

**EFFECTS OF MANAGEMENT OF WATER RESOURCES
ON PERFORMANCE OF WATER SERVICE PROVIDERS
IN KIAMBU COUNTY**

BY

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UNITED STATES INTERNATIONAL UNIVERSITY-AFRICA

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KIAMBU COUNTY**

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**A Research Project Report submitted to the School of Business in
Partial Fulfillment of the requirement for the degree of Masters of
Management and Organization Development (MOD)**

UNITED STATES INTERNATIONAL UNIVERSITY-AFRICA

SPRING 2019

STUDENTS DECLARATION

I the undersigned declare that this is my original work and has not been submitted to any other college institution or university other than United States International University in Nairobi for academic credit

Signed _____

Date: _____

Josephine N Githinji (ID: 621993)

This project proposal has been presented for examination with my approval as the appointed supervisor.

Signed _____

Date: _____

Professor Paul Katuse

Signed: _____

Date: _____

Dean, Chandaria School of Business

ABSTRACT

The purpose of this study was to establish factors influencing performance of water resource management among water service providers in Kiambu County. This study will be guided by the following research questions: What are the effects of water resource management challenges on performance of water service providers in Kiambu County? How do project management processes affect performance of water service providers in Kiambu County? What is the effect of water resource management strategies on performance of water service providers in Kiambu County?

Descriptive research method was used since this is an exploratory kind of research which is trying to understand the challenges in water resource management. The population was 250 individuals drawn from employees in Kiambu County, ministry of water and sanitation, Athi Water Services Board and customers. A sample size of 153 was drawn and structured questionnaire was used to collect the data and correlation and regression analysis was used to determine the relationship between water resource management and performance of water service providers. Primary data was used in this study and data was collected using questionnaire and developed by the researcher. A questionnaire was defined as a formalized schedule or form, which contains an assembly of carefully, formulated questions for information gathering.

Analysis of the first objective indicated that Kiambu county has mechanisms (e.g. commissions, councils) for river basin management. The findings also show that in the county Water coverage has increased over the past five years and drinking water quality has improved in Kiambu County. The findings also revealed that Kiambu water authority publishes its statutes and by laws are accessible on website or in print format.

A review of the second objective established that hours of water supply has improved in Kiambu County and there is an ongoing technical support to handle technical repairs. It was also agreed that Kiambu County has ongoing institutional support is that encourage ongoing social mobilization in Kiambu County. The findings also show that community participation in the planning and implementation of water resource infrastructure can reduce water crisis in Nairobi.

The last objective established that Kiambu County has water user committees as part of community-based water resources management plans. Finding also show that committee members have common interests and goals. It was also revealed that community members

in Kiambu overlook social difference and heterogeneity of communities as well as environments and drinking water treatment in Kiambu undergo physical, biological, and chemical processes. Results also show that at Kiambu County, measures are put in place for pollution prevention to improve water quality and the county, storage, pumping, and pipe systems in done effectively to protect and deliver the water to customers.

It was concluded that Kiambu County has put in place mechanisms (e.g. commissions, councils) for river basin management; this could have contributed to the increases water coverage over the past five years. The county has also witnessed improved drinking water quality. Secondly, community participation in the planning and implementation of water resource infrastructure can reduce water crisis in Kiambu although some of the group-owned water points lack effective committees and this challenges management. Lastly, Kiambu County utilizes its water user committees as part of community-based water resources management plans, and to ensure continuity of the agenda committee members have common interests and goals and they overlook social difference and heterogeneity of communities as well as environments.

The study recommended that Kiambu County should keep up with its mechanisms for river basin management; there should also be heavy penalty for whoever is found culpable of mismanaging water crisis. Secondly, more community participation initiatives should also be encouraged to improve the planning and implementation of water resource infrastructure. The county should publicize its income projections attained from water revenue collection to ensure transparency. For emergency purposes, the county should have a special funds kitty kept in a special reserves bank account to aid when need arises. Lastly, Kiambu County should continue having water user committees as part of community-based water resources management plans and since community members in Kiambu overlook social difference and heterogeneity there is need to hire more experts from the fields, as well as bench mark with other counties.

ACKNOWLEDGEMENT

This proposal has been an eye opener for me in various issues relating to water resource management. I have gained a lot of knowledge on how water sector operates and I have gained interpersonal skills through interacting with different people who contributed to successful completion of this proposal.

My gratitude goes to God, to my family and friends for the moral support. I would also like to thank my supervisor Professor Katuse for his guidance and consistent support throughout the research period;

DEDICATION

I dedicate this project to my Son Liam Githinji, dad Peter Githinji, brothers Paul and Charles Githinji and sisters Mary and Christine Githinji

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

The process of management is defined by the functions of management, which are distinct from accounting, finance, marketing, and other business functions. These functions provide a useful way of classifying information about management, and most basic management texts since the 1950s have been organized around a functional framework (Amy, 2016). Strategic planning is an organizational management activity that is used to set priorities, focus energy and resources, strengthen operations, ensure that employees and other stakeholders are working toward common goals, establish agreement around intended outcomes/results, and assess and adjust the organization's direction in response to a changing environment (Gaitho, 2015).

Management is the organizational process that includes strategic planning, setting objectives, managing resources, deploying the human and financial assets needed to achieve objectives, and measuring results. Management also includes recording and storing facts and information for later use or for others within the organization. Management functions are not limited to managers and supervisors. Every member of the organization has some management and reporting functions as part of their job (Julian, 2013). Effective strategic planning articulates not only where an organization is going and the actions needed to make progress, but also how it will know if it is successful. Strategic management is the comprehensive collection of ongoing activities and processes that organizations use to systematically coordinate and align resources and actions with mission, vision and strategy throughout an organization (Milanya, 2014).

Resource management is the process by which businesses manage their various resources effectively. Those resources can be intangible – people and time – and tangible – equipment, materials, and finances. It involves planning so that the right resources are assigned to the right tasks. Managing resources involves schedules and budgets for people, projects, equipment, and supplies (Julian, 2013). Water resource management is the activity of planning, developing, distributing and managing the optimum provision and use of water resources. Throughout history much of the world has witnessed ever-greater demands for reliable, high-quality and inexpensive water supplies for domestic consumption, agriculture and industry. With the global population growing at an alarming

rate, estimates show that with current practices, the world will face a 40% shortfall between forecast demand and available supply of water by 2030. Furthermore, chronic water scarcity, hydrological uncertainty, and extreme weather events (floods and droughts) are perceived as some of the biggest threats to global prosperity and stability. (Loucks, van Beek, Stedinger, Dijkman, & Villars, 2005).

To strengthen water security against this backdrop of increasing demand, water scarcity, growing uncertainty, greater extremes, and fragmentation challenges, government will need to invest in institutional strengthening, information management, and (natural and man-made) infrastructure development. Institutional tools such as legal and regulatory frameworks, water pricing, and incentives are needed to better allocate, regulate, and conserve water resources. Information systems are needed for resource monitoring, decision making under uncertainty, systems analyses, and hydro-meteorological forecast and warning. Investments in innovative technologies for enhancing productivity, conserving and protecting resources, recycling storm water and wastewater, and developing non-conventional water sources should be explored in addition to seeking opportunities for enhanced water storage, including aquifer recharge and recovery. Ensuring the rapid dissemination and appropriate adaptation or application of these advances will be a key to strengthening global water security (World Bank, 2017).

The administrative structures and institutional support levels to rural areas in most parts of the world are often too weak to address advocacy, encourage citizen engagement, and facilitate finance and management initiatives for the community. Consequently, water sources become nonfunctional after a few years of service (Lockwood, 2014). As a result of this, some scholars have given emphasis to addressing institutional and administrative issues, along with community water education initiatives in Nepal to enhance the sustainability of water supply (Bhandari & Grant, 2014).

Inadequate access to water for drinking, cooking, bathing and cleaning gives rise to social problems associated with poverty. Indeed, a shortage of water is an acute form of deprivation by any standards. It threatens health and physical well-being and affects gender relations and population patterns. The financial hardship that it reflects and reinforces has severe repercussions on household livelihoods and family relationships. Effects on health are perhaps the most obvious. It has been estimated that 13 million children under 5 years of age die each year from poor sanitation and other diseases linked

to poverty (Redclift, 2014). Dirty water and dirty air are major causes of diarrhoea and respiratory infections, the two biggest killers of poor children (World Bank, 2015).

Some of the ways to manage water resource include; effective and efficient processes in the provision and supply of water, use of new technology in management of water resource, proper maintenance of the already existing water infrastructure, rain water harvesting systems and ensuring there are resources and competent team for monitoring and evaluation. Monitoring technologies help companies to ensure the integrity of their vast water supply networks. Electronic instruments, such as pressure and acoustic sensors, connected wirelessly in real time to centralized and cloud-based monitoring systems will allow companies to detect and pinpoint leaks much faster (Joyce, 2011).

Water is a critical resource for all forms of life and the socio-economic development of all communities. Access to clean, adequate and affordable water and sanitation remains a challenge in many regions of the world, and any positive or negative influence on its management would have far reaching ramifications across all the different sectors and levels of the economy. This is because water is fundamental to food production, in supporting ecosystem services, during industrial production and energy generation. However, water is an increasingly scarce resource around the world and has been mismanaged by governments, leading to several social and economic problems, including degradation in its quality and reduction in the level of services it provides. In the case of river basin water resource management, there have been problems stemming from the common pool nature of the resource and the existence of severe externalities from its use by individuals and sectors in various parts of the basin (Kemper, Blomquist & Dinar, 2006).

With central management often lacking appropriate incentive structures and imposing high transaction costs of management, these problems have been exacerbated, leading to recognition of a need for a paradigm shift in river basin water resource management. Dynamics relating to increased demand for water and changes in the nature of supplies call for innovative ways to manage the available water resources more efficiently (Ngigi, 2016).

The escalating water crisis constitutes a major threat for global progress towards sustainable development in the new millennium. There is growing recognition that the urgent and deepening crisis in water stewardship worldwide is a particularly acute

problem in many countries in spite of many years of humanitarian aid and development, it remains a major challenge to ensure accessibility for all people. The sustainability rate on water projects in developing countries is alarmingly low, due to a lack of resources, capabilities and spare parts for service and maintenance (Hazelton, 2015).

Many developed governments and donor agencies have made substantial investments in projects to improve supplies of water in poor rural areas. In addition to funding, external agencies can bring in technical and managerial skills and open up access to credit. They often carry political influence and may provide charismatic leadership to stimulate project development (Aggarwal, 2014). Despite many years of development efforts, access to safe water supplies and sanitation services in the world continues to be extremely marginal. Over 1.2 billion people worldwide; the majorities living in developing nations, particularly in sub-Saharan Africa, 300 million of which 80% live in rural areas still do not have access to clean water facilities (Prokopy, 2015). In Africa, the number of people in rural areas without an improved water supply is six times higher than that in urban populations (Baur & Woodhouse, 2016).

According to Henley (2013) an estimated 45 million cubic meters are lost every day in distribution networks in developing countries. Leaks are not only costly for companies, but increase pressure on stretched water resources and raise the likelihood of pollutants infiltrating supplies. It doesn't make sense to keep developing new reservoirs when the infrastructure to distribute this water to the end user is faulty. The unreliable and variable water resources in Nairobi city have severe impact on economic development of the city. Inefficient management of water resources makes this situation worse and it affects general economic growth negatively (Chiuta, Johnson & Hirji, 2013).

The African continent poses the most difficult challenge to achieving the water and sanitation MDG targets. The MDGs for water supply and sanitation services require a doubling of the pace of expansion of coverage in water supply in urban areas and a tripling for sanitation. Recent projections show that following the „business as usual“ trends, Sub-Saharan Africa would only reach the MDG targets for water services by 2040, and those for sanitation by 2076 (United Nations Development Programme (UNDP, 2014).

The biggest challenge facing Kenya currently is access to adequate clean and safe water. With a population of 42 million, the Country's water demand stands at 720,000 cubic

meters per day against current supply of 570,000 cubic meters per day (Bancy, 2017). According to Gitonga (2018) the current supply stands at 530 million cubic meters a day against a demand of 780 million cubic meters and this have had to live with poor service provision by the institutions mandated by the government to provide these services and especially water provision services.

According to WBCSD (2005), business activity ranging from industrialization to services such as tourism and entertainment continues to expand rapidly. This expansion requires increased water supply and services, which can lead to more pressure on water resources and natural ecosystems. Other factors that affect management of water resources include overall lack of strategic planning and management, poor financial management, lack of an operating institutional framework low public involvement. There is also the issue of capacity by the staff in charge of water resource management (Agutu, 2013).

Water wastage in the country occurs all the time be it in households, urban and rural areas, rich and poor households, domestic, commercial and agricultural users, the educated and the uneducated. Everyone contributes to water wastage in one way or the other (Mati, 2017). This wastage is mainly through leakage in the water supply pipes, unmetered water and flood water. Implementation of efficient and effective systems in water supply and management then helps with these challenges.

Management of water points is an important aspect of sustainable delivery of water resources to both the rural and urban populations in Kenya (Kakumba, 2010). Although Ministry of Water and Irrigation in collaboration with both international and local organizations, is actively involved at the grassroots level to improve the situation, clean water supply coverage is still in its infancy in many parts of the country. It is estimated that more than 60% of the Kenyan population do not have access to clean water despite the fact that much of the country have reliable water sources and adequate rainfall. The situation is worse in rural areas, occupied by the majority of the population. The ongoing efforts, which are measured based on the performance in achieving short term objectives need to be re-engineered to raise their output by 2000% to meet the water and sanitation Millennium Development Goals (MDGs) by 2015 (MWI, 2011).

Ali (2015) looked at determinants of community ownership of water projects in central division, Isiolo County. Management of water points is an important aspect of sustainable delivery of water resources to both the rural and urban populations in Kenya. Currently,

there seem to be low level of community participation of rural water supply in Kenya, leading to low levels of ownership at community level. Rimberia (2012) studied on the determinants of water projects sustainability in Kieni East Division, Nyeri County. The sustainability rate on water projects in developing countries is alarmingly low, due to a lack of resources, capabilities and spare parts for service and maintenance. Kemuma (2015) assessed the determinants of financial sustainability in water resources management authority in the Kenyan water sector. None of these studies has looked at water project performance in Kiambu County. Therefore this study will answer the question what factors influencing performance of water resource management among water service providers in Kiambu County?

1.2 Problem Statement

Improved sources of water comprise protected spring, protected wells, borehole, piped and rain water collected into dwellings, while unimproved sources include pond, dam, lake, stream/river, unprotected spring, unprotected well, water vendor and others. In Kiambu County, 75% of residents use improved sources of water, with the rest relying on unimproved sources. Use of improved sources is higher in male headed households at 76% as compared with female headed households at 73%. Thika Town constituency has the highest share of residents using improved sources of water at 87%. That is 25 percentage points above Gatundu South constituency, which has the lowest share using improved sources of water. Thika Town constituency is 12 percentage points above the county average. Use of improved sources of water is universal in Kahawa Sukari ward. That is three times Ngoliba ward, which has the lowest share using improved sources of water. Kahawa Sukari is 25 percentage points above the county average (KNBS, 2013).

Various studies have been done on water in Kenya. Rono (2017) studied the extent to which water resource management projects contributes to the resilience of communities in Bureti sub-county in Kericho County. Based on her findings, the study concluded that in water scarce areas, water resource projects were critical in alleviating the dire challenges and hence could positively contribute to community resilience especially in times of drought. The study recommended for more investments to be made in water sector towards water resource management. Bancy (2017) did a presentation on reduction of water wastage in Kenya and concluded that everyone wastes water in one way or the

other and there are gadgets, technologies and changes in practice that can help reduce water wastage.

Otieno (2013) study sought to identify the sources of water for households in Huruma and to identify the formal and informal actors involved in the provision of water in the area. The study sought to highlight the challenges faced by both water actors and households in the provision and access to water respectively. The study revealed that the challenges related to the poor quality of water supplied to households was mainly in relation to cost of water, over ninety percent of household spent about one fifth of their monthly income on water. It emerged that households in informal settlements, with lower purchasing power parity, paid over 12 times more for water than households depending entirely on water supplied by Nairobi City Water and Sewerage Company. Leaking water pipes, illegal water connections, poor condition of access paths and harassment by administrative authorities were some of the challenges affecting water actors sampled in the study area.

Musyima (2015) investigated the factors that influenced performance of water resource users association in the Upper Ewaso Ngiro North sub-catchment area. The study found that there is a significant relationship between water regulations on performance of WRUAs in the Upper Ewaso Ngiro WRUAs. It also confirmed that there was a significant relationship between the socio-economic household activities of the water resource users and the performance of Upper Ewaso Ngiro WRUAs. Further, the study also found that there is a significant relationship between the technical capacity of WRUAs and their performance in water resource conservation. The study concluded that water resource users' associations should provide an opportunity for the involvement of stakeholders and beneficiaries in joint management of water resources and conflict resolution.

Cheruiyot (2016) study sought to determine the magnitude of household water demand, identify key factors that influence the magnitude of water demand and distribution and to examine the effectiveness of the current water use management strategies in Nyangores sub-catchment. Results indicate that income, household size and distance from homesteads to water sources are major determinants of domestic water demand. Human population has been growing rapidly and is putting a lot of pressure on available water

resources, whose quality has greatly deteriorated due to intensified human activities such as agriculture and livestock production.

While several studies have been undertaken to investigate issues such as public participation in water services delivery, integrated water resources management, and ground water management, there seems to be no solution to the water crisis in Kiambu County. For this reason, this study seeks to investigate factors influencing performance of water resource management in Kiambu County.

1.3 Purpose of the Study

The purpose of this study was to establish factors influencing performance of water resource management among water service providers in Kiambu County.

1.4 Research Questions

This study was guided by the following research questions:

1.4.1 What are the effects of water resource management challenges on performance of water service providers in Kiambu County?

1.4.2 How do project management processes affect performance of water service providers in Kiambu County?

1.4.3 What is the effect of water resource management strategies on performance of water service providers in Kiambu County?

1.5 Significance of the Study

1.5.1 Policy Makers

In Kenya policies are formulated at the national level by the Ministry of water and sanitation and the fundamental objectives for managing Kenya's water resources are enshrined in the Water Act (2013). The water policy in the act provides direction on how to manage water resources in Kenya however 50% of Kenyan citizens continue to struggle with water scarcity and water quality problems. This research will be significant at this level as it will shed light on the issues affecting water resource management in Kiambu County and the country at large and give possible solutions to these challenges.

1.5.2 County Government

The county government through water service providers is mandated to supply water to citizens and manage the water infrastructure developed by the national government. The water service providers however are faced with various challenges such as inadequate water to supply, dilapidated water infrastructure and high levels of non-revenue water due to corruption and vandalism. This research is significant to the county government of Kiambu and water service providers in the sense that it will point out the weak areas that need to be improved to ensure better management and supply of water to Kenyan citizens.

1.5.3 Researchers

The findings of this study may enrich existing knowledge and hence may be of use to both researchers and academicians who seek to explore and carry out further investigations. The study will provide the background information to research organizations and scholars who will want to carry out further research in this area. The study will facilitate individual researchers to identify gaps in the current research and carry out research in those areas.

1.6 Scope of the Study

The researcher concentrated on eight water service providers who serve Kiambu county with a total population size of 50 respondents both male and female, The ministry of water and sanitation with total population of 50 respondents and Athi Water Services Board which is the infrastructure developer with a population of 50 staff both male and female and 100 people from the general public who are the customers. The entire population size is therefore 250 with male and female of ages between 21 and 60 years. The target population of the study was consisting of the middle management, lower level management and employees. The study was done between January and April 2019.

1.7 Definition of Terms

1.7.1 Management

Management is the organizational process that includes strategic planning, setting objectives, managing resources, deploying the human and financial assets needed to achieve objectives, and measuring results. Management also includes recording and storing facts and information for later use or for others within the organization.

Management functions are not limited to managers and supervisors. Every member of the organization has some management and reporting functions as part of their job (AL-Hussami, 2008).

1.7.2 Water Resource

A resource is a useful or valuable possession or quality of a country, organization, or person. Water resource is an assets of the nation's wetlands, streams, rivers, lakes, and coastal oceans (Cardwell, Cole, Cartwright, & Martin, 2006).

1.7.3 Water Resource Management

Water resource management is the activity of planning, developing, distributing and managing the optimum provision and use of water resources with a particular focus on how management affects the quality of life for both present and future generations (World Bank, 2017).

1.7.4 Water Service Providers

This entails all the firms' registered or subcontracted to offer water services to the residents of Kiambu County (2030 Water Resources Group / IFC, 2015).

1.7.5 Project Management

Project management is the application of processes, methods, knowledge, skills and experience to achieve the project objectives (Musyima, 2015).

1.8 Chapter summary

This chapter has presented a background of the study where the concepts of water resource management have been explored based on various study and a gap has been identified. The research problem has also been clearly outlined together with the purpose of the study as well as the research questions. The significance of the study and the limitations has also been discussed followed by a definition of terms. The next section presents the literature review where a review of studies on the research questions is presented.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter looks at water resource management challenges globally, in Africa and in Kenya specifically Kiambu county. It explores the various components of water resource management which include effects of water resource management challenges, project management processes and water resource management strategies in terms of previous studies done.

2.2 Water Resource Management Challenges on Performance

2.2.1 Water Scarcity

Kenya is classified as a water-scarce country. The natural endowment of renewable freshwater is currently about 21 BCM (billion cubic meters) or 650 m³ per capita per annum. A country is categorized “water-scarce” if its renewable freshwater potential is less than 1,000 m³ per capita per annum. By 2025, Kenya is projected to have a renewable freshwater supply of only 235 m³ per capita per annum. (Ministry of water, 2006). Water supply in Kenya is characterized by low levels of access, particularly in urban slums and in rural areas, as well as poor service quality in the form of intermittent water supply and only 9 out of 55 water service providers in Kenya provide continuous water supply (Kandji, 2006).

Seasonal and regional water scarcity increases the difficulty to improve water supply. The average number of service hours that Kenyan water utilities provide is 14 hours. Only in seven Water Service Providers (WSPs) water supply is continuous. In Nairobi water is provided on average for 16 hours a day and in Mombasa for 6 hours. Instances of water scarcity (defined as more than five days without or with insufficient water supply) still occur in Kenya. In 2006 in Kisumu over 40% of households (both poor and non-poor) connected to water mains reported low water supply (Nyangeri & Ombongi, 2007).

According to Herrero *et al.*, (2010), urban areas, including Nairobi, Mombasa, Kisumu, Nakuru, Thika among others, only about 40 % of the inhabitants have direct access to piped water. The rest obtain water from kiosks, vendors, illegal connections or from wells. Only about 40% of those with access to piped water receive water 24 hours per

day. On average, most of the major towns mentioned receive water 6 hours per day, a level which is unacceptable by the Water Sector Regulatory Board (Joyce *et al.*, 2010).

Wanjohi (2015) study on the impacts of water shortage in Githurai ward, Kiambu county and the study established that the water supply shortage became noticeable in 2015 and since then, the supply has increasingly been unreliable. The increasing population which has led to low water levels due to the increase in demand has majorly contributed to the erratic supply. The increase in demand has resulted to rapid withdrawal of water thus overexploitation at the source points. This is hardly enough for the high population. Most water systems have not been adequately managed and maintained leading to loss of water due to frequent leakages. The management of the water system should be improved. In the study, all these factors have directly or indirectly contributed to the erratic water supply.

2.2.2 Climate Variability

Rainfall patterns in Kenya are extremely variable not only spatially and temporally, but also in rainfall intensities. This makes the natural flow of water in the watercourses highly variable in space and in time. Major recent floods (3 year recurrence) which effected Kenya occurred in 1997-8 (El Nino) and 2013. Major drought periods have been recorded every 7-10 years with the severest occurring in 1981- 1985 and 1998-2000. The high variability of rainfall patterns affects the annual safe yields that may be extracted and could only be overcome by optimizing, providing and managing of water storage facilities. However, the previous actors in the water sector (GoK and Development Partners) did not give adequate priority to water storage mainly due to the high investment costs (Ministry of water, 2006) Environmental degradation and climate change has further weighed on the water shortage problem as they contaminate water resources and reduce the natural storage of water (Kandji, 2006).

Nairobi is well known for flooding during extreme rain seasons. In Kenya the earliest documented flooding events were Uhuru floods of 1961 (Opere, 2013) that triggered the need for research on the extent and magnitude of flooding. More recently however is the El Nino floods of 1997 and 1998 that caused the loss of many lives and massive damage of private property and public infrastructure. Opere (2013) studied the impacts of flooding in Kenya focusing on vulnerability of the flood prone areas and identified the

vulnerability factors as lack of or poorly implemented flood management strategies, Inadequate flood readiness dependence on or over utilization of natural capital lack of adequate financial and infrastructure resources inadequate technology and technological capacity as well as conflicts.

In Nairobi flooding can be traced back to the master plan of the city since 1927. All the masters plans for the city have never been fully implemented due to inadequate funds (Vogel, 2008) leading to unplanned urbanization and settlement patterns. Some of the reasons why Nairobi is prone to flooding include; 1) encroachment and obstruction of riparian reserves, natural water courses and drainage way leaves and denial of access to drainage outfalls. 2) Unsupervised poorly constructed and undersized storm water drainage infrastructure. 3) Informal settlement on low lying areas and flood plains.4) physical development has preceded development of supporting infrastructure such as roads and drainage.

In many areas, climate change is likely to increase water demand while shrinking water supplies. This shifting balance would challenge water managers to simultaneously meet the needs of growing communities, sensitive ecosystems, farmers, ranchers, energy producers, and manufacturers. In some areas, water shortages will be less of a problem than increases in runoff, flooding, or sea level rise. These effects can reduce the quality of water and can damage the infrastructure that we use to transport and deliver water.

According to USGCRP (2014), changes in the amount of rain falling during storms provide evidence that the water cycle is already changing. Over the past 50 years, the amount of rain falling during very heavy precipitation events has increased for most of the United States. This trend has been greatest in the Northeast, Midwest, and upper Great Plains, where the amount of rain falling during the most intense 1% of storms has increased more than 30%. Warming winter temperatures cause more precipitation to fall as rain rather than snow. Furthermore, rising temperatures cause snow to begin melting earlier in the year. This alters the timing of streamflow in rivers that have their sources in mountainous areas.

As temperatures rise, people and animals need more water to maintain their health and thrive. Many important economic activities, like producing energy at power plants,

raising livestock, and growing food crops, also require water. The amount of water available for these activities may be reduced as Earth warms and if competition for water resources increases. Increases in heavy precipitation events could cause problems for the water infrastructure, as sewer systems and water treatment plants are overwhelmed by the increased volumes of water. Heavy downpours can increase the amount of run off into rivers and lakes, washing sediment, nutrients, pollutants, trash, animal waste, and other materials into water supplies, making them unusable, unsafe, or in need of water treatment (CCSP, 2008)

2.2.3 Governance

In recent years, growing awareness that the world's fresh water supplies are vulnerable to human activities, has been matched by the realization that water resources need to be managed in an integrated and systematic way, to ensure these resources can continue to meet the current and future needs of society (Gleick, 2015). This consciousness has been accompanied by increasing recognition of the mounting difficulty and expense involved in providing sufficient supplies of wholesome water, to meet the rapidly growing needs of communities and countries that are fueled by rapid population growth, and increased rates of urbanization and industrialization (Falkenmark, 2015).

The leading cause of water crisis is mismanagement by government officials. In the World Water Vision Report which asserts that the water crisis faced today in many countries is not about having too little water to satisfy human needs, but, is a crisis of managing water so badly that billions of people and the environment suffer badly (Karanja, 2008). An expanding population (high population growth rate) has overstretched the available fresh water resources leading to water scarcity which translates to low water supply. In reference to Urban Water Solutions, 30 years ago there was a third of water available to people but in another 30 years it will be down to a third of current levels. The population is rising and the catchment area for water is declining. Kenya has now just 1.7% of forest, far below the 10% recommended for any country (Birongo & Lee, 2005).

These problems are particularly acute in countries with low levels of economic development, and also in countries located in the drier regions of the world, where water supplies are relatively scarce (Birongo & Lee, 2005). Internationally, water resource managers have responded to these challenges by adopting Integrated Water Resource

Management (IWRM) approaches, since this offers the greatest potential to ensure that water resources are managed effectively and efficiently over the long-term (Kihara, 2016). Importantly, acceptance of the principles of IWRM is driven by the recognition of two key issues: first, that all the components of the water cycle need to be managed as a single unit, rather than as separate components; and, secondly, that all stakeholders should be more closely involved in decision-making processes, to ensure that management outcomes have greater acceptance and legitimacy.

The growing demands for water in water-scarce regions, coupled to the increased prevalence of deteriorating water quality in many areas, has exerted additional pressure on water resource management authorities to adopt this more holistic approach to water resource management. Indeed, the consensus of opinion at the Second World Water Forum indicated that the current crisis in water is not about having too little of the resource to satisfy our needs, but rather a crisis of how we manage the available water resources (World Water Forum 2000). More recent studies have again stressed the importance of effective local stakeholder participation in decision-making processes that affect their lives and livelihoods (Pegram *et al.* 2005).

At a technical level, the changes in management philosophy have prompted a relatively gradual shift away from more traditional engineering approaches, where water supply infrastructure was developed to provide sufficient water to meet people's needs, to a more integrated planning approach that incorporated both conventional and non-conventional options for the reconciliation of supply and demand, including water conservation and demand management measures (Turton, 2013). There are three broad types of governance, namely corporate governance, co-operative or network governance, and the notion of adaptive governance. Corporate governance generally refers to a system for the promotion of corporate honesty, fairness, transparency and accountability to shareholders.

The corporate governance structure specifies the relations and the distribution of rights and responsibilities among four groups of participants – the board of directors, managers, workers, and shareholders (Kihara, 2016). Network governance refers to the means for achieving direction, control, and coordination of individuals and organizations that have varying levels of autonomy to advance the interests or objectives to which they jointly contribute. It involves the following: configuring governmental and non-governmental

organizations; statutes; organizational, financial and programmatic structures; administrative rules and routines; resource levels, and; institutionalized rules and norms. It also involves formal organizational structures, personal relationships, and judgment by those individuals working in the complex space of administering public programmers. It is inherently political and involves bargaining, negotiation, and compromise (Imperial, 2015).

Kihara (2016) objective was to understand and assess whether and, if so, the extent to which the corporate governance systems of water service providers in Kenya are effectively addressing the challenges posed by limited water resources. Using a comparative analysis of the experiences of water service management in three African countries, i.e. South Africa, Uganda and Ghana, the study identified the best practices that should be adopted in Kenya as well as the pitfalls that should be avoided. In this regard, it was concluded that the study was instructive because although there has been an attempt to improve governance in the water sector in Kenya, there is scope for improvement through borrowing best practices from other countries.

Kithuku (2014) investigated the factors influencing water sector reforms in Tana-Athi Water Services Board. Due to the broad nature of the study the survey research design precluded randomized sampling technique because it was difficult to sufficiently visit all the other water boards to make the research statistically valid. Data was collected using a questionnaire for all the staff categories within the board. From the study findings many small- scale water service providers (WSPs) have well documented weaknesses. These providers typically lack both access to finance and the technical and managerial capacity to use finance effectively. They also face resistance from the formal public utilities, lack legal status or tenure and provide services that are largely unregulated in terms of both the price and quality. The study recommended the board to develop it as well as linking its five year strategic plans to the business plans of the water service providers (WSPs) under its jurisdiction. Funds from the parent ministry/donor partners are sometimes diverted to other water services boards or misappropriated hence the study recommends timely and adequate budgetary allocation for Tanathi water services board.

2.3 Project Management Processes on Performance

2.3.1 Project Management of Water

It is common practice for village water schemes to be managed by a village committee of some sort; the creation of which is intended to enable communities to have a major role in the project, to have a sense of ownership over the scheme and to ensure its ongoing operation and maintenance (Harvey & Reed, 2013). Most of the success factors in any project flow from good leadership and management (Mawunganidze, 2012). Well managed water projects will have good monitoring data and gather feedback from the community; they will put in place good governance principles and structures to enable smooth succession and will have links with other stakeholders. A strong management board will provide support and offer expertise, networks and good representation.

While good leadership is critical in enhancing community ownership of water projects, the breadth and depth of capacity and experience within the water committees is also vital. Many of the projects involve a balance between community management, financial expertise and technical knowledge (Kleemeier, 2010). A number of the water projects have relatively high powered boards with Councillors and senior private sector representatives alongside community members. This can be very helpful both in offering technical knowledge and experience, but also in securing other support.

Having a clear vision, realistic objectives and identified actions is another factor that is important in enhancing ownership (Deverill *et al.*, 2012). This makes it easier to manage community expectations and reduces the possibility of friction once the projects have started. Community participation in maintenance of the water projects is not critical to proper function but strong leadership is important. Good governance at the community level during the project cycle is positively correlated with a more sustained water supply. Where projects use existing community management structures the sustainability of the water point is better than where a new committee is set up (Batchelor, 2010).

Kinuthia, Warui and Karanja (2016) in their study in Mbeere found that some of the group- owned water points lack effective committees and this challenges management. Others are improperly protected which exposes them to possible pollution or contamination through run off, dumping of materials and siltation. Proper protection is

required to maintain water quality. Similarly, some water points are seasonal and are therefore unreliable in supplying water especially during the dry season.

Kumar (2012) asserts that the main indicators of success relate to the leadership and capacity of the management team. In almost every case it is the combination of the personal qualities of the project leader, backed by a strong range of more and wider skills and experience in the board, that make for a strong water project. A strong management committee will provide support and offer expertise, networks and good representation. According to Harvey and Reed (2013) participation of women in water project management provides an effective means to mobilize resources, to tap knowledge and energy, and above all provides legitimacy to the project or activity, and promotes commitment and ownership, and thus sustainability.

Further Ockelford and Reed (2012) intimates that having the right core team can make or break a project and therefore; the community must take care when selecting the team members. The elements to consider include: overall team composition, team selection criteria, team size and the process for selecting team members. On team composition, they indicated that a well-rounded team includes a mix of people and skills. The team should include: some individuals who intimately understand the current process (experts – could be at any level in the organization); some individuals who actively use the process and work closely with customers; some technical wizards; some individuals who are completely objective toward the process and outcome (consultants may fall into this category); customers of the process (when possible) and suppliers (those people who are involved with the process) and some individuals who are not familiar with the process (someone who brings a fresh perspective and outlook to the team). In the team selection criteria, they indicated that when selecting team members, one should make sure that they are: creative and open minded, good team players and well respected among peers, stakeholders, and other business leaders.

2.3.2 Financial Strength

Financial sustainability means financial continuity and security (Myers, 2014). The organization and its core work will not collapse if external funding is withdrawn (Norton, 2011). In practice, organizations which fulfill these definitions first have a diversified funding base which emphasizes on the importance to have a financing strategy which

produces several different sources of income. It does not make good sense to put “all your eggs in one basket”. Relying on just one or two donors for your income makes you vulnerable to external threats. Diversification means securing funds from a wide base that includes sources such as the local business community, national and local government and the general public – and not just from external, institutional donors such as USAID.

Availability of unrestricted funds are far much better than restricted funds of which an organization is legally obliged to use them for the reason that the donor gave them to you. In contrast, unrestricted funds can be used for anything at all that helps you to achieve your mission. The more unrestricted funds you have, the more freedom of action you have. You can choose and change the projects that you want to run and you can cover costs that donors are reluctant to fund, like core costs (Fowler, 2010). We have to look beyond institutional donors for sources of unrestricted funds, for example: membership fees, advertising income, fee income, general appeals and bank interest. Having a regular source of unrestricted income is essential for the next feature of a financial sustainable NGO.

Financial reserves which are resources that an organization builds up during its lifetime (from surpluses of unrestricted income) and puts aside to meet unexpected events in the future. These funds are sometimes kept in a special reserves bank account and are shown separately on the annual financial statements. Building up reserves has a number of obvious advantages for NGOs (Tyler, 2014). It reduces their dependence on donors, helps during cash flow shortages and helps to withstand financial shocks and unplanned expenditure.

Strong stakeholder relationships dictate the position an organization will be in. True partnerships occur when back-up and financial support is provided in the good times and the bad times. The key to financial sustainability is to develop your relationships with an eye to the future as well as meeting today’s needs. This means building the confidence of donors over time. For instance, it may not be appropriate to press them for funds today, if you believe that you might win more funds from them in the future. It is a mistake to take funds or projects that you cannot deliver, just because the money is available. This will harm your relationship with the donor and reduce the chance of winning funds that you really need next year or the year afterwards (Myers, 2014).

The project maintenance fund enables host-country project owners to oversee their own development initiatives. In doing so, it assists them to bring their projects to successful completion as rapidly as possible, with the greatest long-term sustainability, and with the greatest benefit for the ultimate host country stakeholders. Project development process associates provide professional service strategies of the very highest standards, individually and specifically rendered on a case-by-case basis. The primary focus is on ensuring maximum appropriateness and effectiveness for addressing the need of the ultimate local stakeholders, while simultaneously contributing to the harmony of their local cultural, social, and natural environments. Project development process associates, neither as individuals nor as organizations, have any intrinsic interest in either the implementation or the outcome of the project development process, other than the interest they share in common with their host country Project Clients, their associates, and their stakeholder constituencies (Nyong & Kanaroglou, 2011).

Project development process associates' self-evaluation of their service delivery and their organizational efficacy is based solely on Project Client inputs reflecting the degree and the extent of satisfaction with project development efforts on their behalf. Project development represents the host-country project client, by proxy through its authorization, as its exclusive agent for coordinating and overseeing its interests on its behalf with all relevant institutions, organizations, and businesses throughout the project development process. The project development Process offers host country Project Clients the most effective mechanism for maintaining control over their development initiatives (Tyler, 2014). The key to this is the Project Client's potential prerogative to determine and sole source all services and products for the project development process. All international development funding agencies require an open-bid solicitation process for the selection of potential contractors and suppliers in order to ensure equitable public access to funding agency-sponsored commerce.

2.3.3 Project Management and Performance of Water Projects

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project management provides an effective means to mobilize resources, to tap knowledge and energy, and above all provides legitimacy to the project or activity, and promotes commitment and ownership, and thus sustainability.

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2.3.4 Maintenance cost

Experiences in many projects have shown that technical issues cannot be ignored on the basis of the argument that they have nothing to do with managerial aspects. However, technical options should be seen as part of the management solution, not as goals in themselves. There is therefore a need to balance training to include sufficient technical focus (Batchelor, 2010). Even where community members are trained in pump maintenance, some repairs are beyond their ability. Ongoing technical support is therefore required for difficult technical repairs and ongoing institutional support is required to encourage ongoing social mobilization in Kiambu County.

It has been suggested that „beneficiary participation is the single most important factor contributing to project effectiveness“ (Holtslag, 2012). Without participation, it has been claimed that systems are unlikely to be sustainable even if spare parts and repair technicians are available. Participation can take different forms, including the initial expression of the demand for water, the selection of technology, the provision of labour

and local materials, a cash contribution to the project costs, the selection of the management type and even the water tariff (Harvey & Reed, 2007).

It is thus the process through which demand- responsiveness is exercised, and empowerment achieved. It is important that rural water supply projects present communities in Kiambu County with a true water infrastructure choice and that they are made aware of the financial and managerial implications of each possible option. The price of a technical option to a community should be based on the actual cost of delivering and sustaining the service and the people's willingness to pay for it (Deverillet, Bibby, Wedgewood & Smout, 2012).

Water users need to have the freedom to choose what type and level of water services they are capable of managing without any undue external pressure. Ease of operation and maintenance, user acceptability and cost must be considered jointly. If a water supply system is not maintained it is because it is too complicated, not „attractive“ or too expensive (Holtslag, 2012). The research to date clearly demonstrates that the hand pump should be seen as an option in rural water supply programmes not an exclusive choice. Simpler technologies (such as the rope-and-washer pump) or local alternatives to hand pumps (such as an open well with bucket and windlass) require greater consideration if systems are to become fully sustainable without continued heavy external support as is the case of most water projects in Kiambu County.

This is primarily because the provision and distribution of spare parts becomes easier. The principal of offering communities a range of choices of technology should be planned carefully if it is to be successfully put into practice (Deverill *et al.*, 2012). The ease of maintenance and operation procedures, and the availability and cost of spares must be considered, and detailed O&M costing should be provided for each technology choice. Thus, for the community to fully own the water projects in Kiambu County the technology used should be easy to maintain and operate and the spare parts should be affordable and available.

2.4 Water Resource Management Strategies on Performance

The resource management strategies can be considered as tools in a toolkit. Just as the mix of tools in any given kit depend on the job to be accomplished, the combination of

strategies will vary from region to region, depending on climate, projected growth, existing water system, environmental and social conditions, and regional goals. At the local level, it's important the proposed strategies complement the operation of existing water systems. Some strategies may have little value in certain regions. Other strategies may have little value in particular conditions. For example, precipitation enhancement may not be effective during drought season (California Department of Water Resources, 2016)

Actual resource management strategies benefits depend on how the strategies are implemented. It's important to note that the water supply benefits of the RMSs are not additive. Although presented individually, the RMSs are alternatives that can complement each other or compete for limited system capacity, funding, water supplies, or other components necessary for implementation. Assumptions, methods, data, and local conditions vary per strategy. For this reason, the estimated benefits and costs should not be used to prioritize actions, policies, or proportion of State investment. (California Department of Water Resources, 2016).

2.4.1 Community Participation

Water Management Scholars have debated the controversial issues surrounding the ways community participation has been conceptualized, mobilized and deconstructed in natural resources management and development literatures (Williams, 2015). Despite critiques of exclusions, captures and marginalization, the considerable staying power of notions of community and participation in development policies has resulted in a rapid increase of community-based and participatory projects throughout the global South. In the water sector, creating water user committees as part of community-based water resources management plans are common, whereby the committee is responsible for representing communities / villages in managing water structures and decision-making at the local scale (Meinzen-Dick & Zwarteveen 2012). Committee members often are assumed to have common interests and goals, overlooking social difference and heterogeneity of communities as well as environments (Leach et al. 2014).

While development project planners may acknowledge the problems that exist, project implementations often treat communities as territorially defined intact wholes within the remit of the projects. Ahluwalia (2014, 3) argues that different water users often have

different interests and that inter-group conflicts tend to be suppressed, such that in name of social cohesion the interests of the less powerful are forgone and existing inequalities are reinforced'. Similarly, Mehta (2014) argues that viewing community a historically, as well as out of its social and political context, can reinforce existing asymmetrical social / power relations. Thus, notions of community being inherently egalitarian are problematic (see also Staeheli 2013).

Mosse (2013) argues that the social and power relations that play out in water management can challenge notions of democracy and equity that are increasingly embodied in national water development policies uncritically espousing community and participation. Thus, while notions of community in water management may be externally defined by implementing organizations (e.g. local or extra-local NGOs, donors, states), they are implemented through local power relations, where different people with various strengths and weaknesses based on their structural position in village society will negotiate their positions within such projects vis-a-vis the costs and benefits in the context of their overall lives and livelihoods. As a result, it is important to look at the ways that community institutions operate in creating boundaries, exclusions, inclusions and regulation.

The second popular discourse, related to that of community, is participation. Community members are expected to participate in projects in order to enhance equity and efficiency, as well as to feel greater ownership towards projects, which is also expected to lead to better water resources management and greater ecological sustainability. Participation invokes notions of inclusion, of people's abilities to make decisions, and to voice opinions/concerns that are heard (Agarwal, 2012; Cooke & Kothari, 2012).

As such, participation is linked to notions of deliberative democracy (Hickey & Mohan, 2015). Cooke and Kothari (2012) posit that participation has become hegemonic in development discourses, yet generally conceals the processes of unjust and illegitimate exercises of power. Agarwal (2012) further argues that participatory institutions are often socio-economically inequitable and perpetuate unequal relations of power. While Ribot (2015) argues that locally accountable representatives can be sufficient if not everyone can participate, this accountability is often a problem as there can be elite capture and corruption of the projects and its benefits.

Downward accountability may be lacking in projects, although there is meant to be greater sharing of powers and resources with all members who are meant to benefit from the project (Platteau 2015). Networks of relationships of reciprocity and livelihoods may also mean that people make decisions to support dominant institutions and not challenge them (Cleaver 2013). Traditional notions of participation in village life are often worked out through patronage systems and kinship structures. It is within such unequal set-ups that participatory water management projects often embed themselves and thereby perpetuate cycles of inequality. As a result, participation is a process that involves conflict and consensus, within broader historical factors and constraints, and not just a mechanism to facilitate project success or a set of techniques, although this is primarily how it has been treated in most development projects.

By undertaking a gender analysis, Cleaver and Elson (2014) expound that community water management schemes may not be equitable and lead to further marginalization of poorer women in accessing water. Gender analysis allows for understanding structural inequalities in community and household resource use and allocation. Women's and men's involvement in community projects have to be assessed in terms of their decision-making powers and the benefits accrued to them in various forms (Coles & Wallace 2005). If the beneficiaries participants are conceptualized along certain criteria, then groups of people may be targeted, for example women'. In such instances, it is likely that women of any background can be assumed to be representative of the different groups of women, and differences between women in a locality get overlooked or obscured in the project. Blindly assuming that having rich or elite women participate in the project leads to gender mainstreaming can be problematic, as exclusions and privilege may become institutionalized.

While adding women to a project may seem to address gender issues stipulated in project documents, it does not necessarily address power issues between men and women, and among different women. Gendered subjects experience simultaneous processes of inclusion and exclusion based on other social processes, and thus it is not possible to generalize across all women or even men (Cornwall 2013). Social relations of class, kinship, marriage and household relations can all complicate the ways that people experience exclusion and inclusion. There may be a range of different lines of connection and differences that situate women differently from each other, and the myth of female

solidarity thus does not hold up to the ways that women may choose to pursue different desires, connections and needs. In water management, however, some more clear patterns of exclusion do emerge, vis-a`-vis men excluding women in decision-making roles, and men and women of wealthier households excluding people of other households from accessing their safe water sources.

What is evident is that it is not just women but many poor and marginalized men are also excluded. Agarwal (2012) poses that seemingly participatory institutions can exclude people through participatory exclusions that can individually and interactively constrain a woman's participation in water resource management. These are: rules of entry, social norms of women's behavior and actions (for example speaking in public forum, gender division of labor), social perceptions of women's abilities, entrenched territorial claims by men, personal endowments and attributes of women (for example education), and household endowments and attributes (for example class).

Furthermore, participation is a specialized process, taking place in specific spaces and places, which are gendered. As a result, specialized subjectivities can discourage people from speaking in public, and people may perform differently in different spaces (Kesby, 2017). For instance, when meetings take place in bazaars, it is more difficult for women to attend meetings (as these are gendered spaces for men). Public space and decision-making in participatory development projects in many places also exclude women largely due to notions of appropriate feminine behavior as well as practices of purdah (varied practices of veiling and seclusion that curtail women's mobility as well as public behavior). Given that participation activities are largely conducted in public spaces, or what are perceived to be public activities of decision-making and sharing opinions, notions of femininity and masculinity can be challenged when women and marginalized men are involved.

These results in both women and men being uncomfortable with projects that attempt to have participatory planning sessions or public committee meetings. These gendered subjectivities and identities are shifting, contested and rethought in development projects so that they make sense to each individual in what it means to be a good man or woman, 18 husband or wife, son or daughter, within the contexts of other factors, experiences and goals in their lives. Thus, women's mobility and autonomy, as well as decision-making

powers, are spatially curtailed in addition to the sociocultural ideologies of their capacities and rights to participate in decision-making fora. Such participatory exclusions can be powerful in highly unequal and patriarchal settings (Sultana, 2015). Greater attention to both gendered identities and agency are thus important in understanding how and why men and women participate in water management projects or not (Resurrection, 2006).

Thus, women can maneuver through patriarchal structural forces in resisting; challenging and reproducing power relations that operate in the ways that participation plays out in water management. Heeding subjectivities of femininity and masculinity that are associated with activities of participation helps explain why different people relate to community participation in the ways they do. Partaking in water projects is bound up with sensitivities beyond the rational water user that is assumed in participatory development projects, where water users are expected to automatically want to participate and do so with unified and collective identity. This is generally not the case. People display varying opinions and agency in the ways that water projects function in their locality, and what it means in their own access to safe water. Such realities are not just socio-culturally defined, but also inflected by various understandings of water contamination and relations to water. This is where a closer attention to nature and water comes to make a difference.

2.4.2 Improved Operational Efficiency

Conveyance provides for the movement of water. Specific objectives of natural and managed water conveyance activities include flood management, consumptive and non-consumptive environmental uses, water quality improvement, recreation, operational flexibility, and urban and agricultural water deliveries. Infrastructure includes natural watercourses as well as constructed facilities like canals, pipelines and related structures including pumping plants, diversion structures, distribution systems, and fish screens. Groundwater aquifers are also used to convey water (Bancy, 2017).

System re-operation means changing existing operation and management procedures for such water facilities as dams and canals to meet multiple beneficial uses. System re-operation may improve the efficiency of existing uses, or it may increase the emphasis of one use over another. In some cases, physical modifications to the facilities may be needed to expand the re-operation capability (Maddaus, 1987).

Conjunctive management is the coordinated operation of surface water storage and use, groundwater storage and use, and the necessary conveyance facilities. Conjunctive management allows surface water and groundwater to be managed in an efficient manner by taking advantage of the ability of surface storage to capture and temporarily store storm water and the ability of aquifers to serve as long-term storage. Surface storage is the use of reservoirs to collect water for later release and use. Surface storage has played an important role in California where the pattern and timing of water use does not always match the natural runoff pattern. Surface reservoirs can be formed by building dams across active streams or by building off-stream reservoirs where the majority of the water is diverted into storage from a nearby water source.

2.4.3 Promote Resource Stewardship

Economic incentives are financial assistance and pricing policies intended to influence water management. For example, economic incentives can influence the amount of use, time of use, wastewater volume, and source of supply. Economic incentives include low-interest loans, grants, and water pricing rates. Free services, rebates, and the use of tax revenues to partially fund water services also have a direct effect on the prices paid by the water users. Governmental financial assistance can provide incentives for resource plans by regional and local agencies. Also, government financial assistance can help water agencies make subsidies available to their water users for a specific purpose.

Flood plain management reduces risks to life and property and benefits natural resources. Floodplain management accepts periodic flooding and generally is a preferred alternative to keeping rivers in their channels and off floodplains. Seasonal inundation of floodplains provides essential habitat for hundreds of species of plants and animals, many of them dependent on periodic floods. There are also benefits to the economy, agriculture, and society to keeping rivers and their floodplains connected, including water quality improvements and groundwater recharge. Floodplain management also entails limiting the amount and type of development in a floodplain (SIWI, 2005)

Watershed management is the process of evaluating, planning, managing, restoring, and organizing land and other resource use within an area of land that has a single common drainage point. Watershed management tries to provide sustainable human benefits, while maintaining a sustainable ecosystem. Watershed management assumes that a prerequisite

for any project is the sustained ability for the watershed to maintain the functions and processes that support the native ecology of the watershed. This does not imply that a goal is to return to an undisturbed condition. Instead it implies an integration of human needs and environmental needs that allow the watershed to sustain ecological integrity over time while providing for sustainable community needs. It is recognized that watersheds are dynamic and the precise makeup of plants, animals, and other characteristics will change over time (American Water Works Association, 1988)

2.4.4 Improved Water Quality

Drinking water treatment includes physical, biological, and chemical processes to make water suitable for potable use. Distribution includes the storage, pumping, and pipe systems to protect and deliver the water to customers. Matching water quality to water use is a management strategy that recognizes that not all water uses require the same quality water. One common measure of water quality is its suitability for an intended use, and a water quality constituent is often only considered a contaminant when that constituent adversely affects the intended use of the water. High quality water sources can be used for drinking and industrial purposes that benefit from higher quality water, and lesser quality water can be adequate for some uses, such as irrigation. Further, some new water supplies, such as recycled water, can be treated to a wide range of purities that can be matched to different uses. (American Water Works Association, 1988)

Pollution prevention can improve water quality for all beneficial uses by protecting water at its source, reducing the need and cost for other water management and treatment options. By preventing pollution throughout a watershed, water supplies can be used, and re-used, for a broader number and types of downstream water uses. Improving water quality by protecting source water is consistent with a watershed management approach to water resources problems. (Maddaus, 1987)

2.5 Chapter Summary

This section has presented the literature review where a review of studies on the research questions has been done. The first section determined looks at the water resource management challenges, the second section examined the project management process. The third section looked at what extent to which the firms employ water resource management strategies. The next seek to discuss the research methodology.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research design, population and sampling design, the data collection methods, the research procedures data analysis and the summary. The chapter also details how sample sizes were arrived at as well as how the collected samples were handled, prepared and analyzed and the statistical tools employed to analyze the data.

3.2 Research design

A research design is a master plan that specifies the methods and procedures for collecting and analyzing the needed information. (William, Barry, Babin, & Carr, 2012). Research design is a plan of procedures to be followed in data collection and analysis by a researcher in order to evaluate the issues of water resource management in Kiambu County. Trochim (2006), states that research design provides the glue that holds the research project together and integrates it's as a part of a whole.

A descriptive research design was used to structure the research as it shows how all the parts of the research project work together to try to address the main research topic. This is the best research method for this study as it answers the questions that need to be addressed, in this case, what are the challenges in water resource management, the benefits of water resource management, strategies in place to ensure there is sufficient water for everyone in kiambu and possible solutions to the water crisis in Kiambu County.

Saunders, Lewis and Thornhill (2013) indicated that surveys form one of the most frequently utilized methods in business research since it allows the collection of a large amount of data from a sizeable population in highly economic way. The survey method was justified for this research because it contained the most desirable traits when one has a sizeable sample size and short time span for administration of the research. Some of the traits of the sampling method include; diversity of the questions, sample control, control of the data collection environment, quality of data, response rate, perceived anonymity speed and cost.

3.3 Population and Sampling Design

3.3.1. Population

A population is the total collection of elements about which the researcher wishes to make inferences. (Cooper & Schindler, 2000). The researcher concentrated on the eight water and sewerage companies which are the service provider in Kiambu county with a total population size of 50 respondents both male and female, the ministry of water and sanitation with total population of 50 respondents and Athi Water Services Board which is the infrastructure developer with a population of 50 staff both male and female and 100 people from the general public who are the customers. The entire population size is therefore 250 with male and female of ages between 21 and 60 years. The target population of the study consisted of the middle management, lower level management and employees.

3.3.2 Sampling Design and Sample Size

3.3.2.1 Sampling Frame

A research sampling design is that part of the research plan that indicates how cases are to be selected for observation. The design therefore maps out the procedure to be followed to draw the study's sample. A sampling frame is a list of elements from which the sample is actually drawn and is closely related to the population under study (Cooper & Schindler, 2013). In this study, the sampling frame constituted the 250 respondents from Kiambu County.

3.3.2.2 Sampling Techniques

Sampling method refers to the rules and procedures by which some elements of the population are included in the sample. Some common sampling methods are simple random sampling, stratified sampling, and cluster sampling (Mugenda, 2016). The sampling technique for this study was stratified random sampling. This is the best for descriptive research method because the population can be divided into several mutually exclusive sub populations or strata therefore inferences on the specific groups of the population can then be made. Other reasons for choosing this method include; to increase a samples statistical efficiency, to provide adequate data for analyzing the various

subpopulations, and to enable different research methods and procedures to be used in different strata (Cooper & Schindler, 2013).

3.3.2.3 Sample Size

According to Kothari (2005), a sampling size refers to the number of items that are to be selected from the sampling frame to form a sample. The size of the sample should be optimal by ensuring that the requirements of efficiency, representativeness, flexibility and reliability are fulfilled. The sample size should not be too big or too small. To determine the sample size of this study, the availability of the employees, time factor and cost factor will be put under consideration.

The sample size for this study was derived from Yamane’s formula as indicated below.

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

Where;

N = Population Size

e = desired level of precision (margin of error) at 5% (0.05)

n = sample size

$$\frac{250}{1 + 250(0.05)^2}$$

Using Yamane’s formula, the sample size is 153.

Table 3.1: Sample Size

Unit	Population	Distribution	Sample
Service provider in Kiambu	50	20	31
Ministry of water and sanitation	50	20	31
Athi Water Services Board	50	20	31
Customers	100	40	61
Total	250	100	153

3.4 Data collection methods

Primary data used in this study and data was collected using questionnaire and developed by the researcher. A questionnaire was defined as a formalized schedule or form, which contains an assembly of carefully, formulated questions for information gathering (Wong, 2013). The questionnaire was structured and the respondents were guided by the interviewer through the illustrated answers to ensure that the respondent understands and answers satisfactorily. The questionnaire were preferred because they allow access to staff who are not easily accessible. It also gives the respondent an opportunity to give anonymous answers and facilitate collection of large amount of data within a short period of time. The questionnaire had six sections; the general information section where the respondent gives his or her age, sex and where they work ,then each objective had its sections and respondents gave any other information relevant to the research.

3.5 Research procedures

The respondents requested for their time prior to sending the actual questionnaire. A pilot test involving 20 respondents was carried out to evaluate the completeness, precision, accuracy and clarity of the questionnaires. This ensured that the reliability of the data collection instruments was used. After the amendment of the final questionnaire, the researchers explained the purpose of the research and seek permission from the insitutions to carry out the actual research. Additionally, an introduction letter from USIU-Africa was used to assist seek the approval of the firm management. Thereafter, the final questionnaires was distributed to the respondents with the help of research assistants. This enhanced the speed of data collection. Each completed questionnaire was treated as a unique case and a sequential number given to each. The filling of the questionnaire was estimated to take approximately 10 minutes. The collected data was then be entered into the Statistical Package for the Social Sciences (SPSS) software for analysis.

3.6 Data Analysis Method

Since the instrument of decision for this research was structured questionnaire, data analysis had both quantitative and qualitative analysis. Qualitative research interested in analysing subjective meaning or the social production of issues, events, or practices by

collecting non-standardised data and analysing texts and images rather than number and statistics. On the other hand, quantitative research denotes amounting something. This research method attempts to investigate the answers to the questions starting with how many, how much, to what extent (Rasinger, 2013).

The raw data was transformed into the right format after collection. The work was then be edited so that errors can be corrected or omitted, then it was tabulated to count the number of samples falling into various categories. In analyzing the data the researcher will use quantitative approach for close ended questions and qualitative approach for open ended questions. The researcher utilized SPSS to analyze the data.

3.7 Chapter Summary

This chapter discussed the methodology of research in terms of the design population and sampling. It has given the details of how the population and the sample size was arrived at, the data collection and analysis methods.

CHAPTER FOUR

4.0 RESULTS AND FINDINGS

4.1 Introduction

This chapter presents the results established from the data analysis done. This included results relating to the demography and specific research objectives aimed at was to establish factors influencing performance of water resource management among water service providers in Kiambu County.

4.1.1 Response Rate

The research issued a total of 153 questionnaires and a total of 136 were filled and returned giving a response rate of 89%. This was sufficient for the study as indicated in Table 4.1

Table 4.1: Response Rate

Variable	Frequency	Percentage
Filled and returned	136	89
Non-response	17	11
Total	153	100

4.1.2 Reliability

Table 4.2: Reliability Statistics

Scale	Cronbach's Alpha	Number of Items
Water resource management challenges on performance.	.716	11
Project management processes on performance.	.875	12
Effect of water resource management strategies on performance.	.925	10

A pilot study was undertaken to establish reliability of the questionnaires. The pilot study was done and random sample selected among 20 respondents. By use of Cronbach's

Alpha in SPSS reliability analysis was done to evaluate internal consistency of the variables and the results are displayed in Table 4.2

The findings shows that effects of water resource management strategies on performance had the highest reliability ($\alpha= 0.925$), project management processes on performance ($\alpha=0.875$), and water resource management challenges on performance ($\alpha= 0.716$). The data on the reliability scale indicated that all the variables were reliable $\alpha > 0.7$

4.2 Demography

4.2.1 Gender of the Respondents

To analyze the respondent gender the result established that majority of respondents accounting for 67.6% were male while female accounted for 32.4 % as shown in Figure 4.1. This indicated that the data utilized represented the views from both gender.

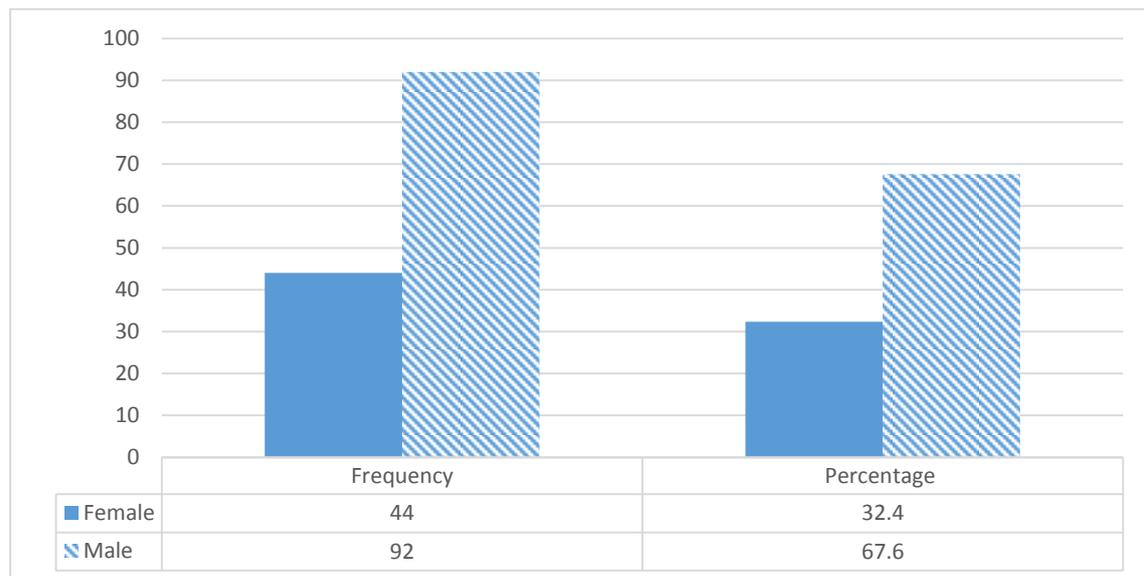


Figure 4.1: Gender

4.2.2 Age of the Respondents

To analyse the ages of the respondents the result established that majority of respondents accounting for 59% were aged between 26-35 years, while 26% were aged between 36-45 years. The findings also show that 12% were of ages 18-25 and those aged between 46-51 years accounted for 3% as shown in Figure 4.2 below.

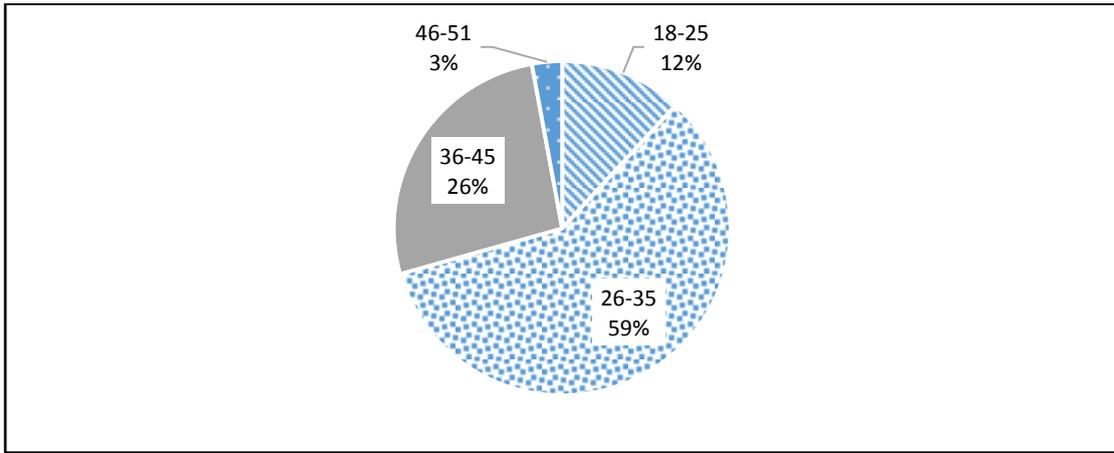


Figure 4.2: Age of the Respondents

4.2.3 Education Level

To analyse the literacy levels of the respondents the result established that majority of respondents accounting for 67.6% were degree holders while Diploma holders were 8.8% and holders of Masters degree and above represented 23.5% as shown in Figure 4.3 below. This implies that the respondents understand the questions asked in the questionnaire.

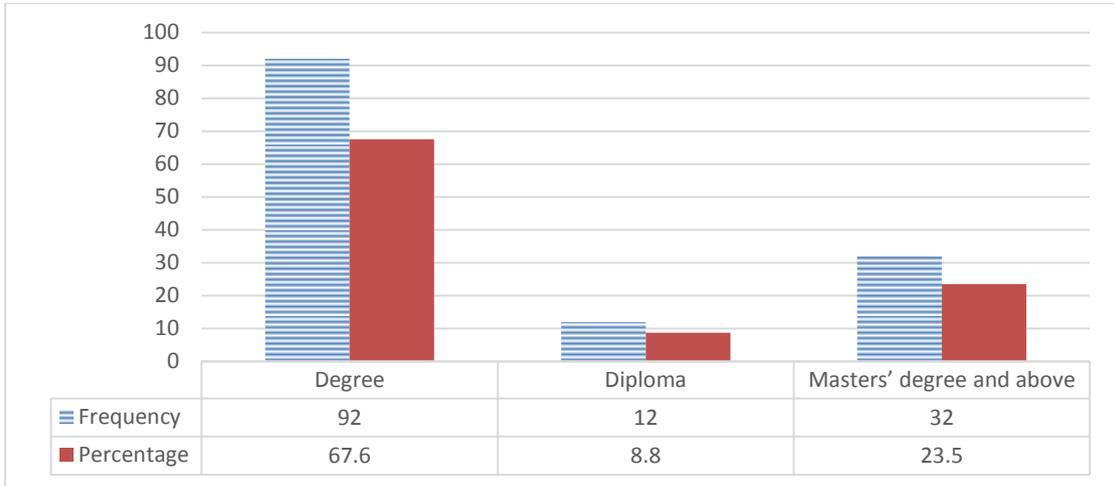


Figure 4.3: Education Level

4.2.4 Duration of Engagement with the Firm

To analyse the duration of engagement with the firm, the result established that majority of respondents accounting for 35.2% had 3-5 years experience with the water service providers, 32.4% had over 6 years experience with the water service providers, while 29.4% had 1-2 years experience with the water service providers as shown in Figure 4.4 as follows.

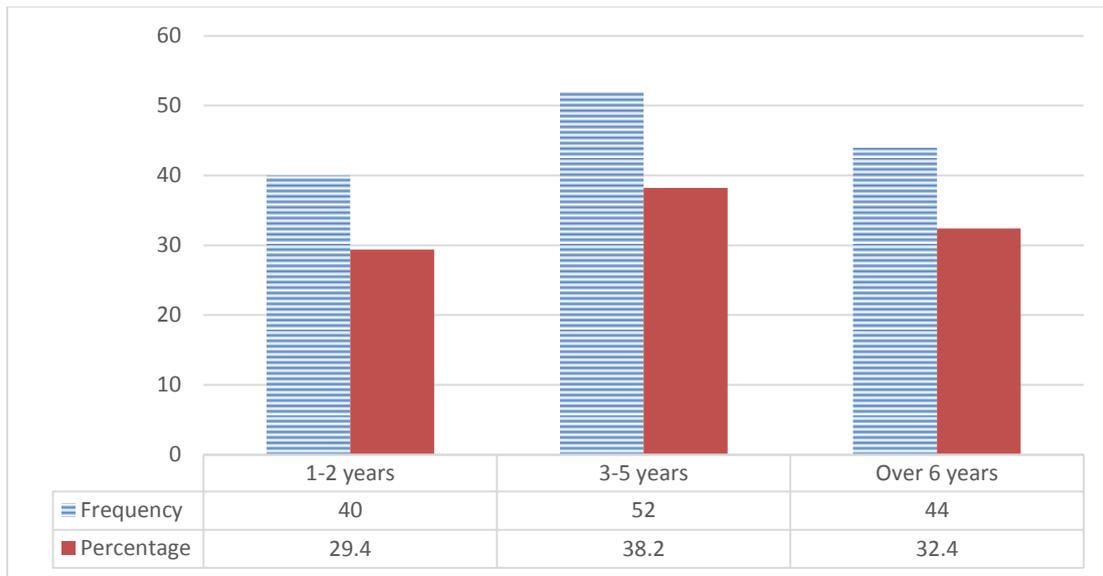


Figure 4.4: Duration of Engagement with the Firm

4.3 Effects of Water Resource Management on Performance of Water Service Providers

The first objective set to establish effects of water resource management on performance of water service providers. Respondents were asked a set of questions to indicate to what extent they agree or disagreed with statement using a five point Likert scale where 1 - Strongly Disagree 2 - Disagree 3 - Neutral 4 - Agree 5 - Strongly Agreed.

4.3.1 Descriptive Statistics of Effects of Water Resource Management

It was agreed that Kiambu county has mechanisms (e.g. commissions, councils) for river basin management (M=4.85, SD=1.145). The findings also show that in the county Water coverage has increased over the past five years (M=4.74, SD=.921). It was also revealed that drinking water quality has improved in Kiambu County (M=4.50, SD=.981). The findings also revealed that Kiambu water authority publishes its statutes and by- laws are accessible on website or in print format (M=4.18, SD=1.082).

The study also indicated that the leading cause of water crisis is mismanagement by government official (M=3.68, SD=1.210). At that same time, there was reports a consistent lack of adequate quality water in Kiambu county (M=3.60, SD= 1.035).

Findings also indicated that climate change is a major challenge in water resource management in Kiambu county (M=3.59, SD=1.358).

Table 4.3: Descriptive Statistics of Effects of Water Resource Management on Performance of Water Service Providers

Variable	N	Mean	Std. Dev
A1: There is consistent lack of adequate quality water in Kiambu county	136	3.60	1.035
A2: Kiambu county has mechanisms (e.g. commissions, councils) for river basin management.	136	4.85	1.145
A3: There is a mechanisms for management of groundwater in Kiambu County	136	3.03	.988
A4: Climate change is a major challenge in water resource management in Kiambu county	136	3.59	1.358
A5: The county has put in place measures to avert flooding	136	2.35	.839
A6: The county has put in place measures to avert drought	136	2.50	1.068
A7: There is Poor governance and corruption in water management	136	3.47	1.095
A8: The leading cause of water crisis is mismanagement by government officials	136	3.68	1.210
A9: Kiambu water authority publishes its statutes and by- laws are accessible on website or in print format.	136	4.18	1.082
A10: Kiambu water authority bodies meet regularly annually for general assembly and several times	132	3.03	.941
A11: Kiambu water authority has good practice around major purchases / procurement of goods and services.	136	3.03	1.075
A12: Water Coverage has increased over the past five years	136	4.74	.921
A13: Drinking water quality has improved in Kiambu County.	136	4.50	.981

Respondents were however no aware that there is Poor governance and corruption in water management (M=3.47, SD=1.095). Results also indicated that there is a mechanisms for management of groundwater in Kiambu County (M=3.03, SD=.988). There was also a lack of knowledge about Kiambu water authority bodies meet regularly annually for general assembly and several times (M=3.03, SD=.941), nor Kiambu water authority having a good practice around major purchases / procurement of goods and services (M=3.03, SD=1.075). Respondents disagreed that the county has put in place

measures to avert drought (M=2.50, SD=1.068). They also disagreed that the county has put in place measures to avert flooding (M=2.35, SD=.839).

4.4 Project Management Processes Affecting Performance of Water Service

Providers

The second objective set to establish Project Management Processes Affecting Performance of Water Service Providers. Respondents were asked a set of questions to indicate to what extent they agree or disagreed with statement using a five point Likert scale where 1 - Strongly Disagree 2 - Disagree 3 - Neutral 4 - Agree 5 - Strongly Agreed.

4.4.1 Descriptive Statistics of Project Management Processes

It was agreed that hours of water supply has improved in Kiambu county (M=4.38, SD=0.943), and Kiambu has ongoing technical support to handle technical repairs (M=4.29, SD=1.048). It was also agreed that Kiambu County has ongoing institutional support is that encourage ongoing social mobilization in Kiambu County (M=4.25, SD=1.035). The findings also show that community participation in the planning and implementation of water resource infrastructure can reduce water crisis in Nairobi (M=4.09, SD= 1.125). It was also agreed was also established some of the group- owned water points lack effective committees and this challenges management (M=3.59, SD=1.119).

There was however an uncertainty of an efficient revenue collection from water distribution at Kiambu County (M=3.32, SD=1.081). Respondents also failed to agree on whether the availability and cost of water maintenance spares is considered (M=3.29, SD = 0.959). Respondents also indicated that there was uncertainty about Kiambu water management bodies have a strong management board that provide support and offer expertise, networks and good representation (M=3.26, SD= 1.013). Respondents also failed to agree on Kiambu water projects have relatively high powered boards with councillors and senior private sector representatives alongside community member (M=3.24, SD= 1.034). Similarly, respondents were not aware about the project maintenance fund enables Kiambu County to oversee their own development initiatives (M=3.12, SD= 1.082).

Table 4.4: Descriptive Statistics of Project Management Processes Affecting Performance

Variable	N	Mean	Std. Dev
B1: Kiambu water management bodies have a strong management board that provide support and offer expertise, networks and good representation	136	3.26	1.013
B2: Kiambu water projects have relatively high powered boards with Councillors and senior private sector representatives alongside community members	136	3.24	1.034
D1: Community participation in the planning and implementation of water resource infrastructure can reduce water crisis in Nairobi	136	4.09	1.125
B3: Some of the group- owned water points lack effective committees and this challenges management	136	3.59	1.119
B4: Kiambu county has financial sustainability hence able to enjoy continuity and security of its water resources	136	2.20	1.142
B5: Through diversification Kiambu has been able to secure funds from a wide base For susainabilty	136	2.15	.978
B6: Kiambu the funds are sometimes kept in a special reserves bank account to aid when need arises.	136	2.38	.911
B7: The project maintenance fund enables Kiambu County to oversee their own development initiatives.	136	3.12	1.082
B8: Kiambu has ongoing technical support to handle technical repairs	136	4.29	1.048
B9: Kiambu County has ongoing institutional support is that encourage ongoing social mobilization in Kiambu County.	128	4.25	1.035
B10: In Kiambu county the availability and cost of water maintanace spares is considered.	136	3.29	.959
B11: Hours of water supply has improved in Kiambu county	136	4.38	.943
B12: There is an efficient Revenue Collection from water distribution at Kiambu County.	136	3.32	1.081

It was however disagreed that Kiambu the funds are sometimes kept in a special reserves bank account to aid when need arises (M=2.38, SD=0.911). It was also disagreed that

Kiambu county has financial sustainability hence able to enjoy continuity and security of its water resources (M=2.2, SD=1.142). Respondents disagreed that through diversification Kiambu has been able to secure funds from a wide base for sustainability (M=2.15, SD=0.978).

4.5 Effect of Water Resource Management Strategies on Performance of Water Service Providers

The third objective set to establish water resource management strategies. Respondents were asked a set of questions to indicate to what extent they agree or disagreed with statement using a five point Likert scale where 1 - Strongly Disagree 2 - Disagree 3 - Neutral 4 - Agree 5 - Strongly Agreed.

4.5.1 Descriptive Statistics of Water Resource Management Strategies

It was agreed that Kiambu County has water user committees as part of community-based water resources management plans (M=4.3, SD=0.873). Finding also show that committee members have common interests and goals (M= 4.24, SD=1.063). It was also revealed that community members in Kiambu overlook social difference and heterogeneity of communities as well as environments (M= 4.06, SD=1.017) and drinking water treatment in Kiambu undergo physical, biological, and chemical processes (M=3.79, SD=1.026). Results also show that at Kiambu county, measures are put in place for pollution prevention to improve water quality (M=3.69, SD=1.103) and the county, storage, pumping, and pipe systems in done effectively to protect and deliver the water to customers (M=3.68, SD=1.108).

It was also agreed that both women and men are comfortable with projects that attempt to have participatory planning sessions or public committee meetings (M=3.57, SD= 1.148). Kiambu has coordinated operation of surface water storage and use (M=3.51, SD= 1.071). There was uncertainty about community members in Kiambu participate in projects in order to enhance equity and efficiency (M=3.18, SD=0.926). There was also uncertainty about the county having a high staff productivity at Kiambu County (M=3.03, SD=1.154).

Table 4.5: Descriptive Statistics of Water Resource Management Strategies

Variable	N	Mean	Std. Dev
C1: Kiambu County has water user committees as part of community-based water resources management plans.	132	4.30	.873
C2: Committee members have common interests and goals	136	3.24	1.063
C3: Community members in Kiambu overlook social difference and heterogeneity of communities as well as environments.	132	3.06	1.017
C4: Community members in Kiambu participate in projects in order to enhance equity and efficiency	136	3.18	.926
C5: Both women and men are comfortable with projects that attempt to have participatory planning sessions or public committee meetings	136	3.47	1.148
C6: Kiambu has coordinated operation of surface water storage and use	136	3.09	1.071
C7: Drinking water treatment in Kiambu undergo physical, biological, and chemical processes	136	3.79	1.026
C8: In Kiambu county, storage, pumping, and pipe systems in done effectively to protect and deliver the water to customers	136	3.68	1.108
C9: At Kiambu county, measures are put in place for pollution prevention to improve water quality	136	3.29	1.103
C10: There is a high staff productivity at Kiambu County	136	3.03	1.154

4.6 Chapter Summary

This chapter presented the results obtained from the data analysis done. This includes results relating to the respondents' demography and the specific research objectives of this study which intended to establish factors influencing performance of water resource management among water service providers in Kiambu County. The research utilised descriptive statistics such as mean and standard deviation. This information was presented in tables and figures. In the next chapter the conclusion, discussion and recommendations as per the objectives of this study are presented.

CHAPTER FIVE

5.0 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This section offers the discussion, conclusions and recommendations arrived at based on the research questions of the study which sought to establish factors influencing performance of water resource management among water service providers in Kiambu County. This study was guided by the following research questions: What are the effects of water resource management challenges on performance of water service providers in Kiambu County? How do project management processes affect performance of water service providers in Kiambu County? What is the effect of water resource management strategies on performance of water service providers in Kiambu County?

5.2 Summary of the Study

The purpose of this study was to establish factors influencing performance of water resource management among water service providers in Kiambu County. This study will be guided by the following research questions: What are the effects of water resource management challenges on performance of water service providers in Kiambu County? How do project management processes affect performance of water service providers in Kiambu County? What is the effect of water resource management strategies on performance of water service providers in Kiambu County?

Descriptive research method was used since this is an exploratory kind of research which is trying to understand the challenges in water resource management. The population was 250 individuals drawn from employees in Kiambu County, ministry of water and sanitation, Athi Water Services Board and customers. A sample size of 153 was drawn and structured questionnaire was used to collect the data and correlation and regression analysis was used to determine the relationship between water resource management and performance of water service providers. Primary data was used in this study and data was collected using questionnaire and developed by the researcher. A questionnaire was defined as a formalized schedule or form, which contains an assembly of carefully, formulated questions for information gathering.

Analysis of the first objective indicated that Kiambu County has mechanisms (e.g. commissions, councils) for river basin management. The findings also show that in the

county Water coverage has increased over the past five years and drinking water quality has improved in Kiambu County. The findings also revealed that Kiambu water authority publishes its statutes and by —laws are accessible on website or in print format. The study also indicated that the leading cause of water crisis is mismanagement by government official. At that same time, there were reports of a consistent lack of adequate quality water in Kiambu County. Findings also indicated that climate change is a major challenge in water resource management in Kiambu County.

A review of the second objective established that hours of water supply has improved in Kiambu County and there is an ongoing technical support to handle technical repairs. It was also agreed that Kiambu County has ongoing institutional support is that encourage ongoing social mobilization in Kiambu County. The findings also show that community participation in the planning and implementation of water resource infrastructure can reduce water crisis in Nairobi. It was also agreed was also established some of the group-owned water points lack effective committees and this challenges management.

The last objective established that Kiambu County has water user committees as part of community-based water resources management plans. Finding also show that committee members have common interests and goals. It was also revealed that community members in Kiambu overlook social difference and heterogeneity of communities as well as environments and drinking water treatment in Kiambu undergo physical, biological, and chemical processes. Results also show that at Kiambu County, measures are put in place for pollution prevention to improve water quality and the county, storage, pumping, and pipe systems in done effectively to protect and deliver the water to customers.

5.3 Discussions

5.3.1 Effects of Water Resource Management Challenges on Performance of Water Service Providers

It was agreed that Kiambu County has mechanisms (e.g. commissions, councils) for river basin management. This is in line with taking precaution about water shortages, as established by Wanjohi (2015) study on the impacts of water shortage in Githurai ward, Kiambu County and the study established that the water supply shortage became noticeable in 2015 and since then, the supply has increasingly been unreliable. The increasing population which has led to low water levels due to the increase in demand has majorly contributed to the erratic supply. The increase in demand has resulted to rapid

withdrawal of water thus overexploitation at the source points. This is hardly enough for the high population. Most water systems have not been adequately managed and maintained leading to loss of water due to frequent leakages. The management of the water system should be improved. In the study, all these factors have directly or indirectly contributed to the erratic water supply.

The study also indicated that the leading cause of water crisis is mismanagement by government official. The leading cause of water crisis is mismanagement by government officials. In the World Water Vision Report which asserts that the water crisis faced today in many countries is not about having too little water to satisfy human needs, but, is a crisis of managing water so badly that billions of people and the environment suffer badly (Karanja, 2008). An expanding population (high population growth rate) has overstretched the available fresh water resources leading to water scarcity which translates to low water supply. In reference to Urban Water Solutions, 30 years ago there was a third of water available to people but in another 30 years it will be down to a third of current levels. The population is rising and the catchment area for water is declining. Kenya has now just 1.7% of forest, far below the 10% recommended for any country (Birongo & Lee, 2005).

Respondents were however not certain that there is Poor governance and corruption in water management. Kithuku (2014) investigated the factors influencing water sector reforms in Tana-Athi Water Services Board. Data was collected using a questionnaire for all the staff categories within the board. From the study findings many small- scale water service providers (WSPs) have well documented weaknesses. These providers typically lack both access to finance and the technical and managerial capacity to use finance effectively. They also face resistance from the formal public utilities, lack legal status or tenure and provide services that are largely unregulated in terms of both the price and quality. The study recommended the board to develop it as well as linking its five year strategic plans to the business plans of the water service providers (WSPs) under its jurisdiction. Funds from the parent ministry/donor partners are sometimes diverted to other water services boards or misappropriated hence the study recommends timely and adequate budgetary allocation for Tanathi water services board.

Respondents disagreed that the county has put in place measures to avert drought and flooding' According to USGCRP (2014), changes in the amount of rain falling during storms provide evidence that the water cycle is already changing. Over the past 50 years,

the amount of rain falling during very heavy precipitation events has increased for most of the United States. This trend has been greatest in the Northeast, Midwest, and upper Great Plains, where the amount of rain falling during the most intense 1% of storms has increased more than 30%. Warming winter temperatures cause more precipitation to fall as rain rather than snow. Furthermore, rising temperatures cause snow to begin melting earlier in the year. This alters the timing of streamflow in rivers that have their sources in mountainous areas.

5.3.2 Effect of Project Management Processes on Performance of Water Service Providers

The study established that Kiambu has ongoing technical support to handle technical repairs. Kumar (2012) asserts that the main indicators of likely success relate to the leadership and the capacity of the management team. In almost every case it is the combination of the personal qualities of the project leader, backed by a strong range of more and wider skills and experience in the board, that make for a strong water project. A strong management committee will provide support and offer expertise, networks and good representation. According to Harvey and Reed (2013) participation of women in water project management provides an effective means to mobilize resources, to tap knowledge and energy, and above all provides legitimacy to the project or activity, and promotes commitment and ownership, and thus sustainability.

It was also agreed that Kiambu County has ongoing institutional support is that encourage ongoing social mobilization in Kiambu County. Batchelor (2010) notes that community participation in maintenance of the water projects is not critical to proper function but strong leadership is important. Good governance at the community level during the project cycle is positively correlated with a more sustained water supply. Where projects use existing community management structures the sustainability of the water point is better than where a new committee is set up (Batchelor, 2010). Further Ockelford and Reed (2012) intimates that having the right core team can make or break a project and therefore, the community must take care when selecting the team members.

The findings also show that community participation in the planning and implementation of water resource infrastructure can reduce water crisis in Kiambu. It is common practice for village water schemes to be managed by a village committee of some sort; the

creation of which is intended to enable communities to have a major role in the project, to have a sense of ownership over the scheme and to ensure its ongoing operation and maintenance (Harvey & Reed, 2013). Many of the success factors in any project flow from good leadership and management (Mawunganidze, 2012). Well managed water projects will have good monitoring data and gather feedback from the community; they will put in place good governance principles and structures to enable smooth succession and will have links with other stakeholders. A strong management board will provide support and offer expertise, networks and good representation.

It was also agreed was also established some of the group- owned water points lack effective committees and this challenges management. Similar results were reported by Kinuthia, Warui and Karanja (2016) in their study in Mbeere found that some of the group- owned water points lack effective committees and this challenges management. Others are improperly protected which exposes them to possible pollution or contamination through run off, dumping of materials and siltation. Proper protection is required to maintain water quality. Similarly, some water points are seasonal and are therefore unreliable in supplying water especially during the dry season.

Respondents failed to agree on Kiambu water projects have relatively high powered boards with councillors and senior private sector representatives alongside community member. While good leadership is critical in enhancing community ownership of water projects, the breadth and depth of capacity and experience within the water committees is also vital. Many of the projects involve a balance between community management, financial expertise and technical knowledge (Kleemeier, 2010). Having a high number of high powered boards with Councillors and senior private sector representatives alongside community members can be very helpful both in offering technical knowledge and experience, but also in securing other support. Having a clear vision, realistic objectives and identified actions is another factor that is important in enhancing ownership (Deverill *et al.*, 2012). This makes it easier to manage community expectations and reduces the possibility of friction once the projects have started.

5.3.3 Effect of Water Resource Management Strategies on Performance of Water Service Providers

It was agreed that Kiambu County has water user committees as part of community-based water resources management plans. Water Management Scholars have debated the

controversial issues surrounding the ways community participation has been conceptualized, mobilized and deconstructed in natural resources management and development literatures (Williams, 2015). Despite critiques of exclusions, captures and marginalization, the considerable staying power of notions of community and participation in development policies has resulted in a rapid increase of community-based and participatory projects throughout the global South. In the water sector, creating water user committees as part of community-based water resources management plans are common, whereby the committee is responsible for representing communities/villages in managing water structures and decision-making at the local scale (Meinzen-Dick & Zwarteveen 2012). Committee members often are assumed to have common interests and goals, overlooking social difference and heterogeneity of communities as well as environments (Leach *et al.*, 2014).

Finding also show that committee members have common interests and goals. While development project planners may acknowledge the problems that exist, project implementations often treat communities as territorially defined intact wholes within the remit of the projects. Ahluwalia (2014) argues that different water users often have different interests and that inter-group conflicts tend to be suppressed, such that in name of social cohesion the interests of the less powerful are forgone and existing inequalities are reinforced'. Similarly, Mehta (2014) argues that viewing community a historically, as well as out of its social and political context, can reinforce existing asymmetrical social/power relations. Thus, notions of community being inherently egalitarian are problematic (Staheli, 2013).

It was also revealed that community members in Kiambu overlook social difference and heterogeneity of communities as well as environments. Popular discourse, related to that of community, is participation. Community members are expected to participate in projects in order to enhance equity and efficiency, as well as to feel greater ownership towards projects, which is also expected to lead to better water resources management and greater ecological sustainability. Participation invokes notions of inclusion, of people's abilities to make decisions, and to voice opinions / concerns that are heard (Agarwal, 2012; Cooke & Kothari, 2012).

It was also agreed that both women and men are comfortable with projects that attempt to have participatory planning sessions or public committee meetings. Cooke and Kothari (2012) posit that participation has become hegemonic in development discourses, yet

generally conceals the processes of unjust and illegitimate exercises of power. Agarwal (2012) further argues that participatory institutions are often socio-economically inequitable and perpetuate unequal relations of power. While Ribot (2015) argues that locally accountable representatives can be sufficient if not everyone can participate, this accountability is often a problem as there can be elite capture and corruption of the projects and its benefits.

Kiambu has coordinated operation of surface water storage and use. However its noted that downward accountability may be lacking in projects, although there is meant to be greater sharing of powers and resources with all members who are meant to benefit from the project (Platteau, 2015). Networks of relationships of reciprocity and livelihoods may also mean that people make decisions to support dominant institutions and not challenge them (Cleaver, 2013). Traditional notions of participation in village life are often worked out through patronage systems and kinship structures. It is within such unequal set-ups that participatory water management projects often embed themselves and thereby perpetuate cycles of inequality. As a result, participation is a process that involves conflict and consensus, within broader historical factors and constraints, and not just a mechanism to facilitate project success or a set of techniques, although this is primarily how it has been treated in most development projects.

5.4 Conclusions

5.4.1 Effects of Water Resource Management Challenges on Performance of Water Service Providers

Kiambu county has put in place mechanisms (e.g. commissions, councils) for river basin management, this could have contributed to the increases water coverage over the past five years. The county has also witnessed improved drinking water quality. To ensure that the information is available to all, the Kiambu water authority publishes its statutes and by- laws are accessible on website or in print format. Majority stake holders attribute the leading cause of water crisis to mismanagement by government officials, consistent lack of adequate quality water in Kiambu County is however still a challenge. Water resource management in Kiambu County is also affected by climate change.

5.4.2 Effect of Project Management Processes on Performance of Water Service Providers

Kiambu County has experienced improved hours of water supply and there is a structure in place to ensure ongoing technical support to handle technical repairs. The county has also gone out of its way to ensure there is ongoing institutional support that encourage ongoing social mobilization in Kiambu. The findings also show that community participation in the planning and implementation of water resource infrastructure can reduce water crisis in Kiambu although some of the group- owned water points lack effective committees and this challenges management. There is however lack of certainty on the county having an efficient revenue collection from water distribution.

5.4.3 Effect of Water Resource Management Strategies on Performance of Water Service Providers

Kiambu County utilizes its water user committees as part of community-based water resources management plans, and to ensure continuity of the agenda committee members have common interests and goals and they overlook social difference and heterogeneity of communities as well as environments. To ensure safety of the community, drinking water treatment in Kiambu undergoes physical, biological, and chemical processes. There are measures in place to prevent pollution so as to improve water quality and the county, storage, pumping, and pipe systems are done effectively to protect and deliver the water to customers.

5.5 Recommendations

5.5.1 Recommendations or Improvement

5.5.1.1 Effects of Water Resource Management Challenges on Performance of Water Service Providers

Kiambu county should keep up with its mechanisms for river basin management, The published statutes and by- laws are accessible on website or in print format therefore, residents need to be informed through meetings on the time period of the documents availability so as to ensure a huge number of stakeholders access the data. There should also be heavy penalty for whoever is found culpable of mismanaging water crisis. With climate change being a major challenge in water resource management in Kiambu county, there should be put strategies in place to curb the problem. With the persistent long rains

being experienced in the country on a regular basis the county has put in place measures to avert drought and flooding.

5.5.1.2 Effect of Project Management Processes on Performance of Water Service Providers

Kiambu needs to continue with its efforts of ensuring water supply improvement in the county, in addition, ongoing technical support to handle technical repairs is also highly encouraged. More community participation initiatives should also be encouraged to improve the planning and implementation of water resource infrastructure. The county should publicize its income projections attained from water revenue collection to ensure transparency. Kiambu water management bodies should strive to have a strong management board that provides support and offer expertise, networks and good representation. This can be achieved by having a diverse board constituted of councillors and senior private sector representatives alongside community. For emergency purposes, the county should have a special funds kitty kept in a special reserves bank account to aid when need arises.

5.5.1.3 Effect of Water Resource Management Strategies on Performance of Water Service Providers

Kiambu County should continue having water user committees as part of community-based water resources management plans and since community members in Kiambu overlook social difference and heterogeneity there is need to higher more experts from the fields, as well as bench mark with other counties. Since both women and men are comfortable with projects that attempt to have participatory planning sessions or public committee meetings, the a third gender rule should still be applied in the nomination and selection of members to the respective committee. There is also a need to have youth and people with disabilities as part on the committee to ensure full inclusivity.

5.5.2 Recommendation for Further Studies

The aim of this study was to establish the factors influencing performance of water resource management among water service providers in Kiambu County. Further studies should be done on water service providers in other counties so as to generalize the findings.

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APPENDICES

Appendix I: Cover letter

28th July 2018,

Josphine N Githinji,
United States International University,
Pobox 14634-00800,
Nairobi, Kenya.

Dear respondent,

RE: ACADEMIC RESEARCH QUESTIONNAIRE

I am a graduate student at United States international university carrying out research on water resource management challenges, benefits, strategies and possible solutions in Kiambu County. This is to partially fulfill the requirements of Masters of Science in management and organization development

You have been selected among many to participate in this research. It is estimated that it will take less than ten (10) minutes of your time to fill the questionnaire. Kindly respond as honestly and objectively as possible. I guarantee that the information given will be treated with utmost confidentiality and will be used only for academic purposes. Your name will not appear anywhere in the research.

Kindly spare sometime to complete the questionnaire attached.

Thank you.

Yours faithfully

Josphine N Githinji

Appendix II: Questionnaire

The questionnaire below seeks to explore water resource management in Kiambu County. It is divided into sections; Section 1 containing bio data and Section II, III, IV, V contains the objectives of the study and VI has open ended questions

SECTION 1: BIO DATA

1. Gender of the respondent. Indicate (tick) appropriately.

Male

Female

2. Age bracket in years.

18-25

26-35

36-45

46 and Above

3. What is your highest level of Education?

Certificate

Diploma

Degree

Masters'

Other _____

4. How long have you worked for the company (firm)?

1-2 years

3-5 years

Over 5 years

SECTION 2: CHALLENGES IN WATER RESOURCE MANAGEMENT

Please tick the appropriate value that corresponds with your opinion on challenges affecting water resource management in Kiambu. Place a check mark in the appropriate square bracket).

Strongly Agree (5) Agree (4) Neutral (3) Disagree (2) Strongly Disagree (1)

Variable	5	4	3	2	1
There is consistent lack of adequate quality water in Kiambu county	5	4	3	2	1
Kiambu county has mechanisms (e.g. commissions, councils) for river basin management.	5	4	3	2	1
There is a mechanisms for management of groundwater in Kiambu County	5	4	3	2	1
Climate change is a major challenge in water resource management in Kiambu county	5	4	3	2	1
The county has put in place measures to avert flooding	5	4	3	2	1
The county has put in place measures to avert drought	5	4	3	2	1
There is Poor governance and corruption in water management	5	4	3	2	1
The leading cause of water crisis is mismanagement by government officials	5	4	3	2	1
Kiambu water authority publishes its statutes and bye- laws are accessible on website or in print format).	5	4	3	2	1
Kiambu water authority bodies meet regularly annually for general assembly and several times	5	4	3	2	1
Kiambu water authority has good practice around major purchases / procurement of goods and services.	5	4	3	2	1
Water Coverage has increased over the past five years	5	4	3	2	1
Drinking water quality has improved in Kiambu County.	5	4	3	2	1

In your opinion what other challenges affect water resource management in Kiambu County

SECTION 3: PROJECT MANAGEMENT PROCESSES IN WATER RESOURCE MANAGEMENT

Please tick the appropriate value that corresponds with your opinion on project management processes affecting water resource management in Kiambu. Place a check mark in the appropriate square bracket.

Strongly Agree (5) Agree (4) Neutral (3) Disagree (2) Strongly Disagree (1)

Variable	5	4	3	2	1
Kiambu water management bodies have a strong management board that provide support and offer expertise, networks and good representation	5	4	3	2	1
Kiambu water projects have relatively high powered boards with Councillors and senior private sector representatives alongside community members	5	4	3	2	1
Some of the group- owned water points lack effective committees and this challenges management	5	4	3	2	1
Kiambu county has financial sustainability hence able to enjoy continuity and security of its water resources	5	4	3	2	1
Through diversification Kiambu has been able to secure funds from a wide base	5	4	3	2	1
For susainabilty Kiambu the funds are sometimes kept in a special reserves bank account to aid when need arises.	5	4	3	2	1
The project maintenance fund enables Kiambu County to oversee their own development initiatives.	5	4	3	2	1

Kiambu has ongoing technical support to handle technical repairs	5	4	3	2	1
Kiambu County has ongoing institutional support is that encourage ongoing social mobilization in Kiambu County.	5	4	3	2	1
In Kiambu county the availability and cost of water maintainace spares is considered.	5	4	3	2	1
Hours of water supply has improved in Kiambu county	5	4	3	2	1
There is an efficient Revenue Collection from water distribution at Kiambu County.	5	4	3	2	1

In your opinion what can be done to ensure sustainability of water resources in the long run?

SECTION 4: WATER RESOURCE MANAGEMENT STRATEGIES

Please tick the appropriate value that corresponds with your opinion on challenges affecting water resource management in Kiambu.

Strongly Agree (5) Agree (4) Neutral (3) Disagree (2) Strongly Disagree (1)

Variable	5	4	3	2	1
Kiambu County has water user committees as part of community-based water resources management plans.	5	4	3	2	1
Committee members have common interests and goals	5	4	3	2	1
Community members in Kiambu overlook social difference and heterogeneity of communities as well as environments.	5	4	3	2	1
Community members in Kiambu participate in projects in order to enhance equity and efficiency	5	4	3	2	1
Both women and men are comfortable with projects that attempt to have participatory planning sessions or	5	4	3	2	1

public committee meetings					
Kiambu has coordinated operation of surface water storage and use	5	4	3	2	1
Drinking water treatment in Kiambu undergo physical, biological, and chemical processes	5	4	3	2	1
In Kiambu county, storage, pumping, and pipe systems in done effectively to protect and deliver the water to customers	5	4	3	2	1
At Kiambu county, measures are put in place for pollution prevention to improve water quality	5	4	3	2	1
There is a high staff productivity at Kiambu County	5	4	3	2	1

In your opinion what are other possible solutions to water resource management in Kiambu County?
