CONTRIBUTION OF WATER RESOURCE MANAGEMENT PROJECTS TO COMMUNITY RESILIENCE: A CASE OF BURETI SUB-COUNTY, KENYA

BY

RONO, CHEPNG'ENO DIANA

648250

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STUDENT'S 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 the United States International University - Africa in Nairobi for academic credit.

Signed: _____ **Date:** _____

Rono, Chepng`eno Diana

ID: 648250

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

Signed: _____ **Date:** _____

Dan N. Odaba

Supervisor

Signed: _____ **Date:** _____

Dr. Tom L.S. Onditi, PhD

Dean, School of Humanities &Social Sciences

Signed: _____ **Date:** _____

Amb. Prof. Ruthie C. Rono, HSC

Deputy Vice Chancellor, Academic and Student Affairs

ABSTRACT

The purpose of this study was to ascertain the extent to which water resource management projects contributes to the resilience of communities in Bureti sub-county in Kericho County. The study specifically sought to examine whether water resource management projects contribute to community resilience, the role of the local community in water resource management, and to assess the ongoing water resource projects in Bureti Sub-County. This study adopted a descriptive study design. From a population of about 180,000 residents, a sample size of 600 was selected using random sampling as well as purposive sampling methodology. The responses from 563 respondents were used in the analysis. Primary data was collected and analysed from residents of the sub-county from all the wards. Descriptive analysis was employed using SPSS and results presented in tables and charts as applies. The study found that water resource management projects in Bureti sub-county have contributed immensly to the resilience of community members in terms of mitigating the effects of drought. The results have also shown that the community was largely involved in the management of water resources in their areas. The results also revealed that the residents of Bureti sub-county are aware of a number of water resource projects in their areas. Based on the findings, this study concludes that in water scarce areas, water resource projects are critical in alleviating the dire challenges and hence can positively contribute to community resilience especially in times of drought. The study recommends that it is important that more investments are made in the water sector. These investments in water resource management will go a long way in enhancing community resilience within the country hence improve agricultural production. Secondly, the study recommends that there is need for stakeholders with the water sector to work together as a unit. Lastly, the study recommends that the financiers of various water resource projects should create avenues for communicating with the community members on the projects they are carrying out and how they intend to implement them.

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DEDICATION

I dedicate this project to my lovely family.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

1.0 INTRODUCTION

1.1 Background of the Study

Water supply and sanitation are among two of the most important sectors of development (Bendahmane 1993). Development of community water supplies and sanitation results in improved social and economic conditions and improved health (Davis et al. 1993).According to a recent WHO report, 8 out of 10 people without improved drinking water sources live in rural areas while an estimated 2.4 billion people do not have access to improved sanitation. The majority of these people live in Asia and Africa(WHO, 2015).

Water plays a key role in ensuring thecountry's agricultural production andsustainable economic growth. The water,sanitation and hygiene situation,particularly in rural areas remains aconcern. Although water is available, keybarriers to sustainable watermanagement include: arseniccontamination of the groundwater; poorhygiene practices; poor waterinfrastructure; degradation of riparian,floodplain and aquatic ecosystems;severe water pollution from industrial andmunicipal sources; unsustainablemanagement of water ecosystems,reduced water availability,and weak institutional arrangements (UNDP, 2013).

The concept of resilience is widely promoted as a promising notion to guide new approaches to ecosystem and resource management that try to enhance a system's capacity to cope with change. A variety of mechanisms of resilience specific for different systems have been proposed. In the context of resource management those include but are not limited to the

diversity of response options and flexibility of the social system to adaptively respond to changes on an adequate scale (Schluter & Pahl-Wostl, 2007).

Droughts resulting in complete crop failure are common in Eastern and Southern Africa. We are at present experiencing a regional crisis, where crop failures related to drought are threatening the lives of millions of people in several countries in Southern Africa. A major challenge is to seek ways of mitigating and coping with droughts in small-holder farming systems, particularly in semi-arid regions which are most hardly hit by the effects of drought. An entry-point for drought mitigation is to build water resilience of present rain fed farming systems. The water balance is a good starting point to assess the options. As has been argued for decades, the term drought is much debated, and the boundaries between droughts being politically and biophysically defined is not sharp. Often crop failures and social suffering are blamed on drought, while in reality the causes are more complex than only a decline in rainfall. A challenge is to find management strategies to deal with the unreliable and extremely variable rainfall in savannah environments (Rockstrom, 2003).

There has been much debate over the definition, implementation,and evaluation of resilience since the seminalwork of Hashimoto et al. (1982). Resilience has many subtlydifferent definitions (Francis and Bekera 2014) and has beenelaborated upon in social, technical, and socio-technicalframeworks (Schoen et al. 2015). Fiksel (2003), for example, considers aresilient system one that is able to survive large perturbations.This paper uses the resilience definition of Butleret al. (2014), “the degree to which the system minimizes levelof service failure magnitude and duration over its design lifewhen subject to exceptional conditions”;

essentially, it is ameasure of how the system performs when subject to unexpectedthreats that exceed design conditions and the systemis unable to meet the required level of service. Alternativedefinitions include the need for rapid recovery (Jones andSchmitz 2009) and prescribe specific capabilities that aresilient system should possess, such as the ability to adaptand learn (Folke et al. 2002). However, these all aim to reducethe magnitude and duration of any failures and are, therefore,captured in the aforementioned definition.

There has been some gradual change in approaches towater management, with increasing research into resilience(Mugume et al. 2015b) and adaptations(Haasnoot et al. 2013) for example, butchange in practice and actualization of these ideas has beenslower. The World Health Organization has recognized theimportance of water supply and sanitation resilience in theface of climate change in their 2030 vision (WHO andDFID 2009), and the resilience of water resources has beena focus of the IPCC (IPCC 2001). The United Nations alsorecognizes that improved water management is critical toensuring sustainable development and have recommendedbuilding long-term resilience through stronger institutionsand investment in infrastructure (UN-Water 2010).

Farmers of the target ward typically pursue low-input/low-output business models that are high risk in terms of outputs over the long term, but attractive due to their low input nature, and hence perceived low risk, in the short term. Many are therefore barely able to produce enough food to sustain their families. These groups rely on key ecological systems that have been degraded over many years and face increasing pressures from shifting weather patterns. The combination of land degradation, soil erosion, high surface-run-off and reducing rainfall

make livelihoods progressively marginal. Weakening social systems such as natural resource governance and lack of extension services compound high rates of vulnerability and mean even modest deficit or excess rainfall can impact negatively on already low outputs. Additionally communities have very little access to savings or credit facilities. As vulnerability to external shocks and stresses grow, communities become either increasingly risk averse, sticking resolutely to traditional approaches which limit their ability to adapt to climate change. Consequently, communities resort to negative coping strategies, such as the increased encroachment of water ways for agricultural use or collection and sale of fuel wood and charcoal, undermining long-term sustainable livelihoods and local natural resources(Kenya Information Guide, 2017).

The most population growth in the world belongs to Africa while actual crop yield, aspercentage of potential yield, is 40% for North Africa, and it is less than 30% for Sub-Saharan Africa (FAO 2012). Therefore, agricultural water management needs to a specificattention in Africa. The different aspects of irrigation in agricultural water management suchas irrigation efficiency soil salinity, water-saving, sustainable development, soil water management and crop yield as well as importance of the different studies in various aspect of water sciences have been investigated in the previousworks. Also, FAO (2011a, 2011b) showed that pressure on water resources due to irrigationwould be increased by 2050. Namara et al. (2010) mentioned the role of agriculturalwater management to reduce poverty in the world via three pathways. Those are improvementof production, enhancement of employment opportunities and stabilization of income andconsumption using access to

reliable water (first pathway), increasing high-value products(second pathway), and finally by its role in nutritional status, health, societal equity andenvironment (third pathway).

1.2 Statement of the Problem

Few would argue with the view that the coming decades will see major challenges to the management of water in cities worldwide, with existing water infrastructure subject to many emerging threats, including climate change, urbanization, asset deterioration, limited resources, and tightening regulation. While currently used methods may be able to cope with future threats individually, water management will become more difficult under highly variable future scenarios, with numerous interconnected global stressors affecting the quality, quantity, and availability of water worldwide (Zimmerman et al. 2008). Recent experiences have revealed serious problems (Hamilton 2009), and levels of service will be significantly challenged by multiple threats and the speed, magnitude, and uncertainty of future change without new ideas and approaches (Butler et al. 2014). Conventional planning and development relies on the ability to project future change (Gleick 2000) and focuses on technical solutions to well-defined problems (Pahl-Wostl et al. 2011). However, to successfully address contemporary challenges and provide sustainable urban water management, a transition or shift in paradigm is required (Pahl-Wostl et al. 2011; Brown and Farrelly 2009).

Bureti, a Sub-County in Kericho County is a predominantly horticultural zone located in the South- Western part of Kenya. Horticulture is the vital source of food and income in a population of about 1 million residing in the zone. In normal years the zone is one of the

major sources of horticultural supply in the local and international markets. During the recent years, Bureti Sub-County has repeatedly experienced different challenges as a result of varying weather patterns. More frequent dry spells and flooding are among the critical consequences of changing weather patterns in the Greater Horn of Africa. Reduction in amounts of available water, has badly affected the livelihoods of the communities and the overall food security in the area. It has been difficult to obtain official estimates of the actual loss of income resulting from the cyclic changes in weather patterns(Kenya Information Guide, 2017).

Currently, there are a number of water resource projects being carried out within the county but no evaluation has been conducted to find out how the projects are contributing towards community resilience. Therefore, there is a gap that the present study sought to address by exploring the role of water resource management projects in enhancing the resilience of communities within Bureti Sub-County in Kericho County.

1.3 Purpose of the Study

The purpose of this study was to ascertain the extent to which water resource management projects contributes to the resilience of communities.

1.4 Research Questions

1.4.1 How do water resource management projects contribute to community resilience?

1.4.2 What is the role of the local community in water resource management?

1.4.3 What are the ongoing water resource projects in Bureti Sub-County?

1.5 Significance of the Study

1.5.1 Policy Makers

Water management is divided between the county and national government. As such, this study will be important to policy makers at both levels of governance in understanding how water resource projects can enhance community resilience as well as the role the local community plays in water resource management.

1.5.2 The Community

The Kericho County community will gain immensely from this study as it will act as an evaluation of how various water projects are helping the community cope with the vagaries of climate change as well as provide the community with a source material on the water projects available in the county as well as the important role the community plays in the management of water resources.

1.5.3 Academicians and Researchers

The results of this study will be significant to academicians and researchers in the field of water resource management as they will get to know how community resilience can be built due through water resource management projects.

1.6 Scope of the Study and Limitations

The study focused on the concept of water resource management. Thus, the conceptual scope is water resource management and its contribution to community resilience. The contextual

scope were the seven wards inBureti Sub-County in Kericho County in Kenya. The study was carried out between May 2017 and August 2017.

One of the limitations of this study was that some respondents were unwilling to take part in the study and therefore did not respond to the questionnaires. This was mitigated by having an official letter from the school which stated that the data was for academic purposes only and therefore the anonymity of the respondents would be of utmost importance to the researcher.

The study also anticipated that it may be impossible to reach all the sub-counties in Kericho and therefore settled on only one sub-county. This limits the applicability of the study to all other sub-counties as well as other counties in Kenya. This was mitigated by conducting an in-depth study where relevant lessons will be learnt by other counties and sub-counties. The analysis was systematic and thorough.

1.7 Definition of Terms

1.7.1 Water Resource

The physical, chemical, biological, economic, cultural, and many other useful "assets" of the nation's wetlands, streams, rivers, lakes, and coastal oceans (Cardwell, Cole, Cartwright, & Martin, 2006).

1.7.2 Water Resource Management

The handling and control of water resources to accomplish some goal or objective ((Cardwell, Cole, Cartwright, & Martin, 2006)).

1.7.3 Resilience

The degree to which the system minimizes levelof service failure magnitude and duration over its design lifewhen subject to exceptional conditions (Butler et al., 2014).

1.7.4 NGO/Donors

The terms were used interchangeably in the study in accordance to the layman understanding of the respondents in the study area who assume that both are one and the same.

1.8 Section Summary

The section has presented a background of the study where the concepts of water resource management and resilience. The research problem has also been clearly outlined. The section has also elucidated on the purpose of the study as well as the research questions. The justification and scope of the study are also 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 2

2.0 LITERATURE REVIEW

This section reviews presents a review of literature. First, a theoretical review is presented where the social learning as well as the resource dependency theories are discussed. This is followed by an empirical review on the contribution of water resource management on the resilience of communities, and the role of communities in water resource management. Lastly, a chapter summary is presented.

2.1 Theoretical Literature

The theory that best describes the water resource management is the social learning theory.The first attempt to define the term and expound a theory was provided by Miller and Dollard in 1941. They suggested that individuals observe the behaviour of others, transform it into cognitive representations and execute the behaviour if it is associated with benefits, rewards or any incentives (Miller and Dollard 1941). Miller and Dollard's work initiated a flood of social learning theories, among which the work of Bandura is considered to be the broadest and most comprehensive (Kihlstrom and Harackiewicz 1990).

Bandura's theory of social learning highlights the importance of observing and modelling the behaviours, attitudes and emotional reactions of others (Bandura 1977). Authors from the domains of human resources and knowledge management have extended the sphere of application for social learning beyond the psychological level to investigate how groups (Davis and Witte 1996, Baron et al. 2003) and social organisations(Argyris and Schon 1978, Lave and Wenger 1991, Argyris 1993) learn through interaction and collaboration.

Despite the lack of a coherent theoretical foundation and a clear definition, a common understanding of the process social learning entails, its outcomes and contributions to natural resource management emerges from the literature. At the core of these models is a process of collective and communicative learning, which may lead to a number of social outcomes, new skills and knowledge. More specifically, it is thought that the generation of new knowledge, the acquisition of technical and social skills as well as the development of trust and relationships may form the basis for a common understanding of the system or problem at hand, agreement and collective action (Webler et al. 1995, Maarleveld and Dangbe´gnon 1999, Pahl-Wostl 2002, Ro¨ ling 2002, Craps and Maurel 2003, Woodhill 2004, Keen et al. 2005).

Water is a natural resource and, therefore, this theory fits into water resource management discussions especially where communities have to be involved in the management of water resources. Through collaboration of community members, there is social learning that enhances better water resource management and, therefore, leads to resilience of these communities in the long run.

The main argument in the resource dependency theory is that resources are key to success and that access and control over resources is a basis of power. Strategies must be considered in order to maintain open access to resources. In this study, the resource in focus is water which is key for the residents of Tebesonik Ward, whose main source of livelihood is horticulture. Lack of reliable water source for this community would mean adverse effect on

their livelihood. Hence they are dependent on water as a key resource for their economic activity.

2.2 Community Participation in Water Management

Scholars have debated the controversial issues surrounding the ways that community and participation have been conceptualised, mobilised and deconstructed in natural resources management and development literatures (Williams 2004). Despite critiques of exclusions, captures and marginalisation, the considerable staying power of notions of community and participation in development policies has resulted in a proliferation 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 and Zwarteveen 2001). 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. 1997). 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 (1997, 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 (1997) 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 2003). Mosse (1997 2003) 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 organisations (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 2001; Cooke and Kothari 2001). As such, participation is linked to notions of deliberative democracy (Hickey and Mohan 2004). Cooke and Kothari (2001) posit that participation has become hegemonic in development discourses, yet generally conceals the processes of unjust and illegitimate exercises of power.

Agarwal (2001) further argues that participatory institutions are often socio-economically inequitable and perpetuate unequal relations of power. While Ribot (2004) 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 2004). Networks of relationships of reciprocity and livelihoods may also mean that people make decisions to support dominant institutions and not challenge them (Cleaver 2003).

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.

Furthering these debates are contributions made by scholars who have looked at either the gendered dynamics of community / participation and / or the spatiality of the processes of community / participation. It is important to look at these issues simultaneously, in addition to paying attention to the roles and spatiality of nature. By undertaking a gender analysis,

Cleaver and Elson (1995) expound that community water management schemes may not be equitable and lead to further marginalisation of poorer women in accessing water. Gendered 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 and Wallace 2005). If the beneficiaries / participants are conceptualised 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 institutionalised.

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 generalise across all women or even men (Cornwall 2003). 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 marginalised men are also excluded, which is often not captured by only focusing on women (as demonstratedin the case study section later in thisarticle).

Participation is often portrayed as increasing the'empowerment' of women, but recent evidencesuggests that many women are disempowered andmarginalised in the process (Cornwall 2000). The critical assessment of how participationis conceptualised and a gender perspectiveon who participates, in what capacity, to what effectand with what means, is important in understanding.

the outcomes of participatory management institutionsbeing set up as the solution to water resourcesmanagement problems as well as achieving problematicnotions of 'empowerment'. For instance,women's participation in the process of planningor decision-making regarding water resources, generally seen as a male domain, is constrained by gendered responsibilities (both productive and reproductive), time, costs, as well as local norms of what is deemed appropriate gender behaviour (Cornwall 2003).

Agarwal (2001) posits 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 behaviour and actions (for example speaking in public forum, gender division of labour), 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 spatialised process, taking place in specific spaces and places, which are gendered. As a result, spatialised subjectivities can discourage people from speaking in public, and people may perform differently in different spaces (also Kesby 2005 2007). For instance, when meetings take place in bazaars, it is more difficult for women to attendmeetings (as these are gendered spaces for men).Public space and decision-making in participatorydevelopment projects in many places also excludewomen largely due to notions of appropriate femininebehaviour as well as practices of purdah (variedpractices of veiling and seclusion that curtailwomen's mobility as well as public behaviour).

Given that participation activities are largely conductedin public spaces, or what are perceived tobe public activities of decision-making and sharingopinions, notions of femininity and masculinity canbe challenged when women and marginalised menare involved. This results in both women and menbeing uncomfortable with projects that attempt tohave participatory planning sessions or public committeemeetings. These gendered subjectivities andidentities are shifting, contested and rethought indevelopment projects so that they make sense toeach individual in what it means to be a 'good'man or woman,

husband or wife, son or daughter,within the contexts of other factors, experiencesand goals in their lives. Thus, women's mobilityand autonomy, as well as decision-making powers,are spatially curtailed in addition to the socioculturalideologies of their capacities and rights toparticipate in decision-making fora. Such participatoryexclusions can be powerful in highly unequaland patriarchal settings (see also Sultana 2009).

Greater attention to both gendered identities andagency are thus important in understanding howand why men and women participate in watermanagement projects or not (Resurreccion, 2006). Thus, women canmanoeuvre through patriarchal structural forces inresisting, challenging and reproducing power relationsthat operate in the ways that participationplays out in water management. Heeding subjectivitiesof femininity and masculinity that are associatedwith activities of participation helps explainwhy different people relate to community participationin the ways they do. Partaking in water projectsis bound up with sensitivities beyond the'rational' water user that is assumed in participatorydevelopment projects, where water users areexpected to automatically want to participate anddo so with unified and collective identity. This isgenerally not the case. People display varyingopinions and agency in the ways that water projectsfunction in their locality, and what it means intheir own access to safe water. Such realities arenot just socio-culturally defined, but also inflectedby various understandings of water contaminationand relations to water. This is where a closer attentionto nature/water comes to make a difference.

2.2 Empirical Literature

Water management faces major challenges over the coming decades, with existing social, ecological, and technical water subsystems subject to emerging global threats such as climate change, urbanization, and depletion of resources. Current methods may be able to deal with these threats individually; however, recent experiences have revealed serious problems, and, without new ideas and approaches, levels of service will be challenged significantly by future change. The study by Butler, et al., (2017) provided a framework that addresses the need to provide safe (reliable) water management that is also resilient and sustainable in the face of emerging threats and highlights opportunities for intervention. In doing so, it aims to provide greater clarity to decision makers, allowing better informed choices to be made. It also connects the additional global challenges of climate change, energy, food production, agriculture, and health, all of which may be threats to water management and/or consequences of water system failure.

Whittington, et al., (2009)reports the main findings of a multi-country research project designed to develop a better understanding of the performance of community-managed rural water supply systems in developing countries. Data were collected from households, village water committees, focus groups of village residents, system operators and key informants in 400 rural communities in Peru, Bolivia and Ghana. Our findings suggest that the demand-driven, community management model, coupled with access to spare parts and some technical expertise, has come a long way toward unravelling the puzzle of how best to design and implement rural water supply programs in developing countries. In all three countries, rural water supply projects were working. Among the households included in our sample in Peru and Bolivia, 95% had operational taps at the time of our field visit. In 90% of the

villages in Ghana, all project hand pumps were still working. Not only had the rural water systems not broken down, but almost all the households in these communities were obtaining at least some of their water from the systems. However, some households were also still using water from other sources. In Ghana, 38% of households still reported using water from unprotected sources for drinking and/or cooking. Another troublesome finding is that rural households in the sample villages are paying very little for the improved water services and, as a result, the finances of many village water committees are in poor shape.

According to Schluter & Pahl-Wostl (2007), implementation of resilience-based management in specific real-world systems has often proven difficult because of a limited understanding of suitable interventions and their impact on the resilience of the coupled social-ecological system. They, therefore, proposed an agent-based modelling approach to explore system characteristics and mechanisms of resilience in a complex resource management system, based on a case study of water use in the Amudarya River. They carried out simulation experiments to compare the resilience of different institutional settings of water management to changes in the variability and uncertainty of water availability. The study revealed that under the given conditions of a regularly fluctuating inflow and compliance of agents with orders from a national authority, the centralized system performs better as long as irrigation is the only type of water use. Diversification of resource use, for example, irrigation and fishing, increases the performance of the decentralized regime and the resilience of both. Systematic analysis of the performance of different system structures will help to identify properties and mechanisms of resilience.

Armitage (2005) sought to answer why some community-based natural resource management strategies perform better than others. Drawing on examples from northern Canada and Southeast Asia, the study examined the relationship among adaptive capacity, community-based resource management performance, and the socio-institutional determinants of collective action, such as technical, financial, and legal constraints, and complex issues of politics, scale, knowledge, community and culture. The study found that an emphasis on adaptive capacity responds to a conceptual weakness in community-based natural resource management.

Rockstrom (2003) examined the small-scale management practices to mitigate drought in semi-arid rain fed farming. The focus was on water harvesting systems for supplemental irrigation. It was shown that with relatively simple and cheap means it is possible to build resilience to deal with water scarcity in semi-arid farming systems. If such measures are combined with efforts of maximising plant water availability and plant water uptake capacity, there are good chances of mitigating certain droughts. Conservation tillage systems have proven to maximise rainfall infiltration and storage of water in the soil, enabling even crops lacking supplemental irrigation to bridge severe dry spells. Interestingly, building resilience in rain fed farming systems is also a means of water demand management. More crop is produced per drop of water in resilient farming systems, which reduces the amount of water needed to produce food.

Burton, Marsh, & Patterson (2007) examined the attitudes towards catchment management, for two community groups: residents of Perth and residents of rural towns in the catchment. These surveys elicited general attitudes towards the environment and agriculture, and views

on responsibilities for managing the catchment. It also included a choice modelling section, where the attributes under consideration included the area of land under salt and trees, ecological risks to off-farm wetlands and risk of flooding, farm incomes and personal financial contributions to a management fund. Preliminary results indicate that residents of both rural towns and Perth are willing to pay to avoid damage to the natural environment, both on and off-farm, as well as the risk of flooding. Perhaps more surprisingly, whether farmers' incomes were being negatively affected in a choice set has a very strong impact on the choice made.

Kyessi (2005) studied the community-based urban water management in fringe neighbourhoods in Tanzania. The study noted that a notable phenomenon has emerged in informal and formal settlements where the communities, through self-help and local governance in their own neighbourhood associations, have organised to fill the gaps in infrastructure services left by the centralised institutions. Among other things, community groups mobilise and organise fund-raising, mutual self-help and external technical assistance to provide water supply and sanitation, roads and drainage channels within the immediate area. This seems to be a trend in infrastructure improvement in poor neighbourhoods including fringe settlements. Actors observed to be participating in the process of providing the basic services and facilities in some of the fringe settlements include Daresalaam City Council (DCC), the civil societies including political party organisations and private individuals as well as youth and women groups, and the donor community. This paper discusses the potentials and constraints existing in the provision of basic infrastructure to fringe settlements taking water management as an example. Potable water was chosen to

explain the case because these settlements are not connected to the Daresalaam Water and Sanitation Authority (DAWASA—a centralised institution) water supply system and are remotely located. Potable water as an essential need plays a major role in health development and if water is not easily accessible much time is wasted to search for it. One of the questionsanswered in the study was how the residents, most of them being poor, are coping up with the deficiency of water supply in their fringe areas.

Valipour (2015) sought to estimate the ratio of area equipped for irrigation to cultivated area (AI) in Africa in 2035 and 2060 using studies of agricultural water management from 1962 to 2011. For this purpose, all necessary information was gathered from Food and Agriculture Organization of the United Nations (FAO) and their values were checked using The World Bank Group (WBG). Among all presented data in the FAO database, 10 indices were selected (due to more importance and more availability for all the regions in Africa). The selected indices were analysed for all seven regions in the study area and the amount of AI was estimated by three different scenarios and using other nine indices. The results show that changes of AI are 0.3% to 49.5% and 16.5% to 83.2% from 2011 to 2035 and 2060, respectively. Indian Ocean Islands has a better potential to increase AI in the future. A considerable note is the change of irrigation status in the future than the current status. In 2011, AI of Sudano-Sahelian is more than AI of Indian Ocean Islands, however, in the future; AI of Sudano-Sahelian would be less than AI of Indian Ocean Islands based on all scenarios.

Barthel & Isendahl (2013) discussed lessons for food security from historic and prehistoric cities. The Chicago school of urban sociology established a modernist understanding of urbanism as an essentialist reality separate from its larger life-support system. However, different urban histories have given rise to a remarkable spatial diversity and temporal variation viewed at the global and long-term scales that are often overlooked in urban scholarship. Drawing on two case studies from widely different historical and cultural contexts – the Classic Maya civilization of the late first millennium AD and Byzantine Constantinople – this paper demonstrates urban farming as a pertinent feature of urban support systems over the long-term and global scales. We show how urban gardens, agriculture, and water management as well as the linked social–ecological memories of how to uphold such practices over time have contributed to long-term food security during eras of energy scarcity. We exemplify with the function of such local blue–green infrastructures during chocks to urban supply lines. We conclude that agricultural production is not "the antithesis of the city," but often an integrated urban activity that contribute to the resilience of cities.

Carter, Kreutzwiser, & de Loe (2005) examined the link between land use planning and water management. The study used a normative model, based on key principles, evaluative questions and benchmark criteria, which provides a practical and adaptable tool for the implementation and evaluation of integrated and sustainable management. This paper illustrated a method by which land use planning and water management activities may be evaluated through the development of a normative model, and discusses lessons learned from an application of the model to three study municipalities in the Province of Ontario, Canada.

Pahl-Wostl, et al., (2008) discussed the importance of social learning and culture for sustainable water management. Currently water resources management is undergoing a major paradigm shift. Water resources management has a strong engineering tradition based on controlling environmental problems with technical solutions. The management of risks relied on the ability to predict extremes and limit their impact with technical means such as dikes, dams and reservoirs. In this paradigm, belief systems, human attitudes and collective behaviours are perceived as external boundary conditions and not as integral part of management. However, the situation has started to change dramatically. Over the past years, integrated water resources management has become the reigning paradigm. The importance of governance and cultural adaptation has become a major issue of concern. At the same time, there is a paucity of adequate scientific concepts that would allow addressing these issues. This paper introduces a concept for social learning developed in the European project HarmoniCOP and discusses its implications for the cultural and institutional context of water resources management. It aims to contribute to the new paradigm of integrated resource management by discussing the importance of processes of culture and social learning for environmental resources management, in general, and water resources management, in particular.

Leahy & Anderson (2008)examined the factors of community trust in a water resources management agency. To describe trust factors in this context, a descriptive, interpretive qualitative case study approach was applied. Specifically the U.S. Army Corps of Engineers (Corps) and key communities nearby or adjacent to water resources managed by the Corps

within the Kaskaskia River Watershed in central Illinois were examined. Trust between the communities and the Corps was the focus of analysis. This research is pertinent and practical because planners, managers, engineers, policy makers, and community stakeholders in many natural resources management situations are seeking better ways of working together that produce sustainable agency–community relationships. The findings suggest that local community trust factors relevant to the Corps are complex and critical to understanding the social context of natural resources management in the Kaskaskia River Watershed. The management significance of this research is a series of suggestions for improving relationships between communities, agencies, and agency managers based on the different factors of trust. Both formal and informal mechanisms are available to address important factors of trust.

Muller (2007) explored the physical and financial implications for urban areas of the potential impacts of climate variability and change on water resources, illustrated by examples from sub-Saharan Africa, which is likely to be one of the most vulnerable and most affected regions. Water management, which will be particularly affected by climate change, could provide an opportunity to initiate structured adaptation responses. Adaptation costs in the sub-Saharan urban water sector are estimated at between 10 and 20 per cent of current overseas development assistance to the region. This paper suggests that additional funding should be made available in terms of the "polluter pays" principle, and should be channelled through government budgets rather than ring-fenced climate funds. This would help ensure that "climate proofing" is mainstreamed and would be in keeping with current trends in

overseas development assistance reflected in the 2005 Paris Declaration on Aid Effectiveness.

Although stakeholder participation is expected to promote equitable and sustainable natural resource management, lessons from the past tell us that more careful attention needs to be paid to achieving equitable impacts. Now the question is how to address social inequities and power asymmetries. Some authors emphasize the need for more dialogue, while others prefer a critical perspective, arguing that dialogue might not be sufficient to avert the risk of a process deepening existing social inequities. Barnaud, van Paassen, Trebuil, Promburom, & Bousquet (2010) aimed at enriching this debate and questioned the practical implications of the critical perspective through an in-depth analysis of power games in a participatory process.A Companion Modelling (ComMod) process was conducted in an Akha community of Northern Thailand with a critical perspective, i.e. with a concern for the less influent stakeholders. Simulation tools such as role-playing games were used to mediate a cross-cultural learning process among researchers, farmers and administrators about a local irrigation water management problem. The detailed analysis of power games in this learning and negotiation process reveals that in spite of initial power asymmetries, the poorest farmers of the community started to voice and assert their interests. This was very much due to the role of a Western researcher who put the equity issue on the public agenda and to the strategic support of a charismatic Christian leader.The study identified a set of practical facilitation methods that helped to manage power asymmetries and to level the playing field, but we also discuss the main limits of our cultural-embedded methodological choices. Acknowledging that ‘the facilitators’ neutrality' is an illusion, this study allows us to raise the

question of their social legitimacy. The study suggested that they should systematically make explicit and reflect on their cultural-ideological background and methodological hypothesis and choices and their effects on the socio-political context.

Harvey & Reed (2007) write that over the past two decades, community management has become the prevalent model for management of rural water supplies throughout sub-Saharan Africa. Despite its widespread popularity among donors and implementing agencies, low water supply sustainability levels throughout the sub-continent indicate that it is not the panacea it is often presented to be. There is a strong need to distinguish between 'community participation' which is a prerequisite for sustainability and 'community management' which is not. If community management systems are to be sustainable, they require ongoing support from an overseeing institution to provide encouragement and motivation, monitoring, participatory planning, capacity building, and specialist technical assistance. If such support is not available, alternatives such as household water supplies and private sector service delivery should be considered.

Community and participation have become popular in development discourse and practice, particularly in the global South and in relation to water resources management. Greater involvement of people in decision making, implementation and evaluation of water management practices is expected to increase efficiency and equity in water projects. However, scholars have pointed out that such discourses are often problematically used and idealised, leading to the exacerbation of gender, class and other social differentiations. Drawing from a case study of drinking water contamination by arsenic in Bangladesh,

Sultana (2009) examined the mobilisation and outcomes of participation and community in water provision and arsenic mitigation. Water hardship, conflicts and marginalisation's are found to be products of social processes (that are gendered, classed and spatialised) as well as natural processes (local geohydrology, depth of arsenic sediments), in addition to the very ways that community and participation are conceptualised and practised. Nature/water comes to play a critical role in the ways that development interventions play out, thereby complicating the general debates around community and participation. This article sought to problematize the ways that considerations of both the roles of nature and gender power relations can be more critically and productively engaged in development geography. As such, the article brings together debates in nature–society geography and development geography to argue that scholars studying community and participation need to pay greater attention not only to gender and spatial power relations, but also to the importance of geographical locations and the agency of heterogeneous nature in the ways water management and development interventions fail and succeed, and are thereby critiqued. More adaptive, reflexive and inclusive development realities that are simultaneously embedded in society and nature may then be envisioned, and more nuanced understandings of nature-in-development enabled.

Evidence supporting the claim that women's participation in large-scale rural water supply projects leads to improved project outcomes is largely limited to isolated case studies. Prokopy (2004)attempts to fill this gap by examining data from 45 villages in two World Bank-assisted projects in India. Using data from a variety of sources, including water committee members, household surveys and focus groups, women's participation is quantified - what percentage actually attend meetings or are involved at higher levels of

participation such as decision-making? While it is determined that, in some cases, female committee members are nominal, or token, participants, there is evidence that being on a local water committee helps women develop skills and confidence. Overall community participation is found to have a positive and significant relationship with different measures of project success; however, women's participation at the levels observed in this study is found to have no relationship to project success.

Community participation, ownership and cost sharing are key components of Tanzania's water policy, in common with the broad international consensus on water governance. However these policy goals are difficult to achieve, beset with paradoxes and their benefits may be overstated, both in terms of efficiency of resource management and equality of outcomes. Cleaver & Toner (2006) drew on longitudinal ethnographic research of a village water supply in Tanzania to explore two issues: the contested nature of community ownership and the complex evolution of a 'community-owned' institution. The evidence from the Uchira Water Users Association leads us to question some of the simplistic assumptions made concerning the capacity of local communities to manage service delivery and to balance equity and sustainability principles.The limitations of 'bottom-up' and demand led approaches need to be recognised without discrediting their potential for challenging inequalities. The article concludes with a consideration of some of the tensions in community-driven development, which raises some important questions about the role of the State and external agencies in setting and enforcing equity criteria in community-managed initiatives.

Sustainable functionality of rural water infrastructures is a major challenge in Nepal, as elsewhere. This paper looks at systems for improved community-based water supply and sanitation management in the Rural Village Water Resources Management Project (RVWRMP), in mid and far west Nepal. White, Badu, & Shrestha (2015) analysed 496 rural, community-managed drinking water and sanitation schemes (with 30 to 250 beneficiary households per scheme) supported by RVWRMP (2006–2014). Observed results are: 91.5% fully functional, 8.3% partially functional and 0.2% of schemes closed due to natural disasters and social conflicts. This compares very favourably to the systems implemented by the government of similar age. We consider that the experience gained in RVWRMP provides relevant lessons on how to safeguard the functionality of rural water services infrastructure systems. The key elements noted by our staff are: prioritisation of the schemes by the community; application of quality implementation and user committee management; Water Safety Plans and active maintenance; and hands-on technical support and monitoring.

The Government of Cameroon's lack of priority for rural water supply has motivated rural communities to harness their internal capacity and networks for self-help community water supply projects. The emerging paradigm of joint water supply projects between communities in rural Cameroon and large corporations, with both parties as principal beneficiaries (unlike self-help projects where the principal beneficiary is the community), is examined. The findings of Folifac & Gaskin (2011), based on the Mautu community and the Cameroon Development Corporation (CDC) joint project, suggest that this paradigm can be an attractive alternative for rural communities to gain access to piped water systems. However, to ensure long term performance of the rural community's distribution network, the more

experienced corporate partner should negotiate a fair agreement, integrate capacity building for operation and maintenance, and include future growth and increased demand in the design of the community's network. Significant inequity during design of the supply to the two partners can lead to the dysfunction of the community system and trigger the perception of profiteering by the corporate partner resulting in subsequent vandalism. It is recommended that such joint partnerships be regulated and that local institutions working with rural communities should educate them on available support services.

Alderwish & Dottridge (2013)compares rural water supply (RWS) and sanitation project schemes where national policies on RWS had been adopted against schemes constructed by public authorities as part of the General Authority for RWS Project. This evaluation tests the policies and provides a comparison of donor supported and government projects. The results indicate that policies will result in relatively high levels of beneficiary satisfaction and will increase the likelihood that the communities will sustain the systems over their design lives. More confidence in Water User Associations as governing and management bodies for water schemes is medium and more transparent selection processes are required. Although beneficiaries are agreeing to and paying tariffs that cover operation and maintenance costs, it affects the quantity of water they use and leads to negative health impact. High percentages of respondents have expressed dissatisfaction with current water charges, water quantity and water quality. Findings suggest that RWS Project's strategy for developing communities' capacity and meaningful involvement in planning and managing their own water systems is effective, however, progress is needed in two areas: RWS subsector still lacks a clearly

agreed strategy and a demand-responsive approach should be adopted strictly in all programs.

As one of the basic human needs, water services should be sustainable. Researches related to the sustainability of water services have been conducted in several developing countries. However, there are no identical researches in Indonesia. Masduqi, Endah, Soedjono, & Hadi (2010) analysed factors that contribute to sustainability of rural water supply systems in East Java, Indonesia. Data is collected by observing rural water supply facilities, interviewing water committees and water users, and taking documentation. The data is used to build a model, which was developed from theoretical or conceptual model. The model's development uses structural equation modelling (SEM). This model can show the factors that contribute to sustainability of rural water supply systems. The sustainability is influenced significantly by nine variables; they are selection of technology, water sources, investment cost, and capability of operator, availability of spare parts, operation cost, technical operation, community participation, and institutional management.

2.3 Section Summary

This section has presented the literature review where a review of studies on the research questions has been done. More specifically, the section has reviewed the social learning and resource dependency theories in relation to water resource management and also reviewed a number of studies on water resource management and their contribution to resilience of communities as well as how communities can be engaged in water resource management. The next section is the methodology.

CHAPTER 3

3.0 RESEARCH METHODOLOGY

This section discusses the research methodology adopted in this study. Specifically, I give an explanation of the methods that were used in this study. It describes the project area, population, sample and sampling design, data collection and data analysis techniques.

3.1 Research Design

Research design is the blueprint for conducting the study that maximizes control over factors that could interfere with the validity of the findings. Designing a study helps the researcher to plan and implement the study in a way that will help the researcher to obtain intended results, thus increasing the chances of obtaining information that could be associated with the real situation, (Burns and Grove, 2001). A research design is defined as a blueprint for conducting a research project, (Malhotra and Birks, 2006). This study sought to examine the contribution of water resource management projects on the resilience of communities. This study therefore adopted a descriptive study design. It is important to note that descriptive research can be cross-sectional or longitudinal. Under this classification, this study design is cross-sectional in nature since data was collected from homogenous sample at a particular instance in time.

3.2 Study Area and Population

3.2.1 Study Area

Kericho County lies between longitude 35º 02’ and 35º 40’ East and between the equator and latitude 0 23’ South. The county is bordered by the UasinGishu County to the north, BaringoCounty to the northeast, Nandi to the northwest, Nakuru County to the east and Bomet County to the south. It is bordered to the South West by Nyamira and Homa Bay Counties and to the West by Kisumu County. The county covers a total of 2,479 km^2.The county is composed of six sub-counties, namely, Kipkelion East, Kipkelion West, Kericho West/Belgut, Kericho East, Sigowet/Soin and Bureti.Bureti Sub-county is a predominantly horticultural zone located in the South- Western part of Kenya. Horticulture is the vital source of food and income in a population of about 1 million residing in the zone.Bureti Sub-county has seven wards namely; Kisiara, Tebesonik, Cheboin, Chemosot, Litein, Cheplanget and Kapkatet; which comprised the detailed study. Bureti sub-county falls under Lake Victoria South Water Basin Authority.

3.2.2 Population

Polit and Hungler, (1999) refer to the total population of a study as an aggregate of all the objects, subjects or members that conform to a set of specifications. In this study the population was the residents of Bureti sub-county in Kericho County. The sub-county in 2012 had a population of 180,706.These formed the population.

3.3 Samplingand Sampling Procedures

3.3.1 Sampling Frame

A sampling frame could be a list of geographical areas, institutions, individuals, or other units added (Churchill and Brown, 2007). However a proper definition was provided by Cooper and Schindler, (2006) who deemed a sample frame to be a list of elements from which the sample is actually drawn and is closely related to the population. It is complete and correct list of population members only. There is agreement on this definition by Saunders, Lewis, and Thornhill, (2007), who define a sample frame as the complete list of all the cases in the population from which the sample is drawn. It is essential that the next step after the clear definition of population is the sampling frame. The sampling frame was the list of community members who are responsible for the management of water resources in Bureti sub-county and members of the community from the seven wards in it.

3.3.2 Sampling Technique

A sampling technique is the method of selecting elements from the population that represents the population (Collis and Hussey, 2006). A simple random sampling technique was employed to select the respondents for the study.

3.3.3 Sample Size

A sample is a proportion of a population that represents the characteristics of a population. The researcher selected a sample size of 50 respondents directly responsible for the management of water resources in the sub-county. This is because there are currently ten

water management committees in the sub-county from which 5 respondents from each committee was drawn. This represents 100% of the committees in the sub-county. Another sample was drawn from members of the public. In this case, a sample size of 600 was used. This was calculated using a sample size formula below. With a population of 180,706 people and a confidence interval of 4, the exact sample size is 598 which was rounded off to 600.

$$ss = \frac{Z^2 * (p) * (1-p)}{c^2}$$

Where:

Z = Z value (e.g. 1.96 for 95% confidence level)
p = percentage picking a choice, expressed as decimal
(.5 used for sample size needed)
c = confidence interval, expressed as decimal
(e.g., .04 = ±4)

To make the calculations easier, the author used the sample size calculator available from www.surveysystem.com by inputting the appropriate figures in the calculator. The calculator uses the sample size formula as described above. Then, it adjusts for a finite population using the formula shown below.

$$new\ ss = \frac{ss}{1 + \frac{ss-1}{pop}}$$

Where: pop = population

3.4 Data Collection Techniques

The study used primary data. Structured questionnaires were developed and organized on the basis of the research's specific objectives and administered to the sampled respondents. Since there is need to ensure that responses from the different respondents are uniform, the questionnaires were structured. There are various reasons for the choice of questionnaires as primary data collection instrument; they are not only versatile but also the most popular instruments and a relatively inexpensive way of getting information (Saunders et al., 2007).

The questionnaire consisted of structured (closed-ended) questions. Respondents were required to give their answers which were restricted to a 5 point Likert scale. The questionnaire had four sections. Section A dealt with the demographics of the respondents. Section B dealt with the water resource management projects in the sub-county. Section C dealt with the role of communities in water resource management while section D dealt with the contribution of water resource management projects on the resilience of the community.

After developing the research instruments, the researchersought permission to use them from the University. The researcher then carried out a pilot study to pre-test the questionnaires. Based on the outcome of the pilot survey, the instruments were amended and deployed to the sampled respondents using trained enumerators. To ensure high response rate, the questionnaires wereadministered through guided questionnaire interviews at the premises of the respondents or a place of their choice.

3.5 Data Analysis techniques

Completed questionnaires were checked for completeness and consistency. Data collected wascoded using a predetermined coding scheme and analysed both qualitatively and quantitatively. The data was organized and analysed using SPSS v.23 – statistical package for social sciences. Quantitative analysis was done using descriptive statistics, that is, frequency counts, percentages, means and standard deviations. The results of the data analysis were presented using charts and tables where applicable.The analysis was done based on each of the objectives of the study and the results interpreted and reported in chapter four of this paper.

3.6 Section Summary

The section has described the research methodology that will be used to carry out this study. First it has defined the research design, the study area and population followed by a description of sampling technique and size. There is further discussion on the data collection methods and the instruments that will be used. At the end, the section looked at the data analysis methods which was used by the researcher to analyse the collected data, and make conclusive remarks on the study.

CHAPTER 4

4.0 RESULTS AND FINDINGS

4.1 Introduction

This chapter present the results of the study. The first section presents the general information about the respondents while the second section presents the findings based on the objectives of the study. The findings are based on responses from 563 participants (35 officials and 528 members of the community). This is a total response rate of 87 percent. The age of respondents (not shown in the results) ranged from 21 years to 65 years with a mean of 36 years and a standard deviation of 10 years.

4.2 Demographics

Figure 1 shows the results on gender distribution of respondents. As shown, 63% were male and 37% were female suggesting a higher number of male respondents than female from the study area. This is not a true reflection of the gender composition in the area but more men than women were willing to take part in the survey hence the results.

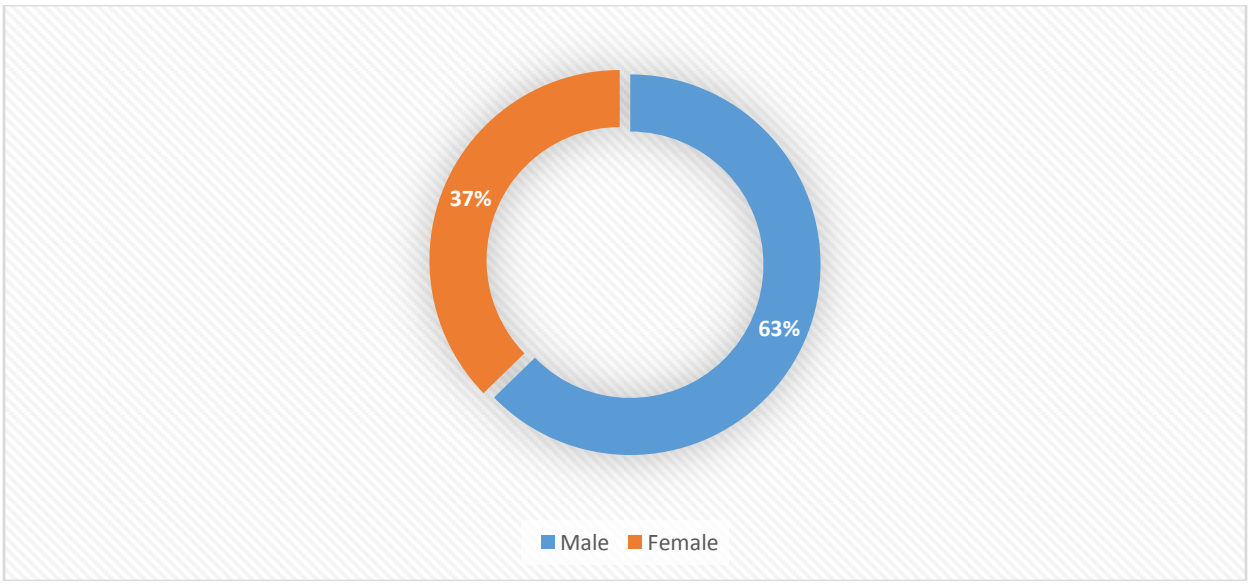

Figure 1: Gender distribution of respondents

Figure 2 shows the population pyramid of the sample respondents in Bureti Sub-County. The results show a fairly mid-aged population in the sub-county with female respondents dominating the 35-44 years age group while men dominate the rest of age groups.

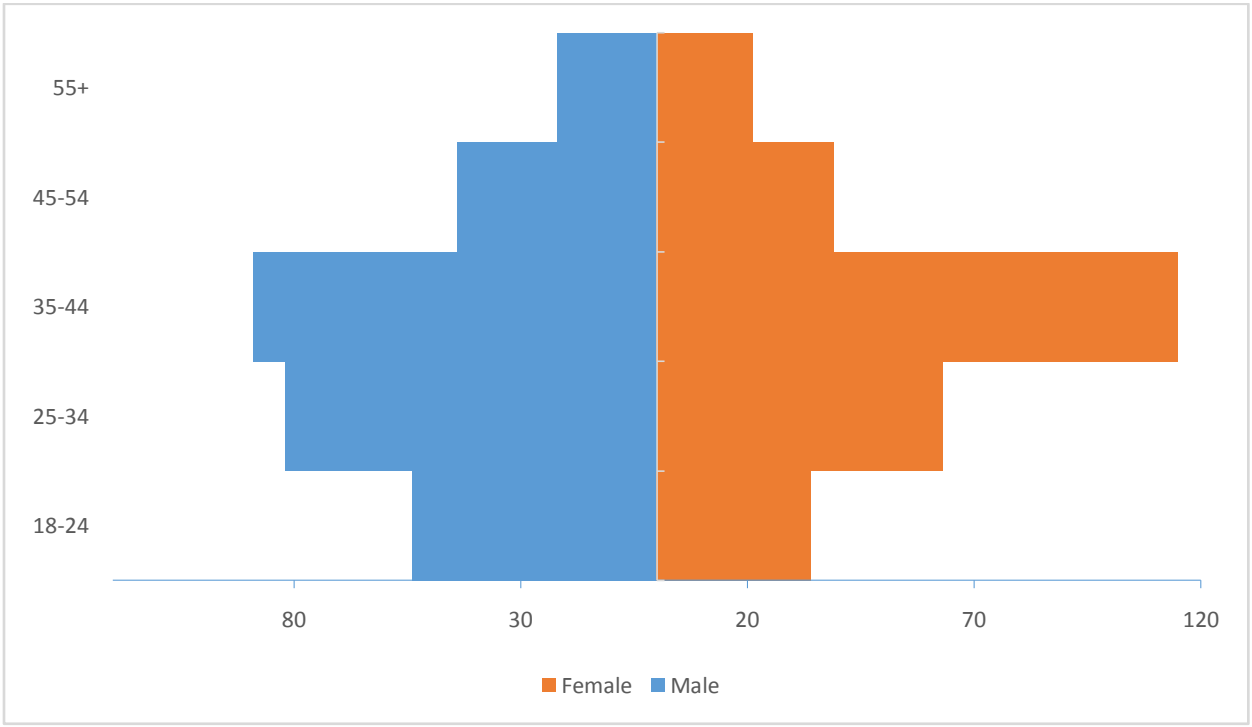

Figure 2: Sample population pyramid in Bureti Sub-County

Table 1 shows cross-tabulation results on the number of respondents by type of respondent and the county assembly wards. As shown, 94% of the respondents were drawn from the community members while only 6% were members or officials of various water committees. Figure 2 also presents the results in Table 1 by showing the composition of respondents by ward. The results show that most of the respondents were from Tebesonik Ward followed by Kapkatet Ward. The wards with the least numbers in the final sample were Chemosot and Litein.

Table 1: Distribution of respondents by ward and category

Ward		Committee member/official	Community member	Total
Kisiara	N	5	81	86
	%	5.80%	94.20%	100.00%
Tebesonik	N	5	123	128
	%	3.90%	96.10%	100.00%
Cheboin	N	5	72	77
	%	6.50%	93.50%	100.00%
Chemosot	N	5	54	59
	%	8.50%	91.50%	100.00%
Litein	N	5	54	59
	%	8.50%	91.50%	100.00%
Cheplanget	N	5	54	59
	%	8.50%	91.50%	100.00%
Kapkatet	N	5	90	95
	%	5.30%	94.70%	100.00%
Total	**N**	**35**	**528**	**563**
	%	**6.20%**	**93.80%**	**100.00%**

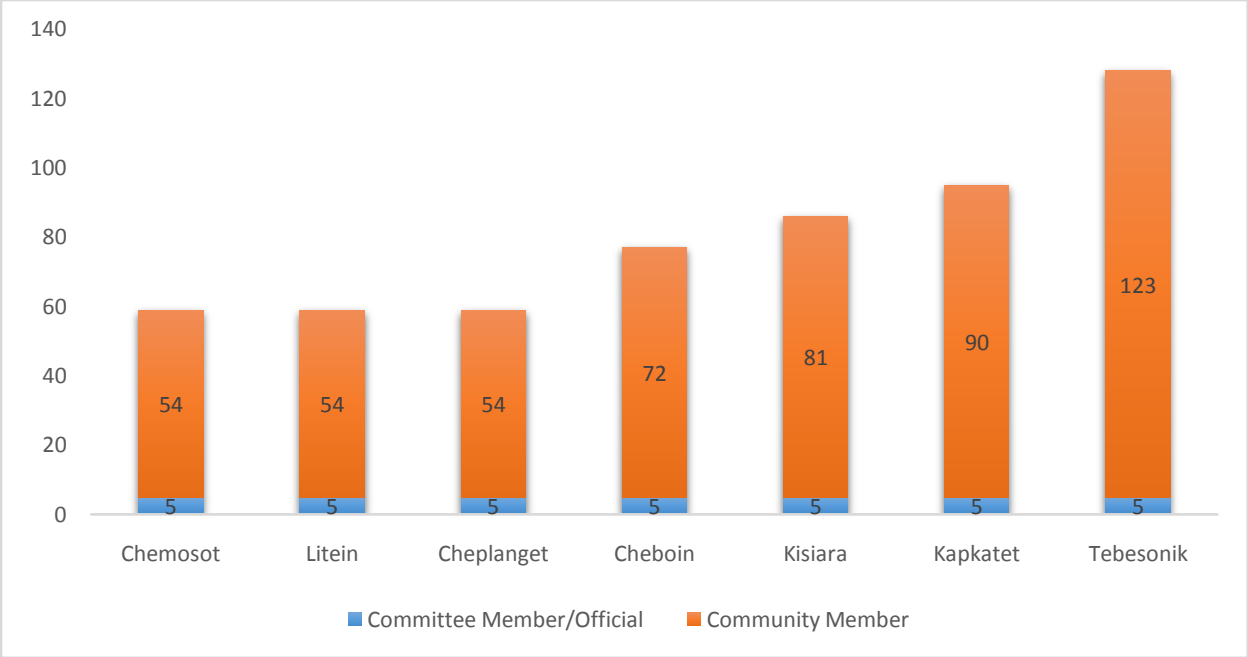

Figure 3: Distribution of respondents by per ward by category of respondents

4.3 Findings

This section presents the findings as per the three research questions. This section is organised into three parts. The first part focuses on the contribution of water projects to community resilience. The second part focuses on the role of community in water resource management and the third section focuses on water projects in the sub-county.

4.3.1 Water Projects and Community Resilience

Table 2 shows the results on the severity of water problems in the sub-county. The results are from a cross-tabulation between county assembly wards and the extent of water severity problems. The results show that the residents face a water problem as agreed to a large extent by 80% of the respondents. The most affected resident are those in Chemosot Ward (100%) followed by those in Kisiara Ward (99%). The least affected are those in Litein Ward (21%).

Table 2: Severity of water problems in various wards in Bureti Sub-County

Ward		Very low/low extent	Moderate extent	Very large/large extent	Total
Kisiara	N	0	1	85	86
	%	0.0%	1.2%	98.8%	100.0%
Tebesonik	N	0	19	109	128
	%	0.0%	14.8%	85.2%	100.0%
Cheboin	N	0	19	58	77
	%	0.0%	24.7%	75.3%	100.0%
Chemosot	N	0	0	59	59
	%	0.0%	0.0%	100.0%	100.0%
Litein	N	1	37	21	59
	%	1.7%	62.7%	35.6%	100.0%
Cheplanget	N	1	0	58	59
	%	1.7%	0.0%	98.3%	100.0%
Kapkatet	N	18	19	58	95
	%	18.9%	20.0%	61.0%	100.0%
Total	**N**	**20**	**95**	**448**	**563**
	%	**3.6%**	**16.9%**	**79.6%**	**100.0%**

The respondents were asked to rate the importance of water resource projects to their communities. The results are shown in Table 3. As shown, 67% of the respondents agreed that, to a large extent, these water projects were important. This goes to cement the importance of various water resource management projects in Bureti Sub-county to the residents within various wards. While the importance of the same to each of the residents in various wards varies by certain degrees, the results show that most of the wards rate the project importance highly with the exception of Cheplanget ward where 63% of the residents rate the importance of the water resource management projects low.

Table 3: Importance of water resource projects to the community

Ward		Very low/low extent	Moderate extent	Very large/Large extent	Total
Kisiara	N	0	0	86	86
	%	0.00%	0.00%	100%	100.00%
Tebesonik	N	18	18	92	128
	%	14.10%	14.10%	71.90%	100.00%
Cheboin	N	0	19	58	77
	%	0.00%	24.70%	75.30%	100.00%
Chemosot	N	0	18	41	59
	%	0.00%	30.50%	69.40%	100.00%
Litein	N	1	20	38	59
	%	1.70%	33.90%	64.40%	100.00%
Cheplanget	N	37	19	3	59
	%	62.70%	32.20%	5.10%	100.00%
Kapkatet	N	18	19	58	95
	%	18.90%	20.00%	61.00%	100.00%
Total	**N**	**74**	**113**	**376**	**563**
	%	**13.10%**	**20.10%**	**66.80%**	**100.00%**

The respondents were asked to state the extent to which they agreed that the water projects had addressed their water needs in their wards. Table 4 presents the results. As shown, 55% of the respondents agreed that it does so to a large extent. However, the results for Kapkatet Ward show that the projects have not really addressed the needs of the community as 57% of the respondents from the area noted as such. This warrants a further investigation to ascertain why the project has not addressed their needs.

Table 4: Extent to which water resource management projects addressed community needs

County		Very low/low extent	Moderate extent	Very large/large extent	Total
Kisiara	N	18	18	50	86
	%	20.9%	20.9%	58.2%	100.0%
Tebesonik	N	0	36	92	128
	%	0.0%	28.1%	71.9%	100.0%
Cheboin	N	0	18	59	77
	%	0.0%	23.4%	76.7%	100.0%
Chemosot	N	18	0	41	59
	%	30.5%	0.0%	69.5%	100.0%
Litein	N	18	18	23	59
	%	30.5%	30.5%	39.0%	100.0%
Cheplanget	N	18	22	19	59
	%	30.5%	37.3%	32.2%	100.0%
Kapkatet	N	54	18	23	95
	%	56.8%	18.9%	24.2%	100.0%
	N	**126**	**130**	**307**	**563**
Total	**%**	**22.4%**	**23.1%**	**54.6%**	**100.0%**

Table 5 shows the results on the extent to which the respondents agreed that the water project has led to more community resilience. The results show that 69% of the respondents agree that the projects have improved resilience of the community. This suggests a positive impact of various water projects in Bureti sub-county on the resilience of the community. All the wards except Cheplanget score over 50% on the impact of the water projects on resilience. There may be need to investigate why the residents of Cheplanget ward feel that the water projects have not impacted on their resilience.

Table 5: Contribution of water resource projects to community resilience

Ward		Very low/low extent	Moderate extent	Very large/large extent	Total
Kisiara	N	1	32	53	86
	%	1.2%	37.2%	61.7%	100.0%
Tebesonik	N	19	1	108	128
	%	14.9%	0.8%	84.4%	100.0%
Cheboin	N	1	0	76	77
	%	1.3%	0.0%	98.7%	100.0%
Chemosot	N	2	20	37	59
	%	3.4%	33.9%	62.7%	100.0%
Litein	N	1	19	39	59
	%	1.7%	32.2%	66.1%	100.0%
Cheplanget	N	21	19	19	59
	%	35.6%	32.2%	32.2%	100.0%
Kapkatet	N	37	1	57	95
	%	38.9%	1.1%	60.0%	100.0%
Total	**N**	**82**	**92**	**389**	**563**
	%	**14.6%**	**16.3%**	**69.1%**	**100.0%**

4.3.2 Role of Community in Water Management

Figure 3 presents the results of the membership of various water resource committees in Bureti sub-county. This was a multiple-response question where the respondents were allowed to say whether any or a combination of various partners formed the water resource management committees in their areas.

The results show that 81% of the respondents cited constituency administration as part of water resource committees while 78% cited local chiefs and sub-chiefs as being part of water management committees. Only 35% of the respondents cited donors or NGOs as being part of the water management committees in their county assembly wards.

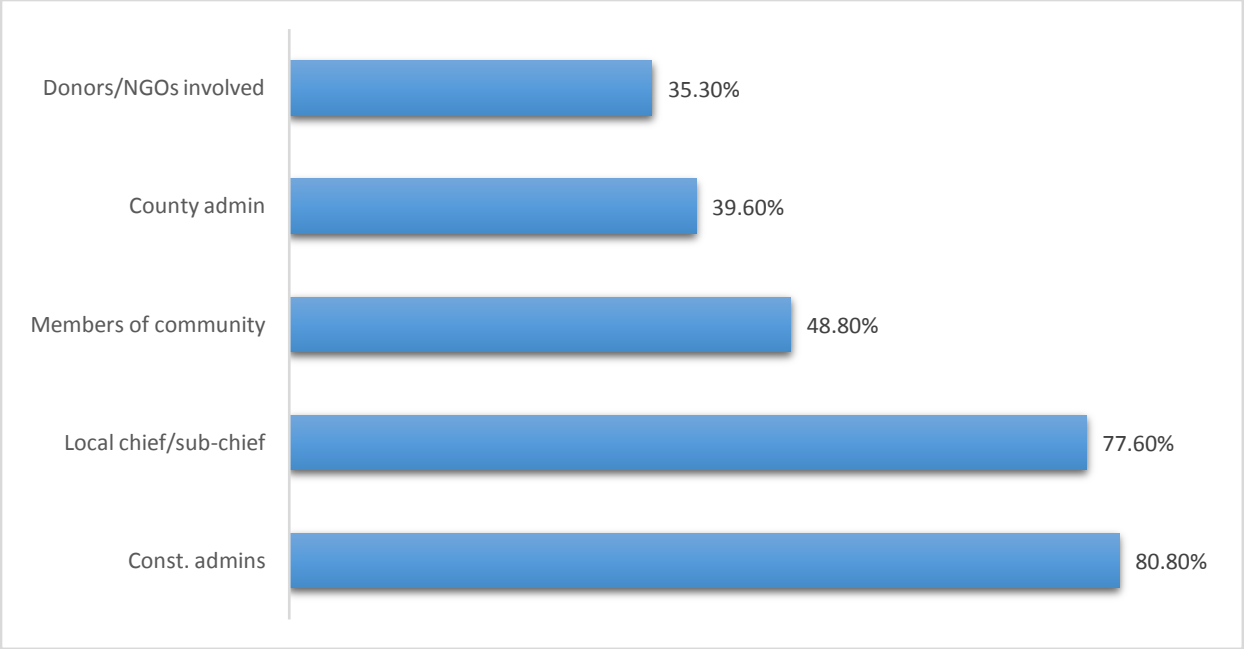

Figure 4: Membership of water resource management committees

Table 6 shows the results for the level of involvement of each of the respondents in the water management in their wards. The results are shown by county assembly wards. The study found that only 22% of the residents were involved either as committee officials or as members of their water management committees. The rest of the residents were not involved in the management of water resources at all.

This trend, if unchecked, may lead to less community ownership of water resource projects in the areas and further lead to resentment from the community members. There is need for members of the community to be engaged in one way or another in the management of water resources to foster a sense of ownership in the various water projects.

Cheplanget ward comes out as the one with the highest number of residents involved in the water resource management as 39% of the residents have been either committee officials or

members. This is quite encouraging. On the other hand, the worst performing wards are Chemosot and Litein where about 92% of the residents have never been involved in the management of water resources.

Table 6: Level of individual involvement in water resource management

Ward		Committee Official	Committee Member	Not involved	Total
Kisiara	N	2	21	63	86
	%	2.30%	24.40%	73.30%	100.00%
Tebesonik	N	1	22	105	128
	%	0.80%	17.20%	82.00%	100.00%
Cheboin	N	2	21	54	77
	%	2.60%	27.30%	70.10%	100.00%
Chemosot	N	3	2	54	59
	%	5.10%	3.40%	91.50%	100.00%
Litein	N	2	3	54	59
	%	3.40%	5.10%	91.50%	100.00%
Cheplanget	N	3	20	36	59
	%	5.10%	33.90%	61.00%	100.00%
Kapkatet	N	1	22	72	95
	%	1.10%	23.20%	75.80%	100.00%
Count	**N**	**14**	**111**	**438**	**563**
% within ward	**%**	**2.50%**	**19.70%**	**77.80%**	**100.00%**

Figure 5 shows the results on the involvement of individuals in the management of water resources by gender. As shown, 71% of officials in water management committees are male while 29% are female and 60% of the members are male while 40% are female.

As regards those not involved in water management, 63% of them are male. Thus, while the men dominate the management of water resources, they also dominate the non-participants in the management of water resources in the area.

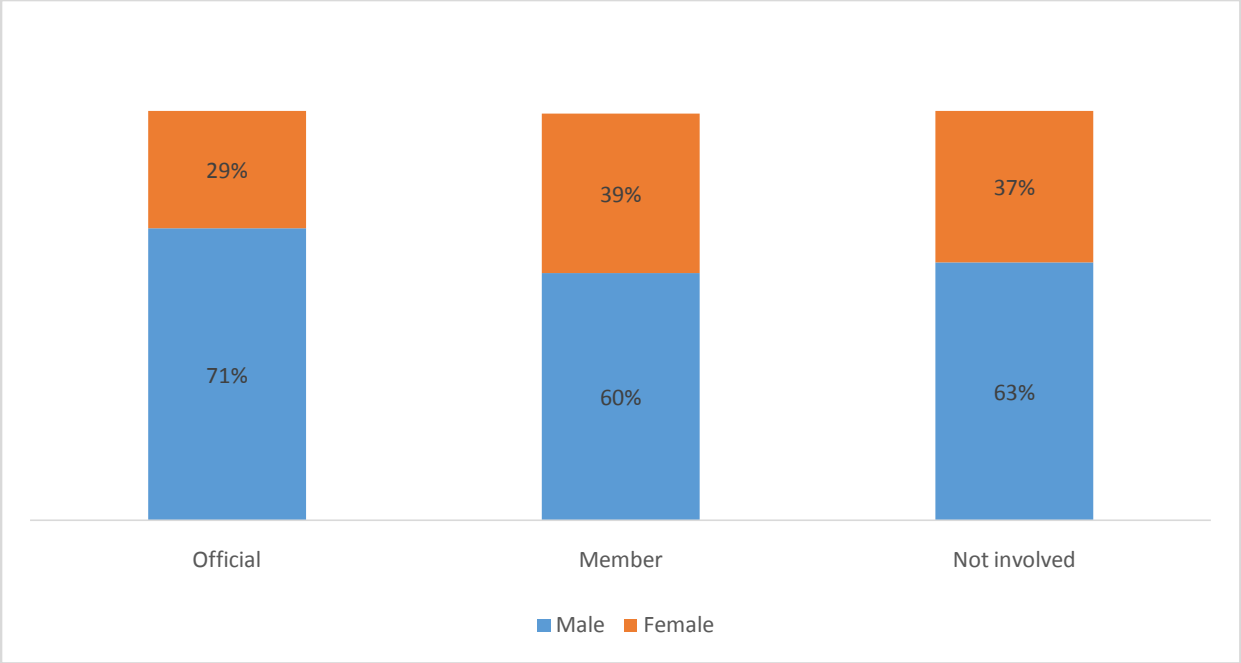

Figure 5: Involvement in water resource management by gender

The study sought to examine the extent to which the community was involved in the management of water resources in Bureti sub-county. Table 7 shows the results. As shown, the study found that 53% of the respondents noted that the community was involved in the management of water resources to a large extent.

The most favourable results were from Cheplanget ward with 92% of the respondents citing community involvement to a large extent in management while the worst results were from Kisiaraand Cheboinwardswhere only 40% and 61% cited that the extent of community involvement was low. These results suggests that the communities were largely involved in the management of water resources in Bureti sub-county with the exception of the two county assembly wards.

Table 7: Involvement of community members in the management of water resources

Ward		Very low/low extent	Moderate extent	Very large/Large extent	Total
Kisiara	N	34	34	18	86
	%	40%	40%	21%	100.00%
Tebesonik	N	21	53	54	128
	%	16%	41%	42%	100.00%
Cheboin	N	0	19	58	77
	%	0%	25%	75%	100.00%
Chemosot	N	36	2	21	59
	%	61%	3%	36%	100.00%
Litein	N	0	18	41	59
	%	0%	31%	70%	100.00%
Cheplanget	N	3	2	54	59
	%	5%	3%	92%	100.00%
Kapkatet	N	23	18	54	95
	%	24%	19%	57%	100.00%
Total	**N**	**117**	**146**	**300**	**563**
	%	**21%**	**26%**	**53%**	**100.00%**

4.3.3 Water Projects in the Sub-County

The respondents were asked whether they were aware of any water resource management projects in their areas. Table 8 shows the results. As presented, the study found that 84% of the residents were aware of the projects in their areas while only 16% were not aware of any such projects. The level of awareness was high in all the county assembly wards except in Tebesonik where only 58% of the residents knew about the existence of such projects.

Those who were aware of the projects were asked to name of the number of projects they knew about. From the 473 respondents who knew about the existence of such projects, the number of projects named ranged from one to three with a mean of 1.4 projects and a standard deviation of 0.5 projects. Some of the projects named include Terta Water Project in Cheboin Ward. This is derived from a waterfall and targets irrigation and electricity source. It

is, however, still an incomplete project. Another project is the Kapkisiara Water Project in Tebesonik ward which supplies water to the Kapkisiara Girls Secondary School. However, this has not been completed to supply water to the homesteads who contributed towards its implementation.

Table 8: Awareness of water resource management projects in the sub-county by residents

Ward		Yes	No	Total
Kisiara	N	86	0	86
	%	100.00%	0.00%	100.00%
Tebesonik	N	74	54	128
	%	57.80%	42.20%	100.00%
Cheboin	N	59	18	77
	%	76.60%	23.40%	100.00%
Chemosot	N	59	0	59
	%	100.00%	0.00%	100.00%
Litein	N	59	0	59
	%	100.00%	0.00%	100.00%
Cheplanget	N	59	0	59
	%	100.00%	0.00%	100.00%
Kapkatet	N	77	18	95
	%	81.10%	18.90%	100.00%
Total	**N**	**473**	**90**	**563**
	%	**84.00%**	**16.00%**	**100.00%**

Figure 6 shows the results on the financing of water projects. The respondents were asked to state if they were aware of who financed the various water projects that they had mentioned. This was a multiple response question as it is possible for a water resource projects to be jointly financed by more than one party.

The results show that 82% of the respondents cited the National Constituency Development Fund as the financier, 80% cited the NGOs and external donors, 54% cited the National

Government, and 50% cited the county government. This suggests that a number of partners in Bureti sub-county take part in the financing of water resource management projects. This engagement of various stakeholders including the national government, county government, and other donors such as NGOs and external donors should be encouraged.

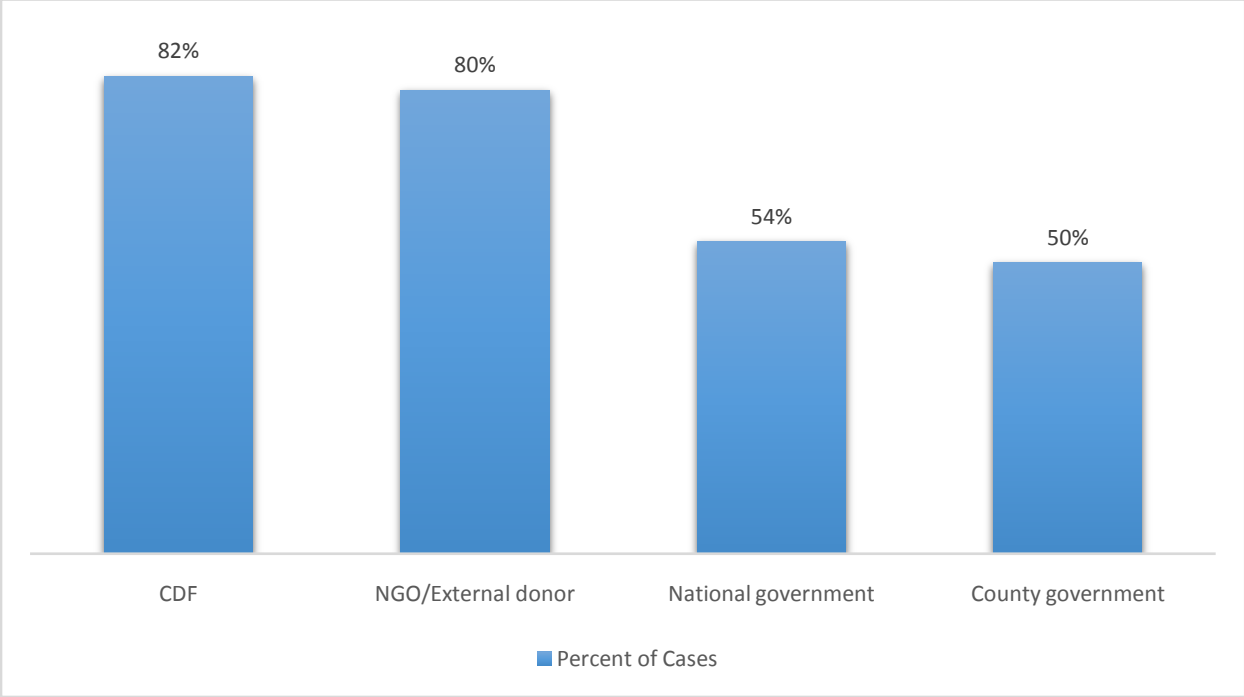

Figure 6: Financing of water projects in Bureti sub-county

4.4 Chapter Summary

This chapter has described the outcomes of the study. It has discussed the findings based on the research questions and presented in both tables and charts the results. The next chapter presents the discussion of results, conclusions and recommendations of the study.

CHAPTER 5

5.0 DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of research findings, discussion of the study, conclusions of the study, and recommendations for policy and practice.

5.2 Summary of Key Findings

The purpose of this study was to ascertain the extent to which water resource management projects contribute to the resilience of communities in Bureti sub-county. To achieve this, primary data was collected and analysed from residents of the sub-county from all the wards. Descriptive analysis was employed using SPSS v.23 and results presented in tables and charts as applies.

The first research question focused on whether water resource management projets contribute to community resilience. The study found that water problems were experienced by 80% of the respondents with the most affected wards being Chemosot and Kisiara. The results further showed that 67% of the respondents ageed that water projects were important for them with all but residents of Cheplanget ward rating the importance of the projects highly. The respondents were also largely in agreement that the water projects addressed their needs as agreed by 55% of the respondents. However, 57% of those from Kapkatet ward did not feel so. Indeed, the study showed that 69% of the respondents were in agreement that the community was more resilient due to the water resource projects in their wards. An exception

was residents of Cheplanget where only about a third of the respondents found the water projects having a positive impact on their resilience.

The second research question was interested in finding out the role played by community members in the management of water resources in the sub-county. The study found that members of the community were involved in water managememt committees. As the results showed, 49% of the respondents noted that members of the community formed part of water resource management committees where other partners were also members. These include the local constituency administration, chief/sub-chief, ciunty administration, and donors/NGOs involved in water projects. The results further showed that 22% of the respondents had been involved in the water management either as members of committees or as officials. More men (71%) than women (29%) were directly involved as officials in the management of water resources and the same was true for membership of committees with 60% of members being men as opposed to 40% women. The results further showed that more than half (53%) of the respondents noted that the community was involved in the management of water resources.

The third and last research question focused on the specific ongoing water resource projects in the sub-county. The results showed that 84% of the respondents were aware of at least one water resource project in their area. The awareness levels differed across wards and of all the wards, the least level of awareness was experienced for the residents of Tebesonik ward where only 58% knew about at least one project in their areas. The awareness of the number of projects ranged from 1 to 3 with a mean of 1.4 projects. The study also showed that most projects were funded by the National CDF (82%) followed by NGOs and external donors

(80%). Only 54% of the respondents mentioned the National Government as being a financier of any water project while half of them mentioned the county government as a financier.

5.3 Discussions

This study has revealed that water resource management projects in Bureti sub-county have contributed immensly to the resilience of community members in terms of mitigating the effects of drought. Given the perenial effects of draught in the area and a serious water problems experienced by most members of the community, the water projects have had a positive impact on their livelihoods. This, indeed, has been the major objective of most water projects financed by various stakeholders within the sub-county. As such, it is important that their water needs to be addressed. As the results showed, more than half of the respondents agreed that the projects had met their needs.

The results have also shown that the community was largely involved in the management of water resources in their areas. About half of the respondents noted that members of the public were as members of the water management committees. The results showed that about one in five residents had been members of various water project management committees. This is a relatively higher number given the size of water committees and the size of population in the area. However, the gender composition of committees seems to favor men. The involvement of community is a good indicator of community buy-in for the water projects. This is important for enhancing ownership of the projects.

The results have also revealed that the residents of Bureti sub-county are aware of a number of water resource projects in their areas. The high level of awareness suggests an interest in the water resource projects within the sub-county. Being an important resource, it is important that the level of awareness is high as that shows the level of engagement with the community on the water projects in the area. From the results, most of the residents are aware that the chief financiers of these water projects are the CDF and the NGOs or external donors. Other sources of financing also come from the National Government and the county government.

5.4 Conclusion

The study sought to examine whether water resource management projets contribute to community resilience. The results showed that water resource management projects in Bureti sub-county have contributed immensly to the resilience of community members in terms of mitigating the effects of fraud. Based on the findings, this study concludes that in water scarce areas, water resource projects are critical in alleviating the dire challenges and hence can positively contribute to community resilience especially in times of drought.

The study also sought to find out the role played by community members in the management of water resources in the sub-county. The results revealed that community memebrs were largely involved in the management of water resources in their areas. Thus, the study concludes that for a positive impact of any water resource projects, community involvment is very important especially when they are involved as part of the water resource committees.

Lastly, the study sought to examine the specific ongoing water resource projects in the sub-county. The study found that there was a very high level of awareness of water resource projects by members of the community in Bureti sub-county. This study concludes that this high level of awareness is key in fostering community engagement in the water resource projects and hence the eventual success.

5.5 Recommendations

The study makes a number of recommendations. First, since there are several areas in Kenya that face water problems annually due to poor rains coupled with our rain-fed agriculture, it is important that more investments are made in the water sector. These investments in water resource management will go a long way in enhancing community resilience within the country hence improve agricultural production.

Secondly, the study recommends that there is need for stakeholders with the water sector to work together as a unit. Of importance is the involvement of community members in the management of water resources. This will enhance community ownership of the water projects hence better management of this key resource in the country. Thus, members of the community need to be encouraged to be part of water resource management committees or be involved in any other way deemed necessary.

Lastly, the study recommends that the financiers of various water resource projects should create avenues for communicating with the community members on the projects they are carrying out and how they intend to implement them. This increases their level of awareness

and encourages more engagement between the project financiers and the communities.

Water management requiresmultiple levels of policy action.The problem is not a shortage ofwater, but the absence of propermechanisms for its augmentation,conservation, distribution, and efficient use. Water managementshould be given number onepriority in agricultural policy,particularly to prevent drought,minimize the risks due to droughtand build a climate-resilientagriculture.

5.6 Suggestions for Further Research

This study faced a number of limitations which can be addressed in future research. The study was based on projects in Bureti sub-county. Future studies could expand the scope by exploring the issues studied here in a wider area in order to enhance the application of results to other places other than Bureti sub-county.

Further, the study makes some interesting observations that require further research. For instance, respondents in some of the wards did not feel that the project had an impact on their resilience, whilst others felt they did not have water problems. The level of involvement of females in water management was also found to be generally low. The reasons for this could be explored in future studies.

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APPENDICES

Appendix 1: Research Questionnaires

Part 1: Background Information

1. Your gender
   Male [ ]
   Female [ ]
2. Your age
   ……
3. Your county assembly ward
   Kisiara [ ]
   Tebesonik [ ]
   Cheboin [ ]
   Chemosot [ ]
   Litein [ ]
   Cheplanget [ ]
   Kapkatet [ ]

Part 2: Water Projects and Community Resilience

4. Having lived in this ward, to what extent would you agree that this area has water problems?
   Very large extent [ ]
   Large extent [ ]
   Moderate extent [ ]
   Low extent [ ]
   Very low extent [ ]
5. How important would you say are the water projects in this area to the community?
   Very important [ ]
   Important [ ]
   Moderate [ ]
   Less important [ ]
   Least important [ ]
6. To what extent would you agree with the statement that the water project has addressed your water needs in this area?
   Very large extent [ ]
   Large extent [ ]
   Moderate extent [ ]
   Low extent [ ]
   Least extent [ ]
7. To what extent would you agree with the statement that the water project has led to a more resilient community?

Very large extent [ ]
Large extent [ ]
Moderate extent [ ]
Low extent [ ]
Least extent [ ]

Part 3: Role of Community in Water Management

8. Who are involved in the water management committees in the area? [Tick as applies]
   The donors/NGOs [ ]
   County administration [ ]
   Constituency administration [ ]
   Local chief/sub-chief [ ]
   Members of the community [ ]
   I don't know [ ]
9. What is your level of involvement in the water management in your area?
   I am an official of water committee [ ]
   I am a member of water committee [ ]
   I am not involved in water management [ ]
10. To what extent are community members involved in water management in the area?
    Very large extent [ ]
    Large extent [ ]
    Moderate extent [ ]
    Low extent [ ]
    Very low extent [ ]

Part 4: Water Projects in the Sub-County

11. Are you aware of water project(s) in the area?
    Yes [ ]
    No [ ]
12. If yes in 11 above, how many water projects are you aware of in this area?
    ……
13. If yes in 11 above, who financed the water project(s)? [Tick as applies]
    NGO(s)/External donor(s) [ ]
    National government [ ]
    County government [ ]
    CDF [ ]
    Local community members [ ]
    I don't know [ ]

The End

Appendix 2: Raw SPSS Output

gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	353	62.7	62.7	62.7
	Female	210	37.3	37.3	100.0
	Total	563	100.0	100.0	

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
age	563	21.00	65.00	36.3623	10.59561
Valid N (listwise)	563				

ward * respondent category Crosstabulation

			respondent category		
			Water committee member/official	Community member	Total
ward	Kisiara	Count	5	81	86
		% within ward	5.8%	94.2%	100.0%
	Tebesonik	Count	5	123	128
		% within ward	3.9%	96.1%	100.0%
	Cheboin	Count	5	72	77
		% within ward	6.5%	93.5%	100.0%
	Chemosot	Count	5	54	59
		% within ward	8.5%	91.5%	100.0%
	Litein	Count	5	54	59
		% within ward	8.5%	91.5%	100.0%
	Cheplanget	Count	5	54	59
		% within ward	8.5%	91.5%	100.0%
	Kapkatet	Count	5	90	95
		% within ward	5.3%	94.7%	100.0%
Total		Count	35	528	563
		% within ward	6.2%	93.8%	100.0%

ward * water problems Cross tabulation

			water problems				
			Low extent	Moderate extent	Large extent	Very large extent	Total
ward	Kisiara	Count	0	1	69	16	86
		% within ward	0.0%	1.2%	80.2%	18.6%	100.0%
	Tebesonik	Count	0	19	21	88	128
		% within ward	0.0%	14.8%	16.4%	68.8%	100.0%
	Cheboin	Count	0	19	40	18	77
		% within ward	0.0%	24.7%	51.9%	23.4%	100.0%
	Chemosot	Count	0	0	40	19	59
		% within ward	0.0%	0.0%	67.8%	32.2%	100.0%
	Litein	Count	1	37	2	19	59
		% within ward	1.7%	62.7%	3.4%	32.2%	100.0%
	Cheplanget	Count	1	0	39	19	59
		% within ward	1.7%	0.0%	66.1%	32.2%	100.0%
	Kapkatet	Count	18	19	21	37	95
		% within ward	18.9%	20.0%	22.1%	38.9%	100.0%
Total		Count	20	95	232	216	563
		% within ward	3.6%	16.9%	41.2%	38.4%	100.0%

ward * importance of water projects Cross tabulation

			importance of water projects					
			Very low extent	Low extent	Moderate extent	Large extent	Very large extent	Total
ward	Kisiara	Count	0	0	0	19	67	86
		% within ward	0.0%	0.0%	0.0%	22.1%	77.9%	100.0%
	Tebesonik	Count	0	18	18	39	53	128
		% within ward	0.0%	14.1%	14.1%	30.5%	41.4%	100.0%
	Cheboin	Count	0	0	19	19	39	77
		% within ward	0.0%	0.0%	24.7%	24.7%	50.6%	100.0%
	Chemosot	Count	0	0	18	20	21	59
		% within ward	0.0%	0.0%	30.5%	33.9%	35.6%	100.0%

	Litein	Count	0	1	20	38	0	59
		% within ward	0.0%	1.7%	33.9%	64.4%	0.0%	100.0%
	Cheplanget	Count	18	19	19	3	0	59
		% within ward	30.5%	32.2%	32.2%	5.1%	0.0%	100.0%
	Kapkatet	Count	0	18	19	55	3	95
		% within ward	0.0%	18.9%	20.0%	57.9%	3.2%	100.0%
Total		Count	18	56	113	193	183	563
		% within ward	3.2%	9.9%	20.1%	34.3%	32.5%	100.0%

ward * projects have addressed needs Cross tabulation

			projects have addressed needs					
			Very low extent	Low extent	Moderate extent	Large extent	Very large extent	Total
ward	Kisiara	Count	0	18	18	17	33	86
		% within ward	0.0%	20.9%	20.9%	19.8%	38.4%	100.0%
	Tebesonik	Count	0	0	36	39	53	128
		% within ward	0.0%	0.0%	28.1%	30.5%	41.4%	100.0%
	Cheboin	Count	0	0	18	22	37	77
		% within ward	0.0%	0.0%	23.4%	28.6%	48.1%	100.0%
	Chemosot	Count	0	18	0	21	20	59
		% within ward	0.0%	30.5%	0.0%	35.6%	33.9%	100.0%
	Litein	Count	0	18	18	20	3	59
		% within ward	0.0%	30.5%	30.5%	33.9%	5.1%	100.0%
	Cheplanget	Count	18	0	22	19	0	59
		% within ward	30.5%	0.0%	37.3%	32.2%	0.0%	100.0%
	Kapkatet	Count	18	36	18	2	21	95

		% within ward	18.9%	37.9%	18.9%	2.1%	22.1%	100.0%
Total		Count	36	90	130	140	167	563
		% within ward	6.4%	16.0%	23.1%	24.9%	29.7%	100.0%

ward * projects led to community resilience Cross tabulation

			projects led to community resilience					
			Very low extent	Low extent	Moderate extent	Large extent	Very large extent	Total
ward	Kisiara	Count	0	1	32	17	36	86
		% within ward	0.0%	1.2%	37.2%	19.8%	41.9%	100.0%
	Tebesonik	Count	1	18	1	107	1	128
		% within ward	0.8%	14.1%	0.8%	83.6%	0.8%	100.0%
	Cheboin	Count	0	1	0	1	75	77
		% within ward	0.0%	1.3%	0.0%	1.3%	97.4%	100.0%
	Chemosot	Count	0	2	20	19	18	59
		% within ward	0.0%	3.4%	33.9%	32.2%	30.5%	100.0%
	Litein	Count	0	1	19	37	2	59
		% within ward	0.0%	1.7%	32.2%	62.7%	3.4%	100.0%
	Cheplanget	Count	20	1	19	19	0	59
		% within ward	33.9%	1.7%	32.2%	32.2%	0.0%	100.0%
	Kapkatet	Count	19	18	1	19	38	95
		% within ward	20.0%	18.9%	1.1%	20.0%	40.0%	100.0%
Total		Count	40	42	92	219	170	563
		% within ward	7.1%	7.5%	16.3%	38.9%	30.2%	100.0%

$partners Frequencies

		Responses		
		N	Percent	Percent of Cases
Water committee management partners[a]	Donors/NGOs involved	199	12.5%	35.3%
	County admin	223	14.0%	39.6%
	Const. admins	455	28.6%	80.8%
	Local chief/sub-chief	437	27.5%	77.6%
	Members of community	275	17.3%	48.8%
Total		1589	100.0%	282.2%

a. Dichotomy group tabulated at value 1.

ward * Level of involvement Cross tabulation

			Level of involvement			
			Official	Member	Not involved	Total
ward	Kisiara	Count	2	21	63	86
		% within ward	2.3%	24.4%	73.3%	100.0%
	Tebesonik	Count	1	22	105	128
		% within ward	0.8%	17.2%	82.0%	100.0%
	Cheboin	Count	2	21	54	77
		% within ward	2.6%	27.3%	70.1%	100.0%
	Chemosot	Count	3	2	54	59
		% within ward	5.1%	3.4%	91.5%	100.0%
	Litein	Count	2	3	54	59
		% within ward	3.4%	5.1%	91.5%	100.0%
	Cheplanget	Count	3	20	36	59
		% within ward	5.1%	33.9%	61.0%	100.0%
	Kapkatet	Count	1	22	72	95
		% within ward	1.1%	23.2%	75.8%	100.0%
Total		Count	14	111	438	563
		% within ward	2.5%	19.7%	77.8%	100.0%

gender * Level of involvement Cross tabulation

			Level of involvement			
			Official	Member	Not involved	Total
gender	Male	Count	10	67	276	353
		% within gender	2.8%	19.0%	78.2%	100.0%

	Female	Count	4	44	162	210
		% within gender	1.9%	21.0%	77.1%	100.0%
Total		Count	14	111	438	563
		% within gender	2.5%	19.7%	77.8%	100.0%

ward * community involvement Cross tabulation

			community involvement					
			Very low extent	Low extent	Moderate extent	Large extent	Very large extent	Total
ward	Kisiara	Count	0	34	34	0	18	86
		% within ward	0.0%	39.5%	39.5%	0.0%	20.9%	100.0%
	Tebesonik	Count	18	3	53	0	54	128
		% within ward	14.1%	2.3%	41.4%	0.0%	42.2%	100.0%
	Cheboin	Count	0	0	19	40	18	77
		% within ward	0.0%	0.0%	24.7%	51.9%	23.4%	100.0%
	Chemosot	Count	18	18	2	21	0	59
		% within ward	30.5%	30.5%	3.4%	35.6%	0.0%	100.0%
	Litein	Count	0	0	18	40	1	59
		% within ward	0.0%	0.0%	30.5%	67.8%	1.7%	100.0%
	Cheplanget	Count	0	3	2	18	36	59
		% within ward	0.0%	5.1%	3.4%	30.5%	61.0%	100.0%
	Kapkatet	Count	21	2	18	36	18	95
		% within ward	22.1%	2.1%	18.9%	37.9%	18.9%	100.0%
Total		Count	57	60	146	155	145	563
		% within ward	10.1%	10.7%	25.9%	27.5%	25.8%	100.0%

ward * Project awareness Cross tabulation

			Project awareness		
			Yes	No	Total
ward	Kisiara	Count	86	0	86
		% within ward	100.0%	0.0%	100.0%
	Tebesonik	Count	74	54	128
		% within ward	57.8%	42.2%	100.0%
	Cheboin	Count	59	18	77
		% within ward	76.6%	23.4%	100.0%
	Chemosot	Count	59	0	59
		% within ward	100.0%	0.0%	100.0%
	Litein	Count	59	0	59
		% within ward	100.0%	0.0%	100.0%
	Cheplanget	Count	59	0	59
		% within ward	100.0%	0.0%	100.0%
	Kapkatet	Count	77	18	95
		% within ward	81.1%	18.9%	100.0%
Total		Count	473	90	563
		% within ward	84.0%	16.0%	100.0%

$financiers Frequencies

		Responses		
		N	Percent	Percent of Cases
Funding of water projects[a]	NGO/External donor	419	27.2%	79.5%
	National government	282	18.3%	53.5%
	County government	263	17.1%	49.9%
	CDF	431	28.0%	81.8%
	Local community	143	9.3%	27.1%
Total		1538	100.0%	291.8%

a. Dichotomy group tabulated at value 1.