=0.877, P=000<.05). The result implies that technical support influences management of water supply in Murang'a County positively. The results also revealed that the variable resource mobilization had a strong

positive and significant association with management of water supply in Murang'a County (r=0.852, P=000<.05). The result implies that resource mobilization influences management of water supply in Murang'a County positively.

The results further indicated that the variable regulatory actors had a strong positive and significant association with management of water supply in Murang'a County (r=0.823, P=000<.05). The result implies that regulatory actors had positive influence on management of water supply in Murang'a County. Finally, the results revealed that the variable Supporters had a strong positive and significant association with management of water supply in Murang'a County (r=0.789, P=000<.05). The result implies that supporters had positive influence on management of water supply in Murang'a County.

These correlation results are consistent with the findings of Cook *et al.*, (2016) which indicate that through data management, communities get control over their systems and make decisions in line with the organization of the management. They also noted that stakeholders often work in partnership with external agencies such that they both provide resources that can be used in the most effective manner to develop reliable and sustainable systems. The results are consistent with the findings of Trenberth (2010) who warned that greater knowledge about climate system with respect to important relationships and feedbacks and the use of empirical data to initialize system conditions may have the paradoxical effect of increasing, not decreasing, uncertainty for certain system parameters and dynamics, which is problematic for decision makers. The results are also consistent with the findings of Garfin *et al.*, (2014) which showed that the water facilities designed by government and constructed with little or no community involvement are not adequately maintained and some have been abandoned. The study showed also that whilst most of the

hand pumps are in good working condition because the technology is so simple that the village mechanic and bicycle repairer can repair the pumps, about 58% of the motorized schemes have ceased functioning.

The results are consistent with the assertion by Dyer *et al.,* (2014) that since water is a shared common property and water services have some basic investment cost, it is imperative that local communities work together to manage the resources and the services accruing. Resource mobilization is an indicator of a demand-responsive project and can be used to identify a project in which people merely participate. Therefore communities could engage in civic organizations while donors encourage existing incentives for shared action or co-production of the services. Additionally, Tukahirwa, Mol and Oosterveer (2013) indicate that governance for sustainability has certain key features and components which include policy integration, shared sustainability objectives, criteria, trade-off rules and indicators, information and incentives for practical implementation, and programmes for system innovation. The results are consistent with the assertion by Ananga (2015) that the quality social relations provide a social support safety net and enable benefitting members to collectively resolve their common problems while achieving mutual benefits. Local people are the directly affected and most of them motivated to seek solutions to their own water and sanitation issues and are generally motivated toward broad inclusion in decision-making. Sponsors and advocacy organizations are organized at local, national and international level and in a diversity of peer groups ranging from professional background, religious or political affiliation, ethnicity or nationality, to thematic face and interest groups.

4.6 Diagnostic Tests

This section investigated characteristics of the dependent and independent variables that influence the application of traditional ordinary least squares estimator. These pre-estimation diagnostics include normality, multicolliniarity, heteroscedasticty and linearity tests.

4.6.1 Test for Normality of Data

Normality tests whether the data is well modelled and normally distributed. It is used to measure how far data deviates from the Gaussian by looking at the graph and seeing whether the distribution deviates grossly from a bell shaped normal distribution. It establishes the likelihood of a random variable being normally distributed. It is an assessment of the normality of data in statistical tests. If the tests are non-normal, then the data has outliers, multiple modes, incorrect measuring tools, incorrect distributions, zero /infinite limits, or scanty collections (Singh & Masuku, 2014). In order to fit a linear model, the dependent variable has to be normally distributed. This study used both Kolmogorov Smirnov and Shapiro-wilk tests for normality for all the dependent variables, and the results are displayed in Table 4.21.

Table 4.21: Test for Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Management of Water Supply	.172	185	.060	.851	185	.113

a. Lilliefors Significance Correction

Source: Research Data (2021)

The results in Table 4.21 indicate that the dependent variable (Management of Water Supply) was normally distributed since p-values were greater than 0.05 for both

Kolmogorov test and Shapiro-wilk. These values confirm further that the data was normally distributed.

4.6.2 Test for Multicollinearity

Multicollinearity exists when two or more predictor variables in a multiple regression model are highly correlated. A set of variables is perfectly multicollinear if there exists one or more exact linear relationships among some of the variables. For the purpose of this study, Tolerance of the variable and the VIF value were used to test for multicollinearity, where values more than 0.2 for Tolerance and values less than 10 for VIF were taken to mean there is no multicollinearity (Miles, 2014). The results are presented in Table 4.22.

Table 4.22: Multicollinearity Test Using Tolerance and VIF

	Collinearity Statistics	
	Tolerance	**VIF**
Data Management	0.270	3.705
Decision Making	0.421	2.376
Technical Support	0.246	4.071
Resource Mobilization	0.303	3.306
Supporters	0.401	2.495
Regulatory Actors	0.306	3.266

Source: Research Data (2021)

The results in Table 4.22 show that all the variables, intervening variable and moderating variable, had tolerance values >0.2 and VIF values <10, indicating that there was no multicollinearity among the independent variables which were data management, decision making, technical support and resource mobilization. The same applied to the intervening variable supporters and moderating variable regulatory actors.

4.6.3 Test of Heteroscedasticity

Heteroscedasticity is a systematic change in the spread of the residuals over the range of measured values. Heteroscedasticity is a problem because ordinary least squares (OLS)

regression assumes that all residuals are drawn from a population that has a constant variance (homoscedasticity). This study used Breusch-Pagan to test the null hypothesis when the error variance remains constant against the alternative hypothesis that the error variances are not constant. Breusch-Pagan tests the null hypothesis that heteroscedasticity is not present. If p-value > 0.05, the null hypothesis is rejected. The alternative hypothesis is that the data does suffer from Heteroscedasticity. The heteroscedasticity test results are presented in Table 4.23.

Table 4.23: Heteroscedasticity Results

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity Ho: Constant variance Variables: fitted values of Management of Water Supply in Murang'a County		
chi2 (1)	=	0.28
Prob > chi2	=	0.5712

Source: Research Data (2021)

Results in Table 4.23 shows that the probability chi-square value was 0.5712>0.05, showing that heteroscedasticity did not exist in the data.

4.6.4 Test of Linearity

Linearity assumes a straight-line relationship between the predictor variables and the target variable. Linearity in this study was assessed by examination of a graph plot of all the independent variables against the dependent variable to determine whether there is a straight-line relationship. Figure 4.5 shows the linear relationship between each predictor variable and management of water supply. All the independent variables depicted a straight-line relationship with the dependent variables as shown in Figure 4.6

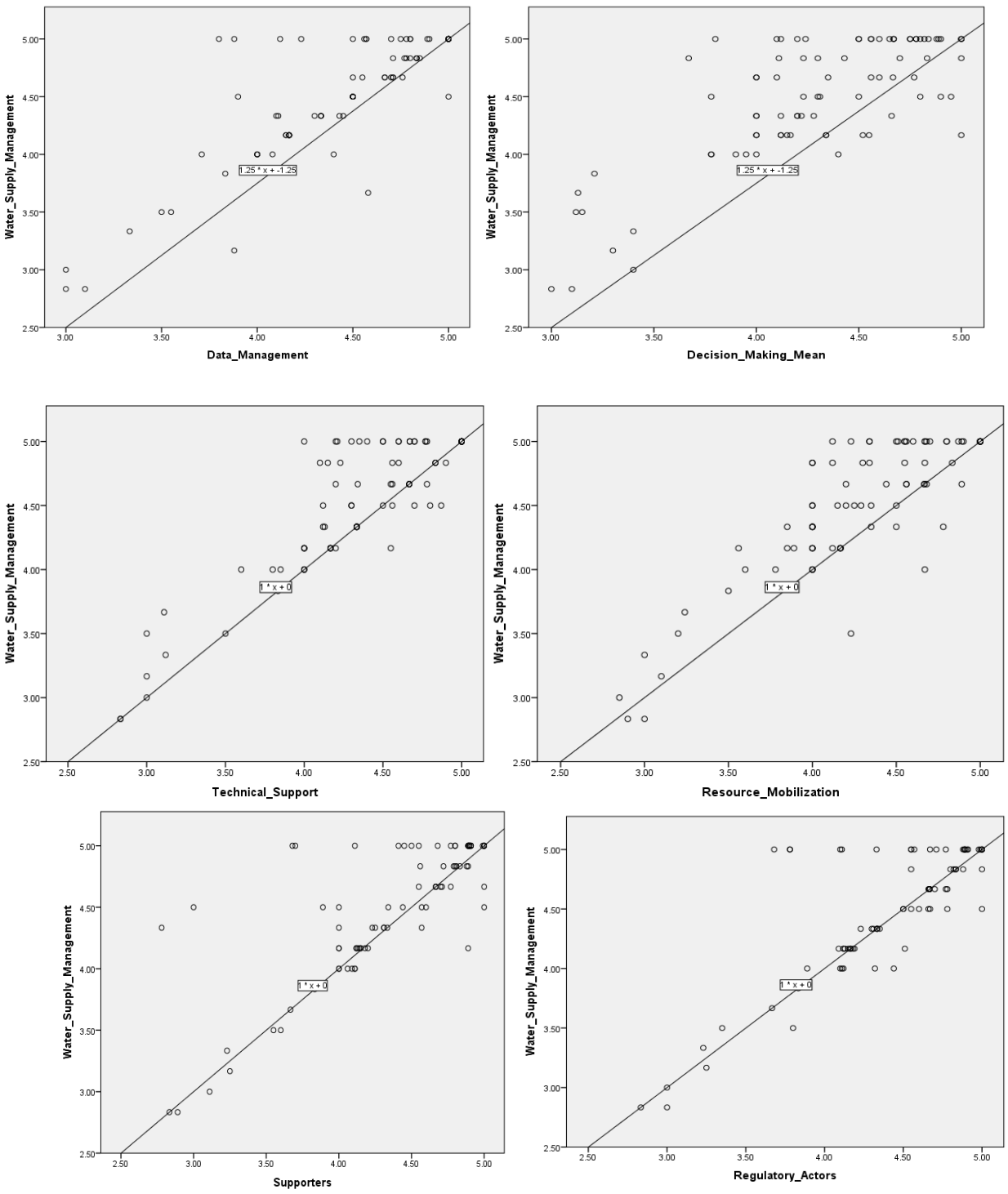

Figure 4.5: Graphical Diagram for Linearity

Source: Research Data (2021)

4.7 Regression Analysis

Regression analysis was used to test all the hypotheses; however, before the test was carried out it was important to carry out several diagnostic tests to confirm whether the data fitted the model. This in line with Hair *et al*. (2006) recommendations. Wan (2013) observed that regression analysis helps in generating an equation that describes the statistical relationship between one or more predictor variables and the response variable. The coefficient of determination, R^2 was used in this study as a useful tool because it gives the proportion of the variance of one variable that is predictable from the other variable. It is a measure that allows the determination of how certain variables can be in making predictions from a certain model. The coefficient of determination is the ratio of the explained variation to the total variation. The coefficient of determination is such that $0<R^2< 100$ and denotes the strength of the linear relationship between x and y. The regression analysis results were presented using regression model summary tables, analysis of Variance (ANOVA) table and beta coefficient tables.

Regression Analysis

For this study, multiple regressions were done because the study had four independent variables to show the joint relationship between the independent variables and the management of water supply in Murang'a County. For interpretation and understanding the result of regression analysis, R squared was used to check how well the model fitted the data. The coefficient of determination, R^2 was used in this study as a useful tool because it gives the proportion of the variance (of one variable that is predictable from the other variable). The coefficient of determination is such that $0<R^2< 100$ and denotes the strength of the linear relationship between independent variables and dependent variable.

Table 4.24: Multiple Regression

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.935[a]	.873	.867	.19832

a. Predictors: (Constant), Resource Mobilization, Decision Making, Data Management, Technical Support

ANOVA						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	21.722	4	5.430	138.071	.000[b]
	Residual	3.146	180	.039		
	Total	24.868	184			

a. Dependent Variable: Water Supply Management

b. Predictors: (Constant), Resource Mobilization, Decision Making, Data Management, Technical Support

Regression Coefficients						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	-.225	.209		-1.078	.284
	Data Management	.300	.078	.266	3.860	.000
	Decision Making	.146	.065	.138	2.249	.027
	Technical Support	.365	.076	.360	4.796	.000
	Resource Mobilization	.277	.075	.268	3.714	.000

a. Dependent Variable: Water Supply Management

Source: Research Data (2021)

The regression model therefore became:

MWS = -.225 + 0.300DT + 0.146DM + 0.365TS + 0.277RM

Where:

MWS=Management of water supply

DT =Data management

DM= Decision making

TS = Technical support

RM = Resource mobilization

The model fitness results in Table 4.24 show that resource mobilization, decision making, data management and technical support were found to be satisfactory variables in explaining management of water supply in Murang'a County. This is supported by coefficient of determination, also described as the R square of 0.873. This means that resource mobilization, decision making, data management and technical support explain 87.3% of the variations in the dependent variable, which in this case is management of water supply in Murang'a County.

The ANOVA results indicate that the overall model was statistically significant. Further, the results imply that resource mobilization, decision making, data management and technical support are good predictors of management of water supply in Murang'a County. This was supported by an F statistic of 138.071, which is greater than tabulated F-statistic, which is greater than tabulated F-statistic $F_{(4,180)} = 3.8415$ and the reported p-value (0.000), which was less than the conventional probability of 0.05. It is therefore concluded that resource mobilization, decision making, data management and technical support had significant combined effect on the management of water supply in Murang'a County.

Regression coefficient results show that there was a positive and significant relationship between data management and management of water supply (β =.300, p=0.000). This was supported by a calculated t-statistic of 3.860 that is larger than the critical t-statistic of 1.96. The results also show that there was a positive and significant relationship between decision making and management of water supply (β =.146, p=0.027). This was supported by a calculated t-statistic of 2.249 that is larger than the critical t-statistic of 1.96.

The results revealed that there was a positive and significant relationship between technical support and management of water supply (β =0.365, p=0.000). This was supported by a calculated t-statistic of 4.796 that is larger than the critical t-statistic of 1.96. Lastly, the results indicate that there was a positive and significant relationship between resource mobilization and management of water supply (β =0.277, p=0.000). This was supported by a calculated t-statistic of 3.714 that was greater than the critical t-statistic of 1.96. This implies that an improvement in data management, decision making, technical support and resource mobilization leads to an improvement in the management of water supply in Murang'a County.

4.7.1 Hypotheses Testing

H_{01}: ***There exist no relationship between data management and management of water supply in Murang'a County, Kenya***

The hypothesis was tested using linear regression and determined using p-value. The acceptance/rejection criteria was that, if the p-value is $p<.05$, then H_{01} is rejected; but if it is $p>.05$, then H_{01} would fail to be rejected. Therefore, the null hypothesis was that there exists no relationship between data management and management of water supply in Murang'a County, Kenya. Results in Table 4.24 show that the $p=.000<.05$. This was supported by a calculated t-statistic which was larger than the critical t-statistic of 1.96. The null hypothesis was therefore rejected. The study adopted the alternative hypothesis that there exists a relationship between data management and management of water supply in Murang'a County, Kenya. The hypothesis results are consistent with the findings of Spaling *et al.* (2014) who observed that ICTs have a potential to contribute towards improvements in water resource management techniques; strengthen the voice of the most

vulnerable within water governance processes; create greater accountability; provide access to locally relevant information needed to reduce risk and vulnerability; and improve networking and knowledge sharing to disseminate good practices and foster multi-stakeholder partnerships, among others.

H_{02}: ***There is no relationship between decision making and management of water supply in Murang'a County, Kenya***

The hypothesis was tested using linear regression and determined using p-value. The acceptance/rejection criteria was that if the p-value is $p<.05$, then H_{02} is rejected but if it is $p>.05$, then H_{02} would fail to be rejected. Therefore, the null hypothesis was that there is no relationship between decision making and management of water supply in Murang'a County, Kenya. Results in Table 4.24 show that the $p=.000<.05$. This was supported by a calculated t-statistic which was larger than the critical t-statistic of 1.96. The null hypothesis was therefore rejected. The study adopted the alternative hypothesis that there exists a relationship between decision making and management of water supply in Murang'a County, Kenya. The hypothesis results are consistent with the findings of Kristan (2013) which indicate that the lack of well-established processes may, ironically, provide significant opportunities for employing collaboration among researchers and decision makers to develop policies and processes that integrate data into making water management decisions and thus prompt increased attention to water demand.

H_{03}: ***There exist no relationship between technical support and management of water supply in Murang'a County, Kenya***

The hypothesis was tested using linear regression and determined using p-value. The acceptance/rejection criteria was that if the p-value is $p<.05$, then H_{03} is rejected; but if it is

p>.05, then H_{03} would fail to be rejected. Therefore, the null hypothesis was that there exists no relationship between technical support and management of water supply in Murang'a County, Kenya. Results in Table 4.24 show that the p=.000<.05. This was supported by a calculated t-statistic which was larger than the critical t-statistic of 1.96. The null hypothesis was therefore rejected. The study adopted the alternative hypothesis that there exists a relationship between technical support and management of water supply in Murang'a County, Kenya. The hypothesis results are consistent with the recommendation made by Hweitzer and Mihelcic (2012) that the community needs to be trained on how to use the taps, springs, hand pumps, among others, and it should also be trained on how to maintain the facilities because the external institutions will not always be available when there are breakdowns.

H_{04}: ***There is no statistically significant relationship between resource mobilization and management of water supply in Murang'a County, Kenya***

The hypothesis was tested using linear regression and determined using p-value. The acceptance/rejection criteria was that, if the p-value is p<.05, then H_{04} is rejected; but if it is p>.05, then H_{04} will fail to be rejected. Therefore, the null hypothesis was that there is no statistically significant relationship between resource mobilization and management of water supply in Murang'a County, Kenya. Results in Table 4.24 show that the p=.000<.05. This was supported by a calculated t-statistic which was larger than the critical t-statistic of 1.96. The null hypothesis was therefore rejected. The study adopted the alternative hypothesis that there exists statistically significant relationship between resource mobilization and management of water supply in Murang'a County, Kenya.

The hypothesis results are consistent with the recommendation made by Dyer *et al*., (2014) that the fundamental goal of resource planning and management is to match the demand for water with the supply (quantity and quality) of the water system through administrative control and management (water regulations/laws and infrastructure) without compromising eco-system sustainability. Since water is a shared common property and water services have some basic investment costs, it is imperative that local communities work together to manage the resources and the attendant services. Resource mobilization is an indicator of a demand-responsive project and can be used to identify a project in which people merely participate. Therefore, communities could engage in civic organizations while donors encourage existing incentives for shared action or co-production of the services.

4.7.2 Moderating Effect of Regulatory Actors

The fifth variable of the study was regulatory actors. The study sought to assess the moderating role of regulatory actors on the relationship between the role of local stakeholders and management of water supply in Murang'a County, Kenya. Multiple regression analysis was conducted between composite variables and management of water supply, which is the dependent variable.

Table 4.25: Model Fitness for the Moderating Effect of Regulatory Actors

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.955a	0.911	0.908	0.16514

a. Predictors: (Constant), RS, RA,RS*RA

ANOVA						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	22.659	3	7.553	276.962	.000[b]
	Residual	2.209	181	0.027		
	Total	24.868	184			

a. Dependent Variable: Water Supply Management

b. Predictors: (Constant), RS, RA, RS*RA

Regression Coefficient						
		Unstandardized Coefficients		**Standardized Coefficients**		
		B	**Std. Error**	**Beta**	**T**	**Sig.**
1	(Constant)	-1.17	0.986		-1.187	0.239
	Role of Stakeholders	0.897	0.249	0.761	3.60	0.001
	Regulatory Actors	0.602	0.258	0.565	2.335	0.022
	Role of Stakeholders*Regulatory Actors	-0.046	0.06	-0.32	-0.763	0.048
a. Dependent Variable: Water Supply Management						

Source: Research Data (2021)

MWS = -1.17 + 0.897RS + 0.602RA-0.046RS*RA

Where

MWS=Management of Water Supply

RS=Role of Local Stakeholders

RA=Regulatory Actors (Moderating Variable)

The R squared was used to check how well the model fitted the data after moderation. The results in Table 4.25 show that the R squared after moderation by regulatory actors was 0.911, which was higher than the non-moderated effect which had its R square being 0.873. This means that regulatory actors moderate the relationship between role of local stakeholders and management of water supply in Murang'a County, Kenya, and this explains 91.1% of the variations in management of water supply in Murang'a County.

The ANOVA results confirm that the regression model of moderating effect of regulatory actors on the relationship between role of local stakeholders and management of water supply in Murang'a County is significant and supported by F=276.962, which is greater than tabulated F-statistic. $F_{(3,181)} = 3.9500$, $p<0.000$ since p-value was 0.000, which is less

than 0.05. The results affirm the importance of regulatory actors in the management of water supply in Murang'a County.

Based on the coefficient results, the role of stakeholders was significant against management of water supply, with P-value=0.001<0.05. The results also show that regulatory actors was significant against the dependent variable (management of water supply) with p-value 0.022<0.05. Finally, the results show that interaction term (the role of local stakeholders and regulatory actors) was significant with P-value=0.048<0.05. This implies that regulatory actors have a moderating effect on the relationship between the role of local stakeholders and management of water supply in Murang'a County, Kenya.

H_{05}: ***The regulatory actors have no moderating effect on the relationship between Role of local stakeholders and management of water supply in Murang'a County, Kenya***.

The hypothesis was tested using linear regression and determined using p-value. The acceptance/rejection criteria was that if the p-value is p<.05, then H_{05} is rejected; but if it is p>.05, then H_{05} will fail to be rejected. Therefore, the null hypothesis was that the regulatory actors have no moderating effect on the relationship between role of local stakeholders and management of water supply in Murang'a County, Kenya. Results in Table 4.25 show that the p=.048<.05. The null hypothesis was therefore rejected. The study adopted the alternative hypothesis that the regulatory actors have moderating effect on the relationship between role of local stakeholders and management of water supply in Murang'a County, Kenya.

4.7.3 Mediating Role of Supporters

The sixth objective of this study was to determine the mediating effect of supporters on the relationship between role of local stakeholders and management of water supply in Murang'a County, Kenya.

The first step in testing for the mediating effect of supporters involved regressing the role of stakeholders on the dependent variable, which is the management of water supply. For this study, multiple regressions were done because the study had four independent variables. In interpreting and understanding the result of regression analysis, R squared was used to check how well the model fitted the data. The coefficient of determination, R^2 was used in this study as a useful tool because it gives the proportion of the variance (of one variable that is predictable from the other variable). The coefficient of determination is such that $0<R^2<100$ and denotes the strength of the linear relationship between independent variables and dependent variable.

Table 4.26: Overall Model Fitness

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.931a	0.866	0.865	0.20016

a. Predictor: (Constant), Role of Local Stakeholders

ANOVA

Model		**Sum Squares**	**ofdf**	**Mean Square**	**F**	**Sig.**
1	Regression	21.543	1	21.543	537.73	.000[b]
	Residual	3.325	183	0.04		
	Total	24.868	184			

a. Dependent Variable: Water Supply Management
b. Predictors: (Constant), Role of Local Stakeholders

Regression Coefficient

Model	Unstandardized Coefficients	Standardized	t	Sig.

		Coefficients				
		B	Std. Error	Beta		
1	(Constant)	-0.261	0.206		-1.269	0.208
	RS	1.097	0.047	0.931	23.189	0.000

a Dependent Variable: Water Supply Management

Source: Research Data (2021)

The regression model therefore became;

MWS = -.261 + 1.097RS

Where:

MWS=Management of water supply

RS =Role of Local Stakeholders

The model fitness results in Table 4.26 show that the role of local stakeholders was a satisfactory variable in explaining management of water supply in Murang'a County. This is supported by coefficient of determination, also described as the R square of 0.866. This means that the role of local stakeholders explains 86.6% of the variations in the dependent variable, which in this case is management of water supply in Murang'a County.

The results indicate that the overall model was statistically significant. Further, the results imply that the role of local stakeholders is a good predictor of management of water supply in Murang'a County. This was supported by an F statistic of 537.73 which is greater than tabulated F-statistic. $F_{(1,183)} = 2.2141$ and the reported p-value (0.000) which was less than the conventional probability of 0.05. It is therefore concluded that the role of local stakeholders had significant effect on the management of water supply in Murang'a County.

Regression coefficient results show that there was a positive and significant relationship between the role of local stakeholders and management of water supply (β =1.097,

p=0.000). This was supported by a calculated t-statistic of 23.189 that is larger than the critical t-statistic of 1.96. This implies that an improvement in the role of local stakeholders leads to an improvement in the management of water supply in Murang'a County.

Step 2: Regression Analysis for Role of Local Stakeholders on Mediating Variable (Supporters)

Regression analysis was conducted to establish the statistical significance of the relationship between the role of local stakeholders and the mediating variable supporters. Wan (2013) observes that regression analysis helps in generating an equation that describes the statistical relationship between one or more predictor variables and the response variable. The coefficient of determination, adjusted R squared, was used in this study as a useful tool because it gives the proportion of the variance of one variable that is predictable from the other variables (Statistics Solutions, 2013). This measure allowed the determination of how the independent variable predicted the mediating variable (supporters) from the study model.

Table 4.27: Regression Model for Predictor Variable on Supporters

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.712a	0.507	0.501	0.40034

a. Predictors: (Constant), Role of Local Stakeholders

ANOVA						
Model		**Sum Squares**	**ofdf**	**Mean Square**	**F**	**Sig.**
1	Regression	13.691	1	13.691	85.427	.000[b]
	Residual	13.302	183	0.16		
	Total	26.994	184			

a. Dependent Variable: Supporters

b. Predictors: (Constant), Role of Local Stakeholders

Regression Coefficient						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	0.574	0.412		1.395	0.167
	RS	0.875	0.095	0.712	9.243	0.000

a Dependent Variable: Supporters

Source: Research Data (2021)

As presented in Table 4.27, the role of local stakeholders was satisfactory in explaining the intervening variable (Supporters). The R coefficient of 0.507 indicated that the role of local stakeholders as the independent factor had a correlation of 50.7 percent with the intervening variable (Supporters). This is supported by coefficient of determination, also described as the Adjusted R square of 0.501. This means 50.1 percent of variations in the intervening variable (Supporters) is influenced by the role of local stakeholders. The remaining 49.9 percent is determined by other factors.

The results in indicate that the model was statistically significant. Further, the results imply that the role of local stakeholders was a good predictor explaining the role of supporters in the management of water supply in Murang'a County. This was supported by an F statistic of 85.427, which is greater than tabulated F-statistic. $F_{(1,183)} = 2.2141$ and the reported $p=.000<.05$ which was less than the conventional probability significance level of $p<.05$ implying that the role of local stakeholders was significant in predicting the intervening variable (Supporters).

Results revealed that the role of local stakeholders was positively and significantly related to the intervening variable (Supporters) ($\beta=0.875$, $p<.000$). The gradient coefficient shows the extent to which a unit change in the independent variable causes a change in the dependent variable, which in this case was the change in role of supporters due to a unit

change in the role of local stakeholders. This implies that a unit change in the role of local stakeholders will cause an improvement in the role of supporters by 0.875units.

Step 3: Regression between Intervening Variable (Supporters) and Dependent Variable

Regression analysis was conducted to establish the statistical significance of the relationship between the intervening variable (Supporters) and the dependent variable (management of water supply).

Table 4.28: Supporters on Management of Water Supply

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.789[a]	.623	.618	.33626
a. Predictors: (Constant), Supporters				

ANOVA						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	15.483	1	15.483	136.930	.000[b]
	Residual	9.385	183	.113		
	Total	24.868	184			
a. Dependent Variable: Water Supply Management						
b. Predictors: (Constant), Supporters						

Regression Coefficient						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	1.184	.284		4.165	.000
	Supporters	.757	.065	.789	11.702	.000
a. Dependent Variable: Water Supply Management						

Source: Research Data (2021)

The mediating variable (Supporters) was found to be satisfactory in explaining the management of water supply. The R coefficient of 0.789 indicated that the supporters had a correlation of 78.9 percent with the dependent variable (management of water supply). This is supported by the coefficient of determination, also described as the adjusted R square of 0.623, holding constant any effects of other variables. This means that supporters

explain 62.3 percent of the variations in management of water supply. The remaining 37.7 percent is determined by other factors. Table 4.28 provides the analysis of the variance (ANOVA) results of supporters on management of water supply.

The results indicate that the model was statistically significant. Further, the results imply that intervening variable (Supporters) is a good predictor in explaining mediation for management of water supply in Murang'a County. This was supported by an F statistic of 136.930 which is greater than tabulated F-statistic $F_{(1,183)} = 2.2141$ and the reported p<=000 which was less than the conventional probability significance level of p<.05 implying that the intervening variable (Supporters) had a significant mediating effect on the management of water supply in Murang'a County.

Results revealed that supporters positively and significantly influenced management of water supply (β=0.757, p<.000). The gradient coefficient shows the extent to which a unit change in the independent/intervening variable causes a change in the dependent variable which in this case is the change in management of water supply in Murang'a County due to a unit change in the intervening variable (Supporters). This implies that a unit change in the role of supporters will lead to an improvement in management of water supply in Murang'a County by 0.757 units.

Step 4: Regression for Predictor Variable and Supporters on Management of Water Supply

Regression analysis was conducted to establish the coefficient of the joint effect on the role of local stakeholders and supporters on management of water supply in Murang'a County. Regression analysis helps in generating an equation that describes the statistical relationship between one or more predictor variables and the outcome variable, Wan

(2013). Multiple regression analysis was therefore conducted to ascertain the effect of the study variable plus the intervening variable (Supporters) on management of water supply. In interpreting and understanding the result of multiple regression analysis, Adjusted R squared was used to check how well the model fitted the data. The coefficient of determination, Adjusted R squared was used in this study as a useful tool because it gives the proportion of the variance of one variable that is predictable from the other variables. This measure allowed the determination of how thr role of local stakeholders and supporters jointly made predictions to the management of water supply from the study model.

Table: 4.29: Predictor Variable and Supporters on Management of Water Supply

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.948a	0.899	0.896	0.17536

a. Predictors: (Constant), Supporters, Role of Local Stakeholders

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.346	2	11.173	363.346	.000[b]
	Residual	2.522	182	0.031		
	Total	24.868	184			

a. Dependent Variable: Water Supply Management
b. Predictors: (Constant), Supporters, Role of Local Stakeholders

Regression Coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0.402	0.182		-2.206	0.030
	RS	0.882	0.059	0.748	14.94	0.000
	Supporters	0.246	0.048	0.256	5.112	0.000

a Dependent Variable: Water Supply Management

Source: Research Data (2021)

Based on the results in Table 4.29, the R coefficient of 0.899 indicated that the role of local stakeholders and supporters as the joint independent factors had a correlation of 89.9 percent with the dependent variable. The Adjusted R squared after introducing the intervening variable is 0.896, which is higher than the Adjusted R squared before introducing the intervening variable (Supporters) whose Adjusted R squared was 0.867 shown in Table 4.30. This means that introducing intervening variable, Supporters, had an improved positive significant joint effect on the relationship between the independent variable and the management of water supply, resulting to a sharp increase of Adjusted R squared from 87.3 percent to 89.9 percent of the variations in management of water supply, known as the total effects. The remaining 10.1 percent of the total variations on management of water supply, referred to as coefficients of alienation, are accounted for by other variables not explained in the study.

The results indicated that the overall model was statistically significant, where F =363.346 which is greater than tabulated F-statistic $F_{(2,182)} = 3.2245$, $p<0.05$, $R^2=.89.9$. Further, the results imply that Supporters and the role of local stakeholders provide a better fit when it comes to predicting management of water supply than the intercept-only model. This implies that supporters had a strong mediation effect on the relationship between the role of local stakeholders and the management of water supply in Murang'a County.

Results revealed that when the intervening variable (Supporters) was included, the role of local stakeholders was positively and significantly related to the management of water supply. Role of local stakeholders was found to positively and significantly influence management of water supply ($\beta=0.882$, $p=.000$). Finally, the results show that the intervening variable (Supporters) positively and significantly influenced management of

water supply (β=0.246, p=.000). The gradient coefficient shows the extent to which a unit change in the independent or intervening variable causes a change on the dependent variable which in this case is the change in management of water supply due to a unit change in the role of local stakeholders and supporters. These results are consistent with the findings of Greaves and Simons (2011) which revealed that without an enabling environment and some form of support, community engagement does not automatically lead to sustainable projects and programs. Increasingly, the idealistic view of assumed gains through preliminary community engagement has been challenged by actual observations in the field.

4.7.4 Role of Supporters on Management of Water Supply

Intervention or mediation is a hypothesized causative sequence where the first variable affects a second variable which in turn affects a third variable (Kenny, 2014). The study investigated the nature of mediation effect of supporters on the relationship between the role of local stakeholders and management of water supply in Murang' County. This was to ascertain whether supporters had full or partial mediation using a four-step method where several regression analyses were run and significance of the Beta coefficients tested through the four steps (MacKinnon *et al*., 2007; Kenny, 2014 in Namazi & Namazi, 2016). First, Management of Water Supply was regressed on the predictor variable and results confirmed that the role of local stakeholders was significantly related with management of water supply. This was followed by intervening variable (Supporters) being regressed on predictor variable, and it was confirmed that the role of local stakeholders was significantly related with the intervening variable (Supporters). Management of Water Supply was then regressed on the intervening variable (Supporters) and results revealed that the intervening

variable was significantly related with management of water supply. Finally, management of water supply was then regressed on the independent variable while controlling for Supporters to test if the relationship between the independent variable and dependent variable is zero. Results confirmed that the relationship between the role of local stakeholders and the dependent variable got stronger than in the first step. This means that the last step's condition was not met, so thus findings supported partial mediation.

H_{06}: ***There is no mediating role of supporters on the management of water supply in Murang'a County, Kenya.***

This hypothesis was tested using the multiple linear regression results in Table 4.30 and tested for mediation in Table 4.29 which was supported using t-statistic and p-values. The acceptance/rejection criteria was that if the p value is $p<.05$, then H_{06} is rejected; but if it is $p>.05$, then H_{06} will fail to be rejected. The null hypothesis was that there is no mediating role of supporters on the management of water supply in Murang'a County, Kenya. Results in Table 4.36 show that the p-value for the intervening variable (Supporters) was $p<.05$ significance level for normally distributed data and the corresponding calculated t-statistics of 5.112 was greater than the critical t-statistic of 1.96. The null hypothesis was therefore rejected and results revealed that supporters had a mediating role on the management of water supply in Murang'a County, Kenya.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The aim of this study was to establish the role of local stakeholders in the management of water supply in Murang'a County, Kenya. This study was guided by six specific objectives: to determine the role of data management on the management of water supply in Murang'a County, Kenya; to establish the role of decision making on the management of water supply in Murang'a County, Kenya; to establish the role of technical support on the management of water supply in Murang'a County, Kenya; to assess the role of resource mobilization on the management of water supply in Murang'a County, Kenya; to assess the moderating role of regulatory actors on the relationship between local stakeholders and management of water supply in Murang'a County, Kenya; and to establish the mediating role of supporters on the management of water supply in Murang'a County, Kenya. This chapter gives accounts of the conclusions and recommendations based on the outcomes of the study and recommends areas for further research.

5.2 Summary of Findings

The first objective of the study was to determine the role of data management on the management of water supply in Murang'a County, Kenya. The results of descriptive statistics revealed that majority of the respondents indicated that the aspects of data management, which included auditing, accounting, information dissemination and stock management, did not have any effect on the management of water supply in Murang'a County. The descriptive statistics on data management further revealed that most of the

respondents disagreed with the statements regarding the effect of data management on the management of water supply in Murang'a County.

The correlation analysis results revealed that there was positive and significant association between data management and management of water supply in Murang'a County. The result implies that data management influences management of water supply in Murang'a County positively. The results were found to be consistent with the findings of Cook *et al.*, (2016) which indicated that through data management, communities get control over their systems and make decisions in line with the organization of the management. They also noted that stakeholders often work in partnership with external agencies, such that they both provide resources that can be used in the most effective manner to develop reliable and sustainable systems.

The study in addition conducted regression analysis to establish the statistical significance of the relationship between data management and the management of water supply in Murang'a County. The findings were that data management positively and significantly influenced the management of water supply in Murang'a County. The regression analysis results revealed R square of 0.708, meaning that data management explains 70.8 percent of the variations in management of water supply in Murang'a County. The results meant that data management is an important aspect in the management of water supply in Murang'a County and any improvement in data management will result in an improvement in the management of water supply in Murang'a County.

Hypothesis was tested to show the influence of data management on the management of water supply in the county of Murang'a. The null hypothesis was that there exists no relationship between data management and management of water supply in Murang'a

County, Kenya. Since the p-value was found to be less than .05, the null hypothesis was rejected; hence the alternative hypothesis was adopted that there exists a relationship between data management and management of water supply in Murang'a County, Kenya. The hypothesis results affirmed the findings of Spaling *et al.* (2014) which indicate that ICTs have a potential to contribute towards improvement in water resource management techniques; strengthen the voice of the most vulnerable within water governance processes; create greater accountability; provide access to locally relevant information needed to reduce risk and vulnerability; and improve networking and knowledge sharing to disseminate good practices while fostering multi-stakeholder partnerships, among other benefits.

The second objective of the study was to establish the role of decision making on the management of water supply in Murang'a County, Kenya. Based on the findings of this study, water agencies face tough decisions on how much water infrastructure to build in order to reliably meet demand for high quality water while minimizing costs for the local stakeholders in Murang'a County. The challenge of balancing the trade-off between shortage risk, cost and environmental protection is compounded by several critical uncertainties. The results of the descriptive statistics revealed discontent among most of the respondents who believed the indicators of decision making were not effective in the management of water supply in Murang'a County. The respondents were asked to indicate their level of agreement with the statements on decision making and how they influenced the management of water supply in Murang'a County. Based on the findings, majority of the respondents disagreed with all the statements informing the variable Decision Making.

The study conducted correlation analysis to establish the statistical significance of the association between decision making and management of water supply in Murang'a County. The findings revealed that the variable Decision Making had a strong positive and significant association with management of water supply in Murang'a County. The correlation analysis results were found to be consistent with the findings of Trenberth (2010) which showed that greater knowledge about climate system with respect to important relationships and feedbacks and the use of empirical data to initialize system conditions may have the paradoxical effect of increasing, not decreasing, uncertainty for certain system parameters and dynamics, which is problematic for decision makers. While data are a crucial ingredient for enabling effective decision making in so far as management of water supply is concerned, providing data does not in and of itself ensure that data can or will be effectively utilized for better water management. The form, accessibility and usability of data provided can make the difference between an invaluable resource and a stranded asset. To be useful for decision making, data must be open, transparent and relevant to the needs of decision makers.

The study further conducted regression analysis to establish the relationship between decision making as an independent variable and management of water supply in Murang'a County. The findings revealed that decision making was satisfactory in explaining management of water supply in Murang'a County. The results revealed a coefficient of determination, also described as the R square of 0.584, which meant that decision making explains 58.4 percent of the variations in management of water supply in Murang'a County. The regression coefficient results revealed that decision making was positively and significantly related to Management of Water Supply. This implies that a unit change

in decision making will lead to an improvement in management of water supply by 0.812 units. These regression analysis results concurs with the findings of a study by Mala and Komlan (2015) which indicated that uncertainty quantification is seen as a strategy to produce risk based assessments and thus facilitate informed decision making.

Hypothesis was tested to establish the influence of decision making on the management of water supply in Murang'a County. The study tested the null hypothesis which stated that there is no relationship between decision making and management of water supply in Murang'a County, Kenya. Based on the findings, p-value was found to be less than .05 and therefore the study rejected the null hypothesis and adopted the alternative hypothesis that there exists a relationship between decision making and management of water supply in Murang'a County, Kenya. The hypothesis results concurred with the findings of Kristan (2013) which showed that the lack of well-established processes may, ironically, provide significant opportunities for employing collaboration among researchers and decision makers to develop policies and processes that integrate data into making water management decisions and thus prompt increased attention to water demand.

The third objective for this study was to establish the role of technical support on the management of water supply in Murang'a County, Kenya. The first part analyzed the descriptive statistics on indicators of technical support. The results of the descriptive statistics revealed that most of the respondents did not believe that the aspects of technical support affected the management of water supply in Murang'a County. According to most of the respondents, technical support was affecting the management of water supply in the county to a very low degree. Majority of the respondents indicated that technical support

did not have any effect on the management of water supply in Murang'a County. Most of the respondents also disagreed with the statements on technical support.

The study conducted correlation analysis to establish the statistical significance of the association between technical support and management of water supply in Murang'a County. The correlation analysis results revealed that the variable Technical Support had a strong positive and significant association with Management of water supply in Murang'a County. The result implies that technical support influences management of water supply in Murang'a County positively. These correlation analysis results were found to be consistent with the assertion by Wendling, Radisch and Jacobzone (2013) which show that many projects had failed because the users were not involved in the provision of technical support. In some cases fashionable choices were made for some communities that lacked the potential of maintaining the technological option chosen for them.

Regression analysis was conducted to determine the influence of technical support on the management of water supply in Murang'a County. The findings revealed that technical support was satisfactory in explaining management of water supply in Murang'a County. This was affirmed by R square of 0.769 which indicated that technical support explains 76.9 percent of the variations in management of water supply in Murang'a County. In addition, positive and significant relationship was established between technical support and management of Water Supply in Murang'a. The regression analysis results were a corroboration of recommendation by Acheampong *et al.,* (2016) that technology should not be predetermined in any rural water supply programme; rather, the final choice of technology should be made by the community from a range of feasible options.

Communities need to be encouraged to select feasible options rather than fashionable options.

Hypothesis was also tested to establish the influence of technical support on the management of water supply. The null hypothesis was that there exists no relationship between technical support and management of water supply in Murang'a County, Kenya. Based on the findings, the null hypothesis was therefore rejected and alternative hypothesis adopted: that there exists a relationship between technical support and management of water supply in Murang'a County, Kenya. The hypothesis results are consistent with the recommendation made by Hweitzer and Mihelcic (2012) that the community need to be trained on how to use the taps, springs, hand pumps, among others, and it should also be trained on how to maintain the facilities because the external institutions will not always be available in case of breakdowns.

The fourth objective for this study was to assess the role of resource mobilization on the management of water supply in Murang'a County, Kenya. Based on the descriptive statistics findings, all the aspects of resource mobilization which included planning the money or finances for water supply, capability to protect the water resources and capacity to generate revenue through water supply services were found to have insignificant effect on the management of water supply in Murang'a County. The results of the descriptive statistics further revealed that most of the respondents were in disagreement with the statements on resource mobilization which were that the community in Murang'a County was contributing towards water supply management through cash and provision of labour. The results revealed that the local community was not being involved in resource mobilization to match the demand with the supply of water. In addition, the study found

out that the water agencies collaborated with the community in sourcing for civic organizations and donors to encourage existing incentives for shared action or co-production of water services. However, this was low level collaboration. Finally, the descriptive analysis results revealed that the level of willingness of users to provide the necessary resources for keeping the water system functioning affected the level of sustainability of water supply in Murang'a County.

The study in addition conducted correlation analysis to establish the statistical significance of the association between resource mobilization and management of water supply in Murang'a County, and the results revealed that the variable Resource Mobilization had a strong positive and significant association with Management of Water Supply in Murang'a County. The result implies that resource mobilization influences management of water supply in Murang'a County positively. The results were consistent with the assertion by Dyer *et al.,* (2014) that resource mobilization is an indicator of a demand-responsive project and can be used to distinguish a project in which people merely participate. Therefore, communities could engage in civic organizations while donors encourage existing incentives for shared action or co-production of the services.

The study further conducted regression analysis to determine the influence of Resource Mobilization on management of water supply in Murang'a County. The results revealed that resource mobilization was satisfactory in explaining management of water supply in Murang'a County. The results had R square value of 0.725, which implies that Resource Mobilization explains 72.5 percent of the variation in the management of water supply in Murang'a County. The findings further revealed that Resource Mobilization was positively and significantly related to Management of Water Supply. This implies that a unit change

in Resource Mobilization will lead to an improvement in Management of Water Supply by 0.878 units. These regression analysis results are in agreement with the conclusion made by Ohiani and Oni (2010) that many of the efforts to strengthen sustainability of community water projects are mainly directed towards the willingness to pay. Willingness to pay can be described as the decision taken under a situation of free choice to spend some of the available resources on a service or good.

Null hypothesis that there is no statistically significant relationship between resource mobilization and management of water supply in Murang'a County, Kenya, was tested. The acceptance/rejection criteria was that if the p-value is $p<.05$, then H_{04} is rejected; but if it is $p>.05$, then H_{04} will fail to be rejected. The regression results revealed that the p-value was less than .05 and therefore null hypothesis was rejected and alternative hypothesis that there exists statistically significant relationship between resource mobilization and the management of water supply in Murang'a County, Kenya, was adopted. The hypothesis results were found to be consistent with the conclusion made by Dyer *et al*., (2014) that the fundamental goal of resource planning and management is to match the demand for water by the socio economic system with the supply (quantity and quality) of the water system through administrative control and management (water regulations/laws and infrastructure) without compromising eco-system sustainability.

The fifth objective of the study was to assess the moderating role of regulatory actors on the relationship between role of local stakeholders and management of water supply in Murang'a County, Kenya. Results of the descriptive statistics revealed that all the indicators of institution and regulatory actors which included Advocacy agencies (e.g. World Bank, FAO), Advocacy agencies (e.g. World Bank, FAO), National Government

Policies, Water services regulatory board (WASRB) and National Environment Management Authority (NEMA), affected the management of water supply in Murang'a County to a little or to no extent. The findings indicated that good governance emphasizes the role of institutions as entities that are largely viewed as being 'up there' and at least currently, insufficiently within the reach of ordinary citizens. As such, this view of governance seems concerned primarily with minimizing bureaucratization and hierarchy.

The correlation results on regulatory actors and management of water supply revealed that the variable regulatory actors had a strong positive and significant association with management of water supply in Murang'a County. The result implies that regulatory actors had positive influence on management of water supply in Murang'a County. The results are consistent with the assertion by Tukahirwa, Mol and Oosterveer (2013) that governance for sustainability has certain key features and components which include policy integration, shared sustainability objectives, criteria, trade-off rules and indicators, information and incentives for practical implementation, programmes for system innovation.

Moderating role of regulatory actors on the relationship between the role of local stakeholders and management of water supply in Murang'a County, Kenya, was tested and the results revealed that the R squared after moderation by regulatory actors was 0.911 which was higher than the non-moderated effect whose R squared is 0.873. The conclusion was therefore that regulatory actors moderate the relationship between the role of local stakeholders and management of water supply in Murang'a County, Kenya and explain 91.1% of the variations in the management of water supply in Murang'a County.

In addition, the moderation results revealed that Regulatory Actors was significant against the dependent variable (Management of Water Supply) with p-value 0.022<0.05. Additionally, the results showed that the role of local stakeholders was significant after moderation. This implies that regulatory actors had a moderating effect on the relationship between the role of local stakeholders and management of water supply in Murang'a County, Kenya. Finally, null hypothesis that the regulatory actors have no moderating effect on the relationship between the role of local stakeholders and management of water supply in Murang'a County, Kenya, was tested. The study rejected the null hypothesis and adopted the alternative hypothesis that the regulatory actors have moderating effect on the relationship between the role of local stakeholders and the management of water supply in Murang'a County, Kenya, was adopted.

The sixth objective of the study was to establish the mediating role of supporters on the management of water supply in Murang'a County, Kenya. The results of the descriptive statistics revealed that majority of the respondents believed Sponsorship Associations (e.g. JICA) affected management of water supply in Murang'a County to a very great extent. The findings also revealed that 83.50% of the respondents believed water management organizations (e.g. MUWASCO) affected management of water supply in Murang'a County to a little or no extent. Also, according to the findings, majority of the respondents indicated that Non-Governmental Organizations had little or no effect on the management of water supply in Murang'a County. The descriptive statistics further indicated that most of the respondents were not confident about the fact that private partners were playing a great role in the management of water supply in Murang'a County.

In addition to descriptive statistics, the study conducted correlation analysis to evaluate the mediating role of supporters on the management of water supply in Murang'a County, Kenya. The findings revealed that the mediating variable supporters had a strong positive and significant association with management of water supply in Murang'a County. The findings were found to be consistent with those Ananga (2015) which showed that quality social relations provide a social support safety net and enable benefitting members to collectively resolve their common problems while achieving mutual benefits. Ananga (2015) pointed out further that local people are directly affected and most motivated to seek solutions to their own water and sanitation issues and are generally motivated toward broad inclusion in decision-making. Sponsors and advocacy organizations are organized at local, national and international level and under a diversity of peer groups, ranging from professional background, religious or political affiliation, ethnicity or nationality, to thematic face and interest groups.

Finally, the study investigated the mediation effect of Supporters on the relationship between the Predictor variables and Management of Water Supply in Murang' County. This was to ascertain whether Supporters had full or partial mediation using a four-step method where several regression analyses were run and significance of the Beta coefficients tested through the four steps (MacKinnon *et al*., 2007; Kenny, 2014 in Namazi & Namazi, 2016).

First, Management of water supply was regressed on the Predictor variable and results confirmed that the role of local stakeholders was significantly related with management of water supply. This was followed by intervening variable (Supporters) being regressed on Predictor variable, and it was confirmed that the role of local stakeholders was

significantly related with the intervening variable (Supporters). Management of Water Supply was then regressed on intervening variable (Supporters) and results revealed that the intervening variable was significantly related with Management of Water Supply. Finally, Management of Water Supply was regressed on the independent variable while controlling for Supporters to test whether the relationship between the independent variable and dependent variable is zero. Results confirmed that the relationship between the role of local stakeholders and dependent variable got stronger than in Step 1, thus supporting partial mediation.

5.3 Conclusion

Based on the findings, this study makes a number of conclusions that are done according to the objective.

The findings revealed that most of the respondents believed the indicators of data management had little or no effect on the management of water supply in Murang'a County. This study therefore concludes that all the aspects of data management, such as auditing, inspection of financial records, accounting, information dissemination and stock management, are not important aspects to consider for effective management of water supply in Murang'a County. The study also concludes that through data management, the local communities in Murang'a County are able to exercise control over their systems and make decisions in line with the organization of the management of water supply in the County. The study, in addition, concludes that local stakeholders in Murang'a County often work in partnership with external agencies such that they both provide resources that can be used in the most effective manner to develop reliable and sustainable water management systems in Murang'a County.

The correlation analysis results revealed that there was positive and significant association between data management and management of water supply in Murang'a County. The study hence concludes that data management is an important variable in the management of water supply in Murang'a County. This study in addition concludes that proper training, capacity building, construction supervision and providing support to the local community owned management on data management is key in ensuring there is proper management of water supply in the county of Murang'a. This is important because it ensures long term functionality of water points.

Regression analysis results between data management and management of water supply revealed a positive and significant relationship. This study hence concludes that proper training of the local stakeholders on the different aspects of data management will help in the improvement of management of water supply in the county of Murang'a.

Based on the findings, it suffices to conclude further that data exchange greatly enhances the shared and sustainable management of water resources and, in times of flood threat, improves the capability of the local stakeholders to provide much required flood forecasting and warning services. In so doing, the local stakeholders will ensure proper management of water supply in Murang'a County so that the community gets constant supply of clean, reliable and affordable water.

The second objective of the study was to establish the role of decision making on the management of water supply in Murang'a County, Kenya. Based on the findings of this study, makes a number of conclusions. First, Decision making in water supply management requires the availability of accurate scientific information needed in the management. However, involvement of local stakeholders in Murang'a in matters of

decision making is still a challenging affair since most of the local community members still felt they are properly involved in making decisions which have to do with the management of water supply in the county. In addition, this study concludes that all the aspects of decision making used in this study, which included identification of water issues, prioritization of set goals/objectives, monitoring and assessment of water projects and proposal of alternative solutions consultations on water projects to be initiated, affect the management of water supply in Murang'a County to a great extent.

Correlation analysis results revealed a positive and significant association between decision making and management of water supply. This study therefore concludes that decision making is an important part in the management of water supply and therefore there is need for the local stakeholders and the local communities and beneficiaries of water services in Murang'a County to be involved in decision making. The study concludes that due to the complexity of the water management system and the necessary planning, there is a great need for intensive participation of stakeholders and integration of various disciplines in the decision-making process so as to achieve successful management of water supply in Murag'a County. Finally the study concludes that there exists a positive and significant relationship between decision making and management of water supply in Murang' County.

The third objective for this study was to establish the role of technical support on the management of water supply in Murang'a County, Kenya. This study concludes that the important considerations and aspects when it comes to technical support in the management of water supply include the extent of technical support, use of solar power in pumping water, use of modern purification systems, use of modern water storage facilities,

leakage detections, maintenance and repairs, water infrastructure upgrading, and training and workshops for the technical support team. These aspects were found to affect the management of water supply in Murang'a County to a great extent. This study also concludes that the local community in Murang'a County supports the work of the water agencies in the county through provision of standardized equipment facilitates to ensure sustainability of water supply. In addition, local community in Murang'a County collaborates with various water management agencies and other stakeholders and are fully involved in their responsibility of maintenance and repairs of water supply systems so as to ensure effective management of water supply in the county.

The study further concludes that there exists a positive and significant association and relationship between technical support and the management of water supply in Murang'a County. This means that an improvement in the aspects of technical support will boost the management of water supply in Murang'a County and this will ensure that the local community are able to access clean water. This study further concludes that, even when responsibility for maintenance and repairs is clearly defined and accepted and funds and technical skills are available, neither routine maintenance nor repairs will be done promptly unless the necessary tools and spare parts are available at the local level and at affordable prices.

The fourth objective of this study was to assess the role of resource mobilization on the management of water supply in Murang'a County, Kenya. Based on the findings, the study concludes that resource mobilization is important in the management of water supply. The important aspects of resource mobilization include planning the money or finances for

water supply, capability to protect the water resources and capacity to generate revenue through water supply services.

Based on the findings, the study concludes that resource mobilization positively and significantly influences management of water supply in Muran'ga County. This means that an improvement in resource mobilization leads to significant improvement in management of water supply significantly. The study further concludes that the local community in Murang'a County supports the work of water agencies in the county through provision of standardized equipment to ensure sustainability of water supply. In addition, local community in collaboration with other agencies are fully involved in the responsibility of maintenance and repairs of water supply systems in Murang'a County. Finally, it is concluded that the stakeholders and water agencies in Murang'a County help in training the local community on how to use the taps, springs and hand pumps to enhance management of water supply

The fifth objective of the study was to assess the moderating role of regulatory actors on the relationship between local stakeholders and management of water supply in Murang'a County, Kenya. Based on the results of the descriptive statistics, this study concludes that advocacy agencies (e.g. World Bank, FAO), National Government Policies, Water services regulatory board (WASRB) and National Environment Management Authority (NEMA) play an important role in the management of water supply in Murang'a County.

In addition, the study concludes that regulatory actors have a strong positive and significant association with management of water supply in Murang'a County. Further, it was established that regulatory actors positively and significantly influenced the relationship between the study variables and the management of water supply in Murang'a

County. Based on the findings, it suffices to conclude that proper and successful sustainability of water management in Murang'a County also calls for policy integration, shared sustainability objectives, criteria, trade-off rules and indicators, information and incentives for practical implementation, programmes for system innovation. Finally, the study concludes that regulatory actors and institutions have moderating effect on the relationship between stakeholders and the management of water supply in Murang'a County.

The sixth objective of the study was to establish the mediating role of supporters on the management of water supply in Murang'a County, Kenya. Based on the results of the descriptive statistics, it was established that majority of the respondents believed that the role of Sponsorship Associations (e.g. JICA) affected management of water supply in Murang'a County to a very great extent. Water management organizations (e.g. MUWASCO) were found to affect management of water supply in Murang'a County to a large extent. This study further concludes that Non-Governmental Organizations affect the management of water supply in Murang'a County to a large extent, and this makes them an integral part in the management of water supply in Murang'a County.

The results of the descriptive statistics revealed that the mediating variable Supporters had a strong positive and significant association with Management of Water Supply in Murang'a County. The study hence concludes that the quality social relations provides a safety net and enables beneficiaries to collectively resolve their common problems and thus achieve mutual benefits. Local people are directly affected and the most zealous when it comes to seeking solutions to their own water and sanitation issues, and they are in favour of broad inclusion in decision-making. Sponsors and advocacy organizations are

organized at local, national and international level and in a diversity of peer groups, ranging from professional background, religious or political affiliation, ethnicity or nationality, to thematic face and interest groups. Finally, mediation was tested using a four-step method where several regression analyses were run and significance of the Beta coefficients tested. Based on the findings, the study concludes that the intervening variable Supporters support partial mediation in the management of water supply in Murang'a County.

5.4 Contributions of the Study to Knowledge

This study sought to establish the role of local stakeholders in the management of water supply in Murang'a County, Kenya. The findings of this study will be beneficial to stakeholders involved in water supply management. The previous studies tested direct relationship between the role of local stakeholders and management of water supply. This study, however, tested for both mediating and moderating role on the relationship between the role of local stakeholders and management of water supply. This will add to the existing body of knowledge in this field.

Additionally, this study contributes to Stakeholder Theory, which states that the first possible approach to take into consideration of the external influences of a firm is to imagine all the groups and individuals that could affect a firm's objectives or be affected by them.. Stakeholder Theory promotes a practical, efficient, effective, and ethical way to manage organizations in a highly complex and turbulent environment. It is a practical theory because all firms have to manage stakeholders; whether they are good at managing them is another issue. This study dealt with the management of stakeholders in the management of water supply in Murang'a County hence contributes to the theory.

This study also contributes to Cognitive Engagement Theory that whose central argument is that participation depends on the citizens having access to information about politics and government, and their desire to use that information in decision making. It is the increase in the levels of education that helps citizens to acquire and process large amounts of information. Education provides skills in many areas, like the area of technology, while at the same time increasing the individual's ability to analyze it further making the informed citizen to be a "critical citizen". However, education also makes citizens' dissatisfaction with the state to manifest in forms of unconventional participation, such as protests.

5.5 Recommendations for Policy Application

This study aimed at establishing the role of local stakeholders in the management of water supply in Murang'a County, Kenya. Based on the findings and conclusions, this study made a number of recommendations.

This study found out that data management was an important variable in the management of water supply in Murang'a County. The study therefore recommends that the stakeholders in the water management process adopt the latest technology in the management of water supply in Murang'a County. This is because an improvement in data management through modern technology, will lead to an improvement in the management of water supply. In addition, it is recommended that the stakeholders in the management of water in Murang'a County should strive to involve the local community and beneficiaries of water services in decision making in every stage of the management of water supply in the county.

In addition, the stakeholders should put in place the necessary technical support system which will ensure the local community are able to maintain the water equipments, such as

pipes, taps and many others, in case of breakdown. Finally, the study recommends that the stakeholders should mobilize resources since resources were found to affect the management of water supply positively and significantly. Further, it is recommended that the stakeholders should involve the expertise of regulatory actors and other relevant institutions since they were found to have a moderating effect on the management of water supply in Murang'a County.

The national government of Kenya and the county government of Murang'a should put in place proper measures that will guide the use of water in Murang'a County and in Kenya as a whole. The government should use the findings of this study to plan for the future water needs by ensuring full implementation of the recommendations relating to different aspects of the management of water supply. The study also recommends that the agencies and government bodies in charge of water management be involved in the provision of the knowledge necessary to meet the national water goals as efficiently as possible. The other recommendations that the study makes are: the government should develop methods for conserving and augmenting the quantity of water available; the government should perfect techniques for controlling water to minimize erosion, flood damage, and other adverse effects in the country; and the government should develop methods for managing and controlling pollution to protect the water resource so as to improve the quality of the water that comes from there.

5.6 Recommendation for Further Research

This study aimed at establishing the role of local stakeholders in the management of water supply in Murang'a County, Kenya. It used data management, decision making, technical support, resource mobilization, regulatory actors and supporters as the study variables. It is

therefore recommended that future researchers should use other variables other than those used in the current study in assessing the management of water supply and compare the findings with those of the current study. This study was conducted in Murang'a County, and a similar study should be conducted in different counties so that the results obtained can be compared.

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APPENDICES

APPENDIX I: RESEARCH QUESTIONNAIRE FOR MANAGEMENT STAFF

My name is Charles Munene Njagi. I am a Ph.D. student pursuing a Degree in Public Policy and Management at Kenyatta University. I'm carrying out a study on "**Role of local stakeholders in management of water supply in Murang'a County, Kenya".** I kindly request your assistance by providing accurate and truthful answers to the items in this questionnaire. Any information you provide will be treated with the utmost confidentiality and will in no way be divulged to a third party. Do not indicate your name or the name of your institution in this questionnaire. The information you provide may be useful in policy formulation but it is devoid of any administrative value. Thank you.

Part I: Background Information

Please tick (√) in the provided spaces

1. Identify your gender:

   Male [ ] Female [ ]

2. What is your age bracket?

   25 years or less [ ] 26-30 [ ] 31-35 [ ]
   36-40 [ ] 41-45 [ ] 46 – 50 [ ]
   51 years and above [ ]

3. In which category do you fall as a respondent?

   County Government officials [ ] Staff in water supply organization [ ]
   National official from the Ministry of Water [ ]
   Other: ……..

4. Indicate your highest academic qualification?

   PhD. Degree [ ] Master's Degree [ ]
   Bachelor's Degree [ ] College Certificate or Diploma [ ]
   Secondary Certificate (KCSE) [ ] Primary Certificate (KCPE) [ ]
   Not academic qualification: ……..

1. Please indicate your work experience in the County of Murang'a.

   0-5 years [ ] 6-10 years [ ]
   11- 15 years [ ] 16-20 years [ ]

Above 20 [ ]

6. For how long have you been residing in Murang'a County?

0-5 years [ ] 6-10 years [ ]

11- 15 years [ ] 16-20 years [ ]

Above 20 [ ]

Part II: Local Community and Management of Water Supply

In this section, use a key of 1 to 5 such that; 1 = Strongly Agree (SA); 2 = Agree (A); 3= Undecided (U); 4=Disagree (D); 5= Strongly Disagree (SD).

Section A: Local Community Engagement

Local community' engagement refers to the various aspects of involving the community to take part in management of water supply activities.

2. Kindly indicate your level of agreement or disagreement with the statement in the table below.

Statement	**1**	**2**	**3**	**4**	**5**
Our involvement of the local community has enhanced water supply in Murang'a County to a great extent					

3. How often do you call for consultative meeting forums with communities in the area of operation?

Aspects of Local Community Engagement	**weekly**	**Monthly**	**Quarterly**	**Semi-Annually**	**Annually**
Educating the community on aspects of water management					
Engaging the community in public forums on matters of water supply management					
Sensitization of the community on the importance of water supply management					

4. What is your level of agreement with the following statements on effects of local community engagement on management of water supply in Murang'a County?

Statements on effects of local community engagement	**1**	**2**	**3**	**4**	**5**
Citizens' involvement enhances management of water supply enhances the facilitation of the same					

Local community generates new ideas that enhances management water supply					
Community enhances relationship between the community and external actors such as funders and donors					
Citizen roles create opportunity for appropriate management of water supply					
Engaging the community has resulted in improved delivery of water services					

5. Please outline the major challenges you face in your work in an attempt to engage the local community in management of water supply in Murang'a County?

   ……

   ……..

Section B: Data Management

Data management is used in this study to refer to the role of information handling, management and presentation for easier access and utilization in management of water supply.

6. Kindly indicate your level of agreement or disagreement with the statement in the table below.

Statement	**1**	**2**	**3**	**4**	**5**
Data management has affected the management of water supply in Murang'a County to a great extent.					

7. Please indicate your level of agreement/disagreenemnt with the following aspects of information management.

Aspects of data management	**1**	**2**	**3**	**4**	**5**
Auditing affects the management of water supply in Murang'a County significantly.					
Accounting affects the management of water supply in Murang'a County to a great extent.					
Information dissemination affects the management of water supply in Murang'a County to a great extent.					
Stock management affects the management of water supply in Murang'a County significantly.					

8. Kindly indicate your level of agreement with the following statements on information management and management of water supply in Murang'a County.

Statements on Information Management and Management of Water Supply	**1**	**2**	**3**	**4**	**5**

Community engagement in the management of information on water supply leads to improvement of reliability in management of water supply					
Effective Communication leads to increased lowering of costs involved in water supply					
Through water interaction forums, local community get control over water supply and make decisions in line with the organization of water issues					
ICT skills in water management has helped us strengthen the local community's capability to manage water supply in Murang'a					
It has been easy for the community to integrate the use of ICT in ensuring sustainability of water supply in Murang'a County					

9. What challenges/difficulties do you face in your attempt to enhance data management to facilitate local community' role in management of water supply in his County?

   ……

   ……..

Section C: Decision Making

Decision making is utilized in this study to imply the various forms and magnitude of involvement of local community in formulating decisions and policies aimed at enhancing management of water supply endeavors.

10. Kindly indicate your level of agreement/disagreement with the following statement regarding the effect of decision making on management of water supply in Muran'ga County.

Statement	**1**	**2**	**3**	**4**	**5**
Decision making affect the management of water supply in Murang'a County to a great extent					

11. Please indicate your level of agreement/disagreementwith the following statements regarding the effect of various aspects of community involvement in decision making on management of water supply in Murang'a County.

Aspects of Decision Making	**1**	**2**	**3**	**4**	**5**
Identification of water issues affects management of water supply in Murang'a County to a great extant.					
Prioritization of set goals/objectives affects the management of water supply in Murang'a County to a great extent.					

Monitoring and Assessment of water projects affects the management of water supply in Murang'a County to a great extent.					
Proposal of alternative solutions affects the management of water supply in Murang'a County to a great extent.					
Consultations on water projects to be initiated is important in the management of water supply in Murang'a County.					

12. Please indicate your level of agreement with the following statements on decision making and management of water supply in Murang'a County?

	Statements on Decision Making and Management	**1**	**2**	**3**	**4**	**5**
1	We find it difficult to engage local community in decision making process					
2	We find it difficult in conducting consultative meeting between us and the local community has enhanced better management of water supply in Murang'a County					
4	The local community finds it difficult to cope up with the policies for water supplies.					
5	We always get support from the local community while conducting capacity building in water supply management.					

13. From a general perspective, which aspects of decision making do you think need to be improved and how can they be pursued to enhance community role in management of water supply in his County?

    ……

    ……..

Section D: Technical Support

Technical support refers to the aspects of products and services provided in the course of enhancing management of water supply.

14. Please indicate your level of agreement/disagrrement with thr following statement regarding effect of technical support on the management of water supply in Murang'a County.

Statement	**1**	**2**	**3**	**4**	**5**
Technical support affects the management of water supply in Murang'a County to a great extent.					

15. Please indicate your level of agreement/disagreement with the following aspects of technical support on the management of water supply in Murang'a County.

Aspects of technical support	**1**	**2**	**3**	**4**	**5**
Using Solar power in pumping water significantly influence the management of water supply in Murang'a County significantly.					
Use of modern purification systems have improved the management of water supply in Murang'a County.					
Use of modern water storage facilities plays key role in the management of water supply in Murang'a County.					
Leakage Detections is an important aspect in the management of water supply in Murang'a County.					
Maintenance and Repairs affects the management of water supply in Murang'a County to a great extant.					
Water Infrastructure Upgrading is a vital aspect in the management of water supply in Murang'a County.					
Training and workshops for the technical support team greatly influences the management of water supply in Murang'a County.					

16. In which forms are the technical supports provided to you by the local community in the management of water supply in Murang'a?

……

……..

17. Please indicate your level of agreement with the following statements on technical supports on management of water supply in Murang'a County.

	Statements on technical support and management of water supply	**1**	**2**	**3**	**4**	**5**
1	Communities are engaged in design of water supply facilities					
2	The local community supports our work through provision of standardized equipment facilitates to ensure sustainability of water supply.					
3	Local community in collaboration with our teams are full involved in					

	the responsibility of maintenance and repairs of water supply systems					
4	The community helps in training the local community on how to use the taps, springs and hand pumps to enhance management of water supply					

Section E: Resource Mobilization

Resource mobilization refers to the generation of monetary efforts, funds and assets by the various community in raising financial and other resources necessary for enhancing the provision of water supply in the local settings.

18. To what extent do you agree/disagree with the statement in the table below regarding effect of resource mobilization on management of water supply in Murang'a County?

Statement	**1**	**2**	**3**	**4**	**5**
Resource mobilization affects the management of water supply in Murang'a County to a great extent.					

19. Please indicate your level of agreement/disagreement with the following aspects of resource mobilization and the management of water supply in Murang'a County.

	Aspects of Resource Mobilization	**1**	**2**	**3**	**4**	**5**
1	Planning the money or finances for water supply affects the management of water supply in Murang'a County to agreat extent.					
2	Capability to protect the water resources greatly influences the management of water supply in Murang'a County.					
3	Capacity to regenerate revenue through water supply services plays key role in the management of water supply in Murang'a County.					

20. Please explain the various sources of resource provided by the local community in the management of water supply in Murang'a?

……

……..

21. Kindly indicate the extent to which you agree with these statements on resource mobilization and management of water supply in Murang'a County.

	Statements on Resource Mobilization and Management of Water Supply	**1**	**2**	**3**	**4**	**5**
1	The community here contributes towards water supply management through cash and provision of labour.					

2	Local community are involved in resource mobilization to match the demand with the supply of water					
3	We collaborate with the community in sourcing for civic organizations and donors to encourage existing incentives for shared action or co-production of water services					
4	The level of willingness of users to provide the necessary resources for keeping the water system functioning affects the level of sustainability of water supply					

Section F: Management of Water Supply

Management of water supply refers to the activities involving planning, developing, distributing and managing the optimum use of water resources in the area.

22. Please indicate the extent to which you agree/disagree with the statement in the table below.

Statement	**1**	**2**	**3**	**4**	**5**
Water supply in Murang'a County is managed efficiently.					

23. Kindly indicate your level of agreement/disagreement with the following statements regarding the extent of realization of water supply management in Murang'a County?

Aspects of Management of Water Supply	**1**	**2**	**3**	**4**	**5**
Sustainability (continued availability and supply of water for consumption and other uses) has been realized in Murang'a County to a great extent.					
Accessibility (Capacity to get water supply with little effort or limited difficulties) has been realized in Murang'a County to a great extent.					
Accountability (Fairness and accuracy of the information provided on the costs involved in water supply) has been realized in Murang'a County to a great extent.					
Reliability (Timeliness and appropriateness of the water supplied) has been realized in Murang'a County to a great extent.					
Affordability (how cheap or expensive is the water supplied) has been realized in Murang'a County to a great extent.					
Quality (The nature of water supplied) has been realized in Murang'a County to a great extent.					

Section G: Supporters

24. Kindly indicate your level of agreement/disagreement with the following statements regarding the role of various supporters in the management of water supply in Murang'a County.

Supporters	**1**	**2**	**3**	**4**	**5**
Sponsorship Associations (e.g. JICA) influence the management of water supply in Murang'a County to a great extent.					
Water management organizations (e.g. MUWASCO) are key in the management of water supply in Murang'a County.					
Non-Governmental Organizations supports the management of water supply in Murang'a County to a great extent.					
Private partners contributes significantly to the management of water supply in Murang'a County.					
Kenya Water Aid has been supporting the management of water supply in Murang'a County to a great extent.					
Kenya Water for Health Organization (KWAHO) has been a key player in the management of water supply in Murang'a County.					
The Water Services Trust Fund (WSTF) has over the years supported the management of water supply in Murang'a County to a great extent.					

Section H: Institutions and Regulatory Actors

25. Kindly indicate your level of agreemt/disagreement with the following statements on the role of Institutions and Regulatory Actors in the management of water supply in Murang'a County.

Institutions and Regulatory Actors	**1**	**2**	**3**	**4**	**5**
Advocacy Agencies (e.g. World Bank, FAO) influence management of water supply in Murang'a County to a great extent.					
National Government Policies to some extent affects management of water supply in Murang'a County.					
Water Services Regulatory Board (WASRB) greatly influences management of water supply in Murang'a County.					
National Environment Management Authority					

(NEMA) plays key role in regulating water supply in Murang'a County.					
The Kenya Water and Sanitation Network (KEWASNET) is actively involved in the management of water supply in Murang'a County.					
Ministry of Water and Irrigation (MWI) plays its regulatory role effectively in the management of water supply in Murang'a County.					
Catchment Area Advisory Committee (CAAC) is fully involved in the management of water supply in Murang'a County.					
National Water Conservation and Pipeline Corporation (NWCPC) plays key role in the management of water supply in Murang'a County.					
Water Appeal Board (WAB) is actively involved in the management of water supply in Murang'a County.					

26. What are the other issues affecting local community in the management of water supply in this County?

……

……

27. What do you think should be done to enhance local community role and management of water supply are realized Murang'a County?

……

……

THANK YOU

APPENDIX II: QUESTIONNAIRE FOR LOCAL COMMUNITY

A.PERSONAL INFORMATION

1**.** What is your Gender?

☐ ☐

Male **Femal**

2. How many members does your household have? (Tick one)

(01) 1-3 ☐ (02) 4-6 ☐ (03) 7 and above ☐

2. What is your level of education? (Please tick one)

☐

(01) No formal schooling

☐

(02) Primary

☐

(03) Secondary

☐

(04)Tertiary

3. What is your monthly income in Ksh? _____

B.WATER SUPPLY MANAGEMENT

……

……..

4 a) Where is the water supplied for use in this county sourced from?

b) Is water supply from the sources available for use all the time? (Tick one)

Yes ☐ **No** ☐

c) Are the sources of water you are supplied with protected (fenced with an outlet tapping point)?

(01) Yes ☐ (02) **No** ☐

5a) Are there water sources that dry up seasonally in Murang'a County?

(01) Yes ☐ (02) **No** ☐

b) If yes, what causes the sources to dry up? _____

c) How did you deal with the situation of drying up of water sources?

……

……..

LOCAL COMMUNITY AND BENEFICIARIES PARTICIPATION

6a) Are you a member of any community-based water supply management group?

(Tick one) (01) Yes ☐ (02) **No** ☐

b) What type of group is it? (Tick appropriately): CBO ☐ NGO ☐ WRUA ☐
TSHCRRMA ☐ SHG ☐ Others (Specify)

……

……..

(a) What does the group do to improve access to reliable water supply in your locality?

……

……..

b) What role do you play in water supply management?

(c) If you don't participate, why_____

7 a) Does the community water supply management group have a committee? (Tick one)

(01) Yes ☐ (02) **No** ☐

b) If yes, how was the committee formed? (Tick appropriately)

(01) Elected ☐

(02) Self-appointed ☐

(03)Appointed by donor agent ☐

(04) Appointed by Murang'a County Government Agent ☐

(05) Others (Specify):

……

8 a) Have you received any training on water supply management?

(01) Yes ☐ (02) **No** ☐

b) If yes, what kind of training? _____

c) Which institution provided the training? _____

d) Did the training have an impact on your contribution in water supply management activities? (01) Yes ☐ (02) No ☐

9a) what challenges do you face while practicing water supply management activities?

……

……..

b).What needs to be done to address the challenges in 9 (a) above?

……

……..

10 a) Do you know of the existence of any Water Supply Management Authorities (institutions) in Murang'a County?

(01) Yes ☐ (02) **No** ☐

(b) If yes, which ones? _____

(c) Do you partner/collaborate with the authorities in water supply management?

(01) Yes ☐ (02) **No** ☐

(d) If yes, in which ways? (Explain) _____

(d) If no, explain why_____

11. How many dams have been constructed in this county in last 5 years?

(01) Less than 3 ☐ (02) 3-5 ☐ (03) above 5 years ☐

12. How affordable is the water supplied to you for domestic use

(01) Not affordable ☐

(02) Less affordable ☐

(03) Very affordable ☐

13. 12. How reliable is the water supply in this county

(01) Not Reliable ☐

(02) Less Reliable ☐

(03) Very Reliable ☐

APPENDIX III: INTERVIEW SCHEDULE FOR STAFF OF NON-STATE ACTORS

Name of Society/Agency

1. When and how was the Society/Agency incepted?

2. What is the coverage area of the Society/Agency in Murang'a County?

3. What are the roles / mandate of the Society/Agency in water supply management?

4. In which ways has the Society/Agency contributed to water supply management in Murang'a County?

5a) Are there community-based water supply management groups that the Society/Agency partners within Murang'a County? (01) Yes ☐ (02) **No** ☐

b) If yes, name them?

c) If no, what do you think is the reason for their non-existence?

6. How does the Society/Agency partner with the community-based groups and other stakeholder institutions?

7. Has the Society/Agency put in place any water supply management initiatives to address the issue of water supply management problems in Murang'a County?

(01) Yes ☐ (02) **No** ☐

8. How do you evaluate the water supply management situation in Murang'a County?

9a). what challenges do you encounter in water supply management in Muranga County?

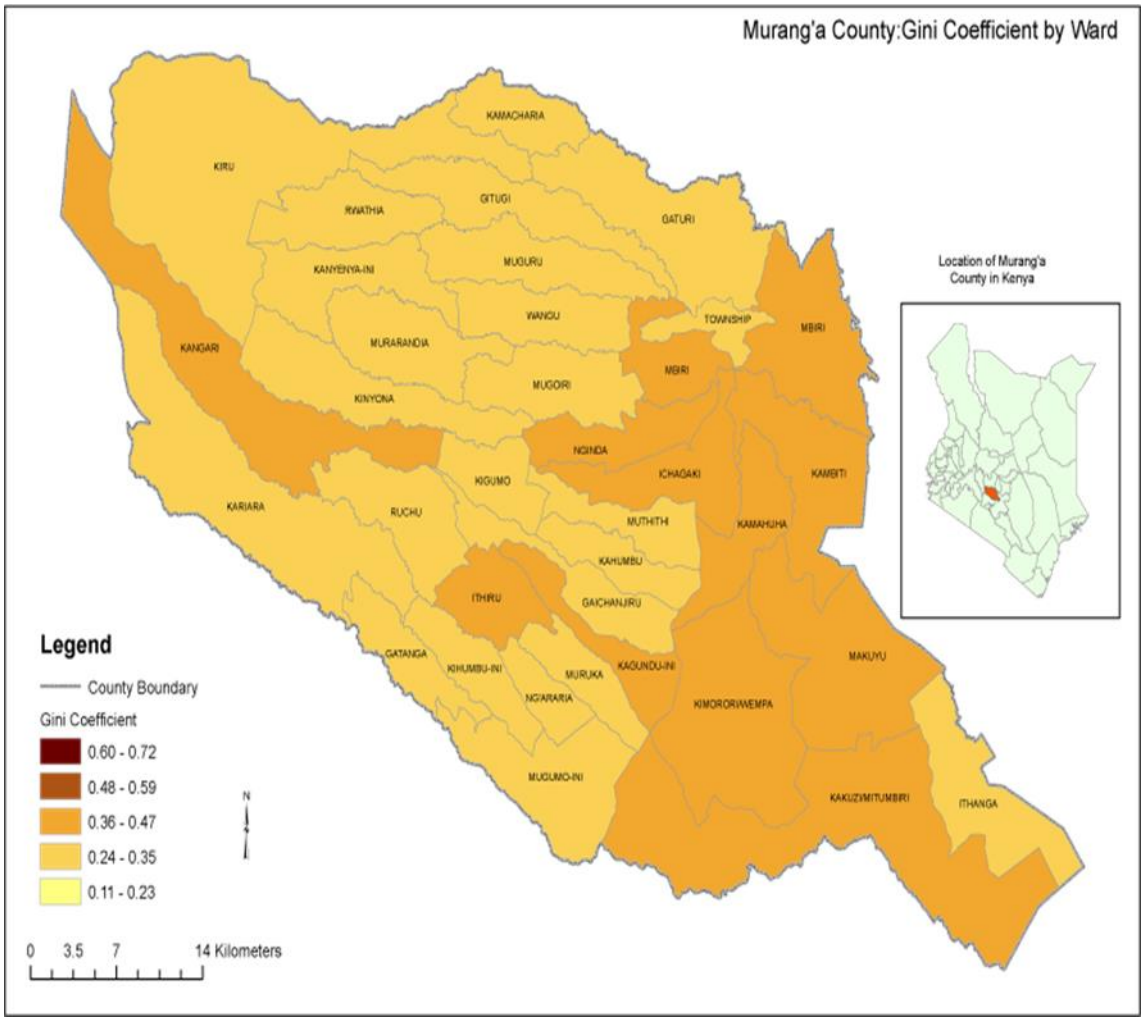
b) How do you address these challenges?

10. What are your future plans for Murang'a County in terms of improving water supply management?

11. What are your views on the water security situation in Murang'a County?

12. What in your view is the greatest challenge facing water supply management in Murang'a County?

APPENDIX IV: MAP OF THE STUDY AREA



APPENDIX V: NACOSTI PERMIT

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 398844

Date of Issue: 19/February/2020

RESEARCH LICENSE

This is to Certify that Mr., CHARLES NJAGI of Kenyatta University, has been licensed to conduct research in Muranga on the topic: ROLE OF LOCAL STAKEHOLDERS ON MANAGEMENT OF WATER SUPPLY IN MURANGA COUNTY KENYA for the period ending : 19/February/2021.

License No: NACOSTI/P/20/3957

398844

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

APPENDIX VI: RESEARCH APPROVAL

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 57530

Internal Memo

FROM: Dean, Graduate School DATE: 3rd February, 2020

TO: Charles Munene Njagi REF: C82/CTY/38818/2016
C/o Public Policy & Administration Department.
Kenyatta University

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that Graduate School Board, at its meeting of 29th January, 2020, approved your Ph.D Research Proposal **Entitled, "Role of Local Stakeholders on Management of Water Supply in Murang'a County, Kenya".**

You may now proceed with data collection, subject to clearance with the Director General, National Commission for Science, Technology and Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking forms per semester. The form has been developed to replace the progress report forms. The supervision Tracking Forms are available at the University's website under Graduate School webpage downloads.

By a copy of this letter, The Registrar (Academic) is hereby requested to grant you substantive registration for your Ph.D studies.

Thank you.

ELIJAH MUTUA
FOR: DEAN, GRADUATE SCHOOL

c.c. Chairman, Department of Public Policy and Administration
Registrar (Academic)

Supervisors:

1. Dr. Wilson Muna
C/o Department of Public Policy and Administration
Kenyatta University

2. Dr. Jane Njoroge
C/o Department of Public Policy and Administration
Kenyatta University

APPENDIX VII: RESEARCH AUTHORIZATION

REPUBLIC OF KENYA

THE PRESIDENCY

MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL GOVERNMENT

Telephone: 060-2030467
Email: cc.muranga@interior.go.ke

COUNTY COMMISSIONER
MURANG'A COUNTY
P. O. BOX 7-10200
MURANG'A

When replying please quote

REF.NO.PUB.24/11/VOL.III/110

29TH JUNE ,2020.

ALL DEPUTY COUNTY COMMISSIONERS
MURANG'A COUNTY.

RE: RESEARCH AUTHORIZATION

In reference to the letter **NACOSTI/P/20/3857** dated, **19TH February 2020** to the County Commissioner-Murang'a County on the above subject.

Mr. Charles Njagi is hereby authorized to undertake research on ***"Role of Local Stakeholders On Management Of Water Supply In Murang'a County"*** *For the period ending* **19th February** *,2021.*

Please accord him the necessary support.

COUNTY COMMISSIONER MURANG'A COUNTY

DANIEL MWENDWA
FOR: COUNTY COMMISSIONER
MURANG'A COUNTY.

Copy To: Charles Njagi