

**FACTORS INFLUENCING WATER USE CONFLICTS IN NGARENDARE AND
NGARE NITI WRUAs OF UPPER ISIOLO SUBREGION.**

BY

IKUATHU DOMINIC MARINGA

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DECLARATION

This research project is my original work and has not been presented for award of a degree in any other university.

Signature Date

Mr. Ikuathu Dominic Maringa

L50/82360/2012

This research project has been submitted with our approval as university supervisors:

Signature Date

Professor Nathan Gichuki

School of Biological Sciences

Signature Date

John Chandi Rugendo

Lecturer, School of Continuing and Distance Education

DEDICATION

This work is dedicated to my Wife Betty, My daughters Nelly and Judy and the entire M'Ikuathu's family who shaped the direction of my life from childhood. I love and respect you all.

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ABBREVIATIONS AND ACRONYMS

| | |
|---------------|--------------------------------------|
| ASALs | Arid and Semi Arid Lands |
| ENCC | Ewaso Ngiro North Catchment Area |
| NNFT | Ngare Ndare Forest Thrust |
| NNWRUA | Ngare Ndare WRUA |
| NNWRUA | Ngare Niti WRUA |
| KFS | Kenya Forest Service |
| WDC | WRUA Development Cycle |
| WRMA | Water Resources Management Authority |

ABSTRACT

Kenya's Vision 2030 has got five pillars of which Social Development is one of them. In the social pillar, environmental protection, rehabilitation and protection of water resources in the five water towers of Kenya are very well highlighted. In the economic pillar, one of the flagship projects of Agriculture sector is ASAL development through provision of water for domestic, livestock and irrigation in ASALs. WRMA is the Government body that regulates water resources in Kenya. One of its roles includes monitoring water resource use and formulating policies that develop the water sector. Some of their policies have culminated in the formation of Water Resource Users Associations (WRUAs), to ensure devolved management practices for efficient and sustainable use of the water resources by the users themselves. Despite WRMA efforts in this devolution, water related conflicts have not ended. In the Ewaso Ngiro region water conflicts are a common phenomenon. Water Resource User Associations (WRUAs) are comprised of river users, water projects, riparian land owners and borehole owners who voluntarily associate with a common objective of protecting and sharing a common water resource. The purpose of this study was to establish the factors influencing the water use conflicts in the WRUAs of upper Isiolo sub-region. The objectives were to determine the influence of water sources on water use conflicts in Ngarendare and Ngareniti WRUAs; to determine the influence of water access to water use conflicts in the two WRUAs; to estimate the influence of water demand per household on water use conflicts in the two WRUAs and to determine the influence of the WRUA on water use conflicts in the study area. The sample was the thirty water projects found in the two WRUAs. The sample size was 87 respondents chosen from the membership lists of the water projects. Descriptive survey design was used in the study where systematic sampling was used to identify respondents to whom the questionnaires were administered. Data collected in this study was analyzed using descriptive statistics with the aid of Statistical Package for Social Studies. The results showed that 63% of members got their water from springs, while the water demand had the strongest positive relationship with the water conflict in the study area of 0.89. Influence of the WRUA showed the weakest positive relationship with water conflicts of 0.6. The results also showed that 60% of the members rarely get enough water and that 67.7% of the projects had experienced water related conflicts. The results were presented using frequency tables and graphs to help WRUAs, WRMA and other players in the Water Sector in the region to understand and mitigate water conflicts. The study concluded that there is a positive relationship between water sources and water use conflicts. This means that water is essential for socio-economic development and for maintaining healthy ecosystems. It also concluded that water demand has got the strongest positive relationship with water conflicts and therefore the biggest cause of water conflicts in the sub-region. This study is important to the water projects of the area for they clearly understand the causes, and mitigate water conflicts in the area. It is also be important to the WRUAs, WRMA and Government in providing vital information on policy development for managing water conflicts and water conservation at the grassroots level. It also helps the ground authorities to understand that properly managed water resources are a critical component of growth, poverty reduction and equity. The study recommends that community members be encouraged to participate by mobilizing their own resources, initiating and taking responsibility for their own development activities. The study also recommended that WRUAs and the WRMA should help members in policy implementation at the grassroots.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

A close examination of the Millennium Development Goals (MDGs) confirms the central role of water and sanitation in sustainable development and the major contributions that expand access to safe drinking water and adequate sanitation can lead to poverty alleviation.

As the UN Habitat (2008) noted, improving access to safe drinking water implies less burden on people, mostly women, to collect water from available sources. It means reducing the global burden of water-related diseases, and the improvement in the quality of life (Alaci and Alehen, 2009). Water is a delicate and scarce resource in the Ewaso Ngiro region and the little available serves the larger arid and semi arid region of Northern Kenya.

The United Nations Millennium Declaration (MDGs) called upon all members to stop the unsustainable exploitation of water resources by developing water management strategies at the regional, national and local levels which promote both equitable access and adequate supplies. The United Nations has a target, established in the Water Supply and Sanitation Collaborative Council and presented at the Second World Water Forum as “Vision 21: A shared Vision for Hygiene, Sanitation and Water Supply and a Framework for Action”, 2000. This study will seek to determine the reasons underlying water use characteristics and expose the causes of water related conflicts in Upper Isiolo Sub-region of particularly in Ngarendare and Ngare Niti sub-Catchment area. Also, an assessment shall be done to establish if measures that have been employed in the mitigation of the existing water use conflicts and their effectiveness by the two WRUAs. The study will focus on the two main Water Resource Users Associations (WRUAs) found in the upper sub-region namely Ngarendare and Ngare Niti.

1.2 Statement of the Problem

According to Interpress Service, Water scarcity is fuelling deadly inter-ethnic and inter-clan wars that continue to claim lives in Kenya, according to government officials. And if nothing is done to educate communities on how to conserve the valuable resource, the situation will escalate, governance experts and environmentalists warn. Over 200 people have been killed in revenge attacks in the Tana River Delta district of Kenya's Coast province, in a conflict revolving around the use of the Tana river water. The deceased include children, women, men, and e police officers. (IPS, Nairobi, Sep 11 2012).

In northern Kenya, communities face huge challenge of water access due to increased distances to water sources. Distances to water sources are significantly above average levels, ranging between 10-20 kilometers, for example in northeastern Isiolo, northern Marsabit, southern Moyale, and Wajir. Water consumption is below the minimum set standards across all the livelihood zones, and range between 10 to 20 liters per person per day. Although, water consumption is less than 10 liters per person per day in localized areas in northern Marsabit, eastern Isiolo, and southern Samburu, this is typical in these areas as they normally experience chronic water shortages leading to frequent water related conflicts (GoK, 2012-2013 Short rains Assessment Report). The upper Isiolo region is a key water catchment for the river Ewaso Ngiro. The major rivers in the region being Ngarendare, Ngarendare Niti and Isiolo rivers have their springs in the upper reaches of the catchment area. In the upstream of the catchment area, high population, small scale farming, large scale farming, ranching and tourism are the main economic activities. Due to these activities, the demand for water surpasses the capacity of the springs that serve the three rivers. The downstream communities, whose main activity is pastoralism often, have to go upstream in search for water for their livestock, especially during dry spells. During the search for water and pasture, the herders and their livestock invade private farms, trespassing, and generally displaying little respect for private property. Consequently, conflict between the farmers and the livestock owners over water resources ensues.

Although there exists high pressure on the water resources and high inequality in the water access, demand and use chain, no study has been done to evaluate the real reasons behind the water conflicts in the WRUAs of upper Isiolo region. WRUAs have been formed in the country as the ground authorities with an objective to regulate and control water use and alleviate conflicts among different water users. However, there has been no comprehensive evaluation of their powers to manage water access and use, and alleviate water conflicts in Isiolo sub region. This study was also necessary to evaluate the effectiveness of the roles played by WRUAs in ensuring equity in water access and use as well as reducing conflict among water users in various river basins, particularly in Isiolo County.

1.3 Purpose of the Study

To establish the factors influencing the water conflicts in WRUAs of upper Isiolo region and whether their efforts to regulate water demand, access and use chain has born any success in mitigating water related conflicts in the neighboring communities.

1.4 Objectives of the Study

The objectives of this study were:

1. To determine the influence of water sources on water use conflicts in Ngarendare and Ngareniti WRUAs.
2. To determine the influence of water access to water use conflicts in the two study areas
3. To estimate the influence of water demand per household on water use conflicts in the two WRUAs
4. To determine influence of WRUA on water use conflicts in the study area.

1.5 Research Questions

This research strived to answer the following questions:

1. What are the principal sources of water and how do they influence water use conflicts in the two WRUAs?
2. How is water accessed and how does it influence water use conflicts in the study areas?

3. How does water demand per household influence the water use conflicts in the study area?
4. What is the role of the WRUA in influencing water use conflicts in the study area?

1.6 Significance of the study

Water conflicts in Kenya are very real threat to the development of humanity both economically, socially and intellectually and are a huge obstacle to the achievement of vision 2030. This study will be important because it seeks to establish the factors related to water use and to expose the causes of water conflicts in Isiolo catchment area. WRUAs, being the water controllers on the ground need to understand their capacity to grasp the water use pattern and causes of the water conflicts in order to eradicate them. This research will help the WRUAs to have in-depth understanding of the causes of conflicts over the meager resource and the suggested remedial actions to abate future conflicts. This study will therefore be important to water officers and in particular WRMA as it will help them to formulate policies geared towards resolving water conflicts in Kenya. After the results of this research are realized it is expected the communities in Isiolo sub-region will have in-depth understanding of their role and participate in water sector development in the region.

1.7 Limitations of the Study

Ngarendare and Ngare Niti are vast water sub catchments areas of the greater Ewaso Ngiro North water catchment. They are found in Isiolo region which is particularly dry region with most of the rivers draining through arid lands into Ewaso Ngiro river. The two WRUAs therefore cover vast regions where a single water projects serves large areas. This was therefore a limit to the study to cover every section of the two WRUAs. The researcher and his assistants therefore arranged common meeting points each targeting respondents of each water project in order to tackle the problem of large distances.

The study also faced the constrain of uncooperative respondents, and this was solved by searching information from government offices, WRMA and other stakeholders.

1.8 Delimitation of the Study

The study covered the Isiolo catchment area. It specifically focused on the water projects of the two main WRUAs in the region that is Ngarendare and Ngare Niti WRUAs. It in particular drew its attention to the WRUA committees, Water project members and WRMA in the region. The WRUAs progress reports, minutes of projects meetings and WRMA documents were reviewed.

1.9 Assumptions of the study

This study assumed that all respondents who were contacted in the course of the research provided honest and reliable data. It also assumed that the sampled population represented the general population of membership all the water projects in the two WRUAs. This was very important for the research findings to be reliable. Further, it was assumed that the respondents were literate, cooperative and willing to respond.

1.10 Definitions of significant terms

Catchment Area - Catchment areas is area within which rain water flows into a water course

Community- A group of people living together with a common interest, language etc

Community Water Projects- Any or all projects for the development, storage, treatment, purification and distribution of water for use by a group of people living together.

Conflict-Any form of friction, disagreement, or discord arising within a group when the beliefs or actions of one or more members of the group are either resisted by or unacceptable to one or more members of another group.

Drainage system-Convergence of many river systems into a water course

Region-WRMA delineation of hydrological patterns that feeds a drainage system

Sub-region-WRMA delineation of two to three river systems that feed a drainage system

Water access-refers to the right of a user to use water from a source eg a pod, river, spring etc

Water demand-refers to the amount of water consumption for various purposes

Water use-Are the diverse purposes under which water is put by various groups or individuals

Water users-A group of people who use water for diverse purposes

Water use conflicts-Is a term describing a conflict between countries, states, or groups over an access to water resources.

WRUA Controls-refers to the use and the effectiveness of WRUA powers in water use as given by the water authorities.

1.11 Organization of the study

This research work is organized into five chapters.

Chapter one covers Introduction consisting of background of the study, statement of the problem, purpose of study, objectives, research questions, significance of the study, delimitations of the study, limitations of the study, assumptions, definition of significant terms and finally organization of the study.

Chapter Two deals with the literature review. This covered introduction, works of other researchers and writers, and conceptual framework.

Chapter Three covers research methodology. The main components constituted introduction, research design, target population, sampling procedures, instruments of data collection, validity and reliability, procedure for data collection, methods of data analysis, and operational definition of variables.

Chapter Four deals with data analysis, interpretation and presentation of findings, while chapter Five is composed of summary of the findings, discussions, conclusions and recommendations for further research which begins with introduction, summary of the findings and discussions of key findings.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section reviews literature related to previous research on the related topics and also literature related to the research questions. This chapter reviews literature on four themes namely water sources and ways of water access, Water demand, water uses and areas of conflict in the demand, use and access chain. The aim is to know what has been researched on and documented in relation to these themes. This will be important in the proposed research because it will help determine if there is particular relationship in the areas of water demand, access and use chain and water conflicts in the Isiolo sub-region. The relationship between what has been documented and current status shall be exposed thus justifying a case for the study.

2.2 Water sources and ways of water access

2.2.1. Water sources

According to Water Act 2002, Water source means any lake, pond, swamp, marsh, stream, water course, estuary, aquifer, artesian, basin or other body of flowing or standing Water, whether above or below ground; (Water Act, 2002).

Water resources are sources of water that are useful or potentially useful. Uses of water include agricultural, industrial, household, recreational and environmental activities. Virtually all of these human uses require fresh water. (Wikipedia, accessed 23rd March, 2013). 97% of the water on the Earth is salt water. However, only three percent is fresh water; slightly over two thirds of this is frozen in glaciers and polar ice caps. The remaining unfrozen fresh water is found mainly as groundwater, with only a small fraction present above ground or in the air. Fresh water is naturally occurring water on the Earth's surface in ice sheets, ice caps, glaciers, icebergs, bogs, ponds, lakes, rivers and streams, and underground as groundwater in aquifers and underground streams. Fresh water is generally characterized by having low concentrations of dissolved salts and other total dissolved solids. The term specifically excludes seawater and brackish water although it does include mineral-rich waters such as chalybeate springs. The term "sweet water"

has been used to describe fresh water in contrast. (Wikipedia, accessed 23rd March, 2013). Surface water is water in a river, lake or fresh water wetland. Surface water is naturally replenished by precipitation and naturally lost through discharge to the oceans, evaporation, evapotranspiration and sub-surface seepage. Although the only natural input to any surface water system is precipitation within its watershed, the total quantity of water in that system at any given time is also dependent on many other factors. These factors include storage capacity in lakes, wetlands and artificial reservoirs, the permeability of the soil beneath these storage bodies, the runoff characteristics of the land in the watershed, the timing of the precipitation and local evaporation rates. All of these factors also affect the proportions of water loss.

Human activities can have a large and sometimes devastating impact on these factors. Humans often increase storage capacity by constructing reservoirs and decrease it by draining wetlands. Humans often increase runoff quantities and velocities by paving areas and channelling stream flow. (Wikipedia, accessed 23rd March, 2013). Sub-surface water, or groundwater, is fresh water located in the pore space of soil and rocks. It is also water that is flowing within aquifers below the water table. Sometimes it is useful to make a distinction between sub-surface water that is closely associated with surface water and deep sub-surface water in an aquifer (sometimes called "fossil water"). Sub-surface water can be thought of in the same terms as surface water: inputs, outputs and storage. The critical difference is that due to its slow rate of turnover, sub-surface water storage is generally much larger compared to inputs than it is for surface water. This difference makes it easy for humans to use sub-surface water unsustainably for a long time without severe consequences. Nevertheless, over the long term the average rate of seepage above a sub-surface water source is the upper bound for average consumption of water from that source.

2.2.2 Ways of water access

AlertNet, reporting on the 20th UN World Water Day, observed that we know access to safe, clean water transforms people's lives: it can prevent disease, save time, empower women and keep children in school. When all those changes happen together the transformation is amazing.

With world leaders currently debating what will replace the Millennium Development Goals in two years time, there is a real opportunity to be seized in adopting a target to get water, sanitation and hygiene to every person on the globe. When the current goals were set, halving the number of people without access to clean water was included, but sanitation was left out and only included two years later. Ever since then it's been the most off-track target. The consequences for this lack of access to water, sanitation and hygiene are terrifying, 2,000 children dying every day just from diarrhoeal diseases associated with a lack of these services. (AlertNet News, accessed 23rd March, 2013).

In Nigeria, during the World Water Day 2013, the Minister for Water Resources Mrs. Sarah Ochekepe said that Nigeria will achieve 100 per cent access to potable water by 2025. Ochekepe explained that the purpose of the celebration was to create awareness on the importance of water and its significance to human existence and socio-economic growth of the nation. With the theme, 'International Water Cooperation,' Ochekepe sought the cooperation of different stakeholders within the government and non-governmental institutions to provide water for all Nigerians. The minister also urged the three tiers of government, especially the local government, being the closest to the people to treat the provision of water as a priority.

Improved accessibility of water through mechanisms such as water projects as been found to contribute towards poverty alleviation in Kenya and in other parts of the world. (World Bank. 2013). Were, et al, (2006), argues that safe water is widely recognized as both a fundamental human need and a key input into economic activity. There is potential that provision of modest amount of water to smallholder farmers can enhance household economic production, save time for women and girls, and improve family health. He continues that in Western Kenya communities, two groups have managed to install and protect water springs and install piped water to their members' homesteads. Members of these homesteads particularly women have benefited substantially in terms of time saving, health and small scale production.

2.2.3 Access to safe drinking water

Lack of safe water and sanitation is said to cost sub-Saharan Africa around 5% of its Gross Domestic Product (GDP) each year (UNDP, 1998), while 443 million school days are lost each year due to water-related diseases. Eleven percent more girls are said to attend school when sanitation is available as opposed to times when water is unavailable. According to DFID 40 billion working hours are spent carrying water each year in Africa. Households in rural Africa spend an average of 26% of their time fetching water, and it is generally women who are burdened with the task (UK, DFID).

The Zimbabwe Red Cross, with support from the British Red Cross, is in the early stages of a five-year water and sanitation programme. Households are already benefiting from improved access to water and better still, this change is being driven by the communities within Chivi district. Epidemics of cholera, malaria, diarrhoea diseases and typhoid meant the area was identified as having a real need for better sanitation and water access. Diane Moody, British Red Cross Africa programme manager, explains: “During the dry season more than 70 per cent of the people we spoke to used water from unprotected sources and it would take them between two and six hours to fetch the water.”

2.3 Water demand

According to International Water Resource Management Institute, (IWRMI), Water is essential for socio-economic development and for maintaining healthy ecosystems. Properly managed water resources are a critical component of growth, poverty reduction and equity. The livelihoods of the poorest are critically associated with access to water services. IWRMI asserts that with higher rates of urbanization, increasing demand for drinking water will put stress on existing water sources. Feeding a planet of 8 billion by 2030 will require producing more food with less water and through improved water efficiency in agriculture. Energy demand will more than double in poor and emerging economies in the next 25 years and hydropower will need to be a key contributor to clean energy production.

Floods and droughts will continue to threaten farmer livelihoods and lowland economies. Besides the needs for these human activities we have to ensure that the environmental water flows required maintaining ecosystems are also maintained.

Water Resources Management aims at optimizing the available natural water flows, including surface water and groundwater, to satisfy these competing needs. Adding uncertainty, climate change will increase the complexity of managing water resources. In some parts of the world, there will be more available water but in other parts, including the developing world, there will be less.

The mounting challenges posed by the changing demand for and supply of the resource highlight the importance of water in any development and growth agenda. The ability of developing countries to make more water available for domestic, agricultural, industrial and environmental uses will depend on better management of water resources and more cross-sectoral planning and integration. With water security declining in many parts of the world, strengthening the resiliency of the poorest countries and populations to climate change impacts becomes crucial, not only to ensure future water supply but also to combat food and energy price volatility.(IWRMI).

2.3.1 Water demand-based estimates

According to WRMA an estimate for water demand is used to gauge out the amount of water for projects allocation. The considered demand components are; Irrigation, domestic and livestock water demands. Water Demand (Dw) in m³/day is given by the following expressions: (WRMA, 2012) .

People: $D_w = \text{No of People} \times 50 \text{ Liters per Day} \times 10^{-3}$

Livestock: $D_w = \text{No of Livestock Units (equivalent to 1 Grade Cow, 3 Local Cattle or 15 Goats or Sheep)} \times 50 \text{ Liters per Day} \times 10^{-3}$

Irrigation: The following parameters are assumed in calculating irrigation demand:

Reference Potential Evapotranspiration ETO = **5mm**

Crop Factor **Kc = 0.8**

Irrigation Efficiency $\eta = 70\%$

$$D_w = E_{To} \times A \times 4047 \times 10^{-3} \times 0.8 \times (100/70)$$

Where A = Area in Acres (WRMA, 2012).

2.4 Water use

Speelman et al (2006) argues that one of the benefits of water use not to be neglected is the positive impact on the livelihoods of the poor. Especially in the extensive semiarid and arid areas of the world, rural livelihoods are strongly influenced by water use. The impact goes further than the traditional public health benefits attributed to it. Water can also be a resource used in or necessary for productive activities and its collection is important in terms of time consumption. According to Speelman et al (2006), the following categories of water use by rural households can be identified: Water for basic needs-these are the uses focused on survival, providing water for drinking, cooking, sanitation and hygiene, with many health impacts and benefits; water for productive activities-these impacts on food security and income. Output may serve own consumption (subsistence production of vegetables, brick making) or the market (sale of vegetables, fruits or ice blocks). Activities may also be associated service provision (hair salon); water for other activities-those not focused on production but mainly on religious or environmental significance. As a productive asset for the poor, water is thus generating both financial and non financial livelihood benefits. Better understanding and analysis on how these water uses affect the livelihoods of the rural people has a huge potential to add to the goal of reducing rural poverty. Hence, benefits from productive water uses should not only be taken into account within water resources management but also within poverty reduction strategy (Speelman et al, 2006)

Katsi, et al (2007) also concurred that water with all its multiple uses plays a pivotal role in the sustenance of rural livelihoods. As such the provision of water which go behold domestic uses should be encouraged to enhance people's livelihoods option by making significant contribution to household income, food security, improved nutrition and health. All these multiple benefits can assist in the fight against hunger and poverty.

2.5 Water related conflicts

According to Wikipedia, Water conflict is a term describing a conflict between countries, states, or groups over an access to water resources. The United Nations (UNO) recognizes that water disputes result from opposing interests of water users, public or private. A wide range of water conflicts appear throughout history, though rarely are traditional wars waged over water alone. Instead, water has historically been a source of tension and a factor in conflicts that start for other reasons. However, water conflicts arise for several reasons, including territorial disputes, a fight for resources, and strategic advantage.

These conflicts occur over both freshwater and saltwater, and between international boundaries. However, conflicts occur mostly over freshwater; because freshwater resources are necessary, yet limited, they are the center of water disputes arising out of need for potable water. As freshwater is a vital, yet unevenly distributed natural resource, its availability often impacts the living and economic conditions of a country or region.

In the Middle East, the lack of cost-effective water desalination techniques in areas like the Middle East, among other elements of water crises can put severe pressures on all water users, whether corporate, government, or individual, leading to tension, and possibly aggression. Recent humanitarian catastrophes, such as the Rwandan Genocide or the war in Sudanese Darfur, have been linked back to water conflicts. (Wikipedia, Free Encyclopedia).

2.5.1. Causes of water conflicts

According to the 1992 International Conference on Water and the Environment, Water is a vital element for human life, and any human activity relates somehow to water. Unfortunately, it is not a renewable resource and in the future there will be a lot of water problems. Moreover, some people like Allen Hammond, World Resources Institute, stated that future wars will be fought for water especially in the Middle East.

Water conflicts occur because the demand for water resources and potable water extend far beyond the amount of water actually available. Elements of a water crisis may put pressures on affected parties to obtain more of a shared water resource, causing diplomatic tension or outright conflict. According to UNESCO, 2006, 1.1 billion people are without adequate drinking water, the potential for water disputes is correspondingly large. Besides life, water is necessary for proper sanitation, commercial services, and the production of commercial goods. Thus numerous types of parties can become implicated in a water dispute. For example, corporate entities may pollute water resources shared by a community, or governments may argue over who gets access to a river used as an international or inter-state boundary.

According to Kiteme and Gikonyo (2002), Water use conflicts may occur between different users at different levels. The nature of these conflicts can be understood by examining the kind of complaints registered by different water users at their respective WRUA. These would also help to reveal the symptomatic manifestation of the conflicts so that they can be addressed in earnest before they become explosive. Their study revealed that conflicts experienced in the Ewaso Ngiro area are triggered by: Water shortage and increased competition among users leading to manipulation and/or destruction of river courses, water intakes, furrows, or pipes (92%), Illegal and/or over abstraction of river water as individual users compete to realize unmet needs and expectations (54%), failure by some water users to accept to share equitably the little available water (38%), water pollution from activities upstream such as car washing in urban centers (23%), catchment destruction through felling of trees, cultivation along river banks and quarrying, in riparian neighbourhoods (23%), other factors such as biased or failed reconciliatory intervention by the local administration and leadership, and lack of water situation information to guide the negotiation processes between conflicting parties (31%).

Conflicts arising from any one or a combination of these problems can occur between different user groups at different levels: upstream versus downstream water users; small-scale versus large-scale irrigators; agro-pastoralists versus pastoralists; users versus authorities; users versus Environmentalists; and among users at project level, (Kiteme & Gikonyo, 2002; Mujwahuzi 2001).

2.5.2 Notable water conflicts and their consequences

Water conflicts can occur on the intrastate and interstate levels. Interstate conflicts occur between two or more neighboring countries that share a trans-boundary water source, such as a river, sea, or groundwater basin. For example, UNESCO, 2006, says the Middle East has only 1% of the world's freshwater shared among 5% of the world's population. Intrastate conflicts take place between two or more parties in the same country. An example would be the conflicts between farmers and industry (agricultural vs industrial use of water).

According to UNESCO, the current interstate conflicts occur mainly in the Middle East, like the disputes stemming from the Euphrates and Tigris Rivers among Turkey, Syria, and Iraq; and the Jordan River conflict among Israel, Lebanon, Jordan and the Palestine territories. In Africa, Nile River-related conflicts among Egypt, Ethiopia, and Sudan, as well as in Central Asia; the Aral Sea conflict among Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan and Kyrgyzstan. At a local level, a remarkable example is the 2000 Cochabamba protests, depicted in the 2010 Spanish film *Even the Rain* by Icíar Bollaín. Some analysts estimate that due to an increase in human consumption of water resources, water conflicts will become increasingly common in the near future. During World War One, the Battle of Beersheba (1917) was fought with the expressed intention of securing water resources in Palestine.

In Kenya, the Tana River Delta is amongst the top three of Kenya's largest and most important freshwater wetland systems with a significant local community of cattle herders and others dependent on it who have done so for centuries. Last year, there was a flurry of stories about brutal mass killings in clashes between the Pokomo and Orma communities over water and land in southeast Kenya's Tana River County. The Kenyan media reported that about 30 people, including eight security personnel, had been killed and scores wounded, and reports on the death toll since last year are more than 100. (Newsecurity Beat, September 28, 2012).

In North Eastern Province of Kenya, water conflicts are frequent. Overseas Development Institute (ODI), a UK think tank, noted: Livestock movement in search of water and pasture remains a driver of conflict. Competition for scarce natural resources is widely understood to be

a primary cause of conflict in the region. (ODI, in a November report, Pastoralists' Vulnerability in the Horn of Africa, Exploring political marginalization, donors' policies and cross-border issues). It continues to note that the movement of livestock and herders often transcends national borders and pastoralist groups across the region depend on the same communal pool of natural resources. Endemic conflict represents one major obstacle to the free movement of pastoralists and their livestock, and therefore greatly contributes to pastoralists' chronic vulnerability in the region.

InterPress Service News Agency (IPS) reported that pastoralist communities across the Horn of Africa frequently cross national borders in search of pasture and water. Although neighboring states often share ethnic groupings, such migrations can be problematic. (IPS, NAIROBI, Sep 11TH,2012) . Rashid Osman, an assistant chief in the town of Moyale, told IRIN that ,sometimes there are cross-border attacks, adding that these were especially frequent during the rains .“During the drought, the police are sent to seal the wells, but during the rains it is less secure,” he said. “Rainfall is an indicator of conflict.”(IRIN News, Nairobi, 17th Dec. 2009).

AlertNet (Monday, 6th, August 2012) observed: As droughts become more frequent and water shortages worsen, Kenya is seeing an increase in water thefts and other water-related crime, Police records show. The most common crimes are theft, muggings and illegal disconnections of water pipes by thieves who collect and sell the water. Many of the crimes occur in urban slums, which lack sufficient piped water. “Since 2003, we have made piped water available to at least half of the slum residents in the entire country, but we are faced with severe hurdles as populations continue to grow and demand for the commodity continues to increase,” said Mangich, acting director of water services in the Ministry of Water. (AlertNet, 2012). Police statistics show that in Kibera – Nairobi’s largest slum which has an estimated 200,000 inhabitants - there are as many as 75 reported incidences of water-related theft daily. Police say they believe many other cases go unreported since residents fear reprisals. Makumi Mwangiri, of the Institute of Diplomacy Studies, University of Nairobi said that what we are witnessing in the slums is very serious. Some think that water theft is petty, but we are living with a time bomb. (AlertNet, Monday 6th August 2012). He said that most cases involving water crimes rarely make

it to court, largely because Kenyan police view water theft as a petty offense. But “there have been incidents where people have been killed that relate to water,” he said. In July, a Kenyan newspaper, the Daily Nation, reported that an old man living in Kenya’s Rift Valley killed another man with his walking stick after being refused permission to jump to the head of a long queue of people waiting for water at a community well. (AlertNet, 2012).

2.6 Community water projects and the role of the WRUA

UN (1971) defined community as a bond by common values and objectives with basic harmony of interest and aspirations. Development is a multi-dimensional process involving many changes in the social structure, popular attitudes and rationale attitudes as well as acceleration of economic growth, eradication in equality and eradication of poverty (Alila, 2006).

2.6.1 Water Projects

Projects must be based on the plans which must be designed in such a way that the project outcome also meets the objectives of the- would be beneficiaries (Mantel and Meredith 2002). On the same, Bwisal (2006) added that project inputs and outputs characteristics define the impact of the project on the project implementing body and the environment, and on the development of the beneficiaries of the project and are more acceptable.

According to the National Development Plan (2002-2008) project beneficiaries should participate in initiations of projects, work plans, budgets, progress reports and monitoring and evaluation in order for such projects to have a positive impact in the community’s development. According to Dolores (1997) Community participation is the voluntary and democratic involvement of residents in decision making in issues directly affecting their lives and development? It is a process by which community mobilizes its resources, initiating and taking responsibility for its own development activities and sharing in decision making for the implementation of all development projects for the overall improvement of their status.

Mulwa (2008) recommended that community members be encouraged to participate by mobilizing their own resources, initiating and taking responsibility for their own development activities. He asserted that people must be given opportunities to participate in projects that benefit them. He continues to say that activities especially in the initial stages of development should meet the felt needs by a significant proportion of the communities involved. This is because it enhances social acceptability. It also ensures that the impacts of development projects favor the economically weaker groups. She advised that projects should be organized using community resources for them to have concrete impacts.

Bartle further point's that Poverty is a social problem, and is contrasted with the individual problem of lack of cash or other resources. We must distinguish between the social level and the individual level, analysis, in our observations, and in our interventions (Bartle1998). A community is a social organization, and is not an individual. It is far more than a mere collection of individuals. It is an entity, sometimes described as super organic that transcends the individuals that compose it at any one time (Bartle 1989). We can make individuals stronger (physically, psychologically) and we can make communities stronger (capacity, wealth, power); these are not the same. To be successful then, in empowering the community, it is necessary to understand the nature of social organizations, of the social level, of society. It is also necessary for you to know something about the relationship between an individual, or individuals, and community, and society (Batchelor 1993).

2.6.2 Role of the WRUA in water access, demand and use chain

A WRUA is an association of water users, riparian land owners, or other stakeholders who have formally and voluntarily associated for the purposes of cooperatively sharing, managing and conserving a common water resource (WRMA Rules 2007).

WRUAs are formed with the objectives to conserve the water catchments; to manage the resources properly; to increase the availability of water resources to increase the usage of the water for economic and social improvements; to develop sustainable and responsive institutions. According to the WRMA Performance Report of July, 2010, water resource management is done at the local level in collaboration with the WRUAs. The involvement of the WRUA is a concept

that was formulated to ensure that water resource management is participatory. The role of the WRUA in management of water resource is to ensure that water sharing is done in harmony without any conflicts. Since the WRUAs are the immediate beneficiaries in their locality, they are also able to participate in corporate management so as to monitor the water resource and in the process enhance quantity and quality of the resource. These activities are regulated by WRMA through a working arrangement with the WRUAs. WRMA Report 1, 2010 describes water users as individual farmers, water projects, corporate institutions and enterprises like large scale ranches, horticultural farms, municipalities, schools, international hotel, etc. and include the wildlife (IWMI/ SICWC 2003). The Water Act 2002 recognizes River Water Users Associations (through the Water Resources User Associations (WRUAs)) as the grassroots institutions for conflict resolutions and community mobilization towards better and sustainable water resource management in their respective catchments areas (GoK 2002c: Water Act 2002 Sec 15(5)).

According to CETRAD, the River Water Users Associations (RWUAs) in Mt. Kenya region commenced as part of the larger strategy for water use and management, under the water awareness creation campaign initiative, in the mid 90s (long before the repeal of the water act). The subsequent years saw the gradual growth (in numbers) of the WUAs, as they gained prominence as one of the most effective ways of enhancing water users (community) participation in water resources management, especially in conflict resolution as water became scarce and competition among users stiffer.(CETRAD: Jan 2005).

2.8 Conceptual Framework

A conceptual framework is used in research to outline possible courses of action or to present a preferred approach to an idea or thought. Conceptual frameworks (theoretical frameworks) are a type of intermediate theory that attempt to connect to all aspects of inquiry (e.g., problem definition, purpose, literature review, methodology, data collection and analysis). Conceptual frameworks can act like maps that give coherence to empirical inquiry. Because conceptual frameworks are potentially so close to empirical inquiry, they take different forms depending upon the research question or problem. Frameworks have also been used to explain conflict

theory and the balance necessary to reach what amounts to resolution. Within these conflict frameworks, visible and invisible variables function under concepts of relevance (Wikipedia). In this research, the independent variables are the key objects of the study, while the dependent variables are the water use patterns and water use conflicts. Within these there are moderating and intervening variables.

The Conceptual Framework:

Independent Variables

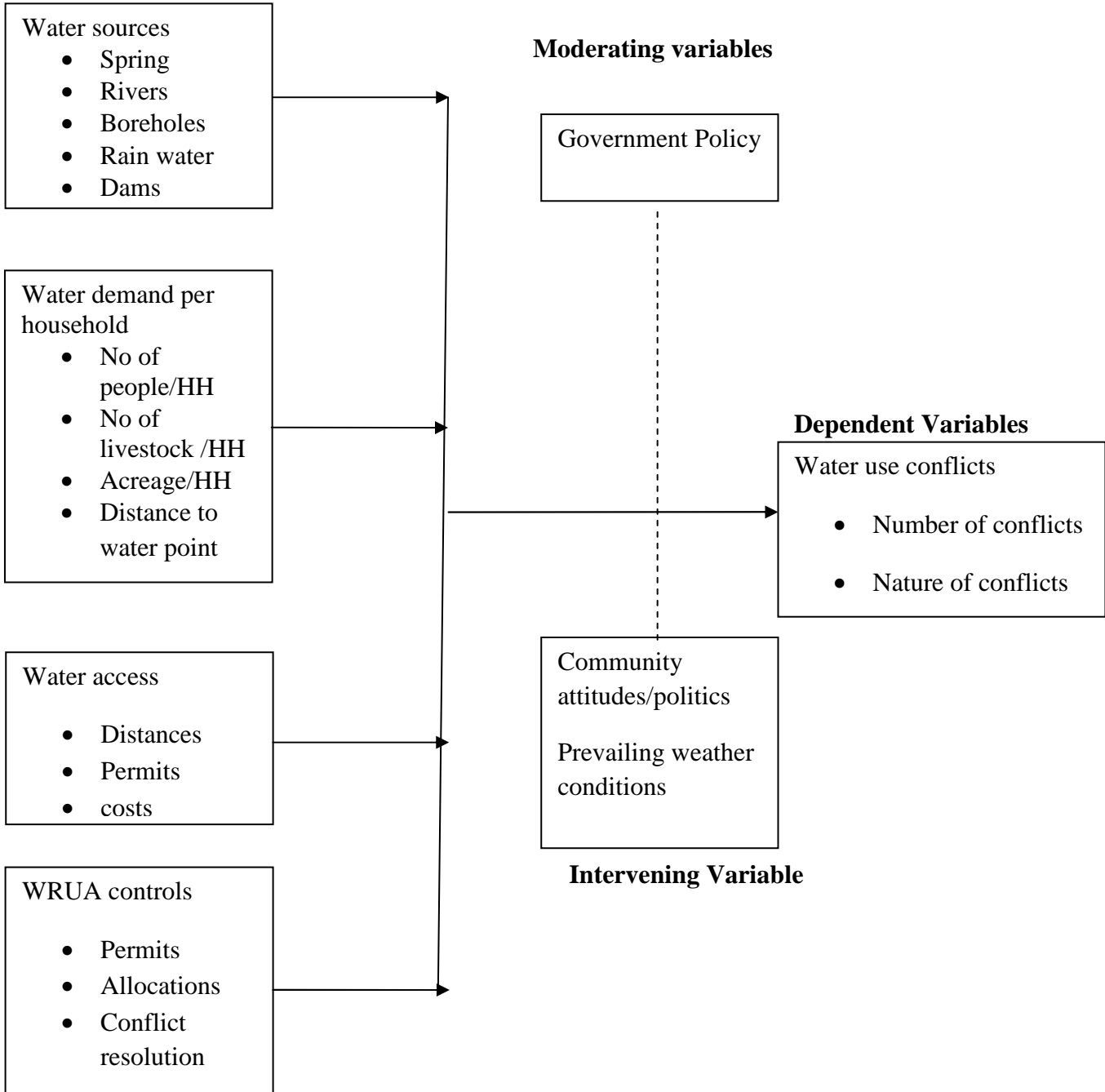


Figure. 1: Conceptual Framework

2.8.1 Summary of interrelationships between variables

The independent variables are linked to the presence and extent of the dependent variables. The Government policy moderates the extent to which the independent variables influence the water use and water related conflicts. The community attitudes to water use intervene in the resultant water use pattern and water conflicts. Local politics is an external factor which may influence the dependent variable (Water use Conflicts) either positively or negatively.

2.9 Knowledge Gap

The literature review shows that there is a problem of increasing water use conflicts in the country. There is limited knowledge in the factors causing water use conflicts in upper Isiolo region and this study will address the problem by studying the water projects in the two dominant WRUAs in the region

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discussed the research design and data collection methods that were used by the researcher in carrying out the study. It also discussed aspects such as target population, sample size, sampling methods, data collection, and Operationalization of variables.

3.2 Research Design

The research design used was descriptive survey in order to describe the influence of variables in this study to yield maximum information with minimum expenditure of time and money (Kothari, 1995). This research design attempted to describe the possible behavior, attitude and characteristic of a variable. This involved collecting information by administering a questionnaire or interviewing a sample of well chosen individuals. Primary data was used whereby questionnaires were administered to respondents and an interview questions asked to enhance the questionnaire and responses.

3.3 Target Population

The population targeted by the researcher is all the 30 water projects who were members of Ngarendare and Ngareniti WRUAs within Isiolo sub-region. The 30 water projects of the two WRUAs formed the sampling frame.

3.4 The Sample size and sampling procedure

A sample is a small part of a large population which is taken to be representative of a large population (Schindler and Cooper 2003). The sample was determined using the following formula: $n = \frac{N}{1 + (e)^2}$ (Yamane, 1967) where:

n=sample size; N=Size of population; E=sampling error (10% point) (Yamane, 1967)

N, being the total number of water projects in the two WRUAs, there are 30 water projects.

Therefore $n = \frac{30}{1 + (0.1)^2}$ hence $n = 29$.

Table 3. 1: Sample frame and sample size

| WRUA | No. of projects (Sample frame) | % | Ratio | Sample size | Sample |
|-------------------|---|------------|--------------|--------------------|---------------|
| Ngarendare | 20 | 65 | 0.65 | 19 | 57 |
| Ngare Niti | 10 | 35 | 0.35 | 10 | 30 |
| Total | 30 | 100 | 1 | 29 | 87 |

As shown in the Table 3.1, a sample size of 29 (twenty nine) water projects was selected which constitutes 96% of the accessible population (30 in both WRUAs) of water projects to represent the target population. Then questionnaires and interviews were administered to three (3) members of each of the 29 water projects, selected systematically making a sample of 87 (eighty seven) respondents.

3.5 The Sample Design

The sample was selected using systematic sampling technique. In this technique subjects are selected after a certain interval calculated by dividing the total population with the expected sample size (Mugenda and Mugenda, 1999). The reason for this is that all members of population are listed in the membership register and so it was easy to get the sample by the use of this method (Kothari, 2007). A list of members of each of the 29 water projects was obtained. Three members were selected using an interval of five. This resulted to a sample of 87 members. Questionnaires were administered to the sample.

3.6 Data Collection Instruments and Procedure

Data was collected using a questionnaire. The questionnaires were administered by the Researcher and the research assistant. The questionnaire was well structured to yield in-depth data. There were self administered questionnaires mainly for the literate respondents, and Researcher administered questionnaire with which the Researcher interviewed the illiterate respondents. The Researcher read and interpreted the questionnaire to the illiterate officials and members and the non members of the water projects, and recorded their responses.

3.6.1 Reliability of the instrument

Reliability is the measure to which a research instrument yields consistent results after repeated trials. A pilot study of 20 individuals from the target population was carried out prior to the main study whereby the instrument was tested to check whether it yielded the same results on repeated trials, and lessons learnt were used to improve the data collection technique.

3.6.2 Reliability analysis

Reliability of the questionnaire was evaluated through Cronbach's Alpha which measures the internal consistency. The Alpha measures internal consistency by establishing if certain items measure the same construct. Nunnally (1978) established the Alpha value threshold at 0.6 which the study benchmarked against. Cronbach Alpha was established for every objective in order to determine if each scale (objective) would produce consistent results should the research be done later on. Table 4.1 shows that all the scales were significant, having an Alpha above the prescribed threshold of 0.6. Water sources had an Alpha of 0.923, water demand per household had an Alpha of 0.890, water access had an Alpha of 0.787, the influence of the WRUA on water use conflicts had an Alpha of 0.702.

Table 3. 2: Reliability analysis

Table 3.2 shows the reliabilities of the four variables

| Scale | Cronbach Alpha | Item |
|-----------------------------|----------------|-----------|
| water sources | 0.923 | 6 |
| water access | 0.787 | 5 |
| water demand per household | 0.890 | 6 |
| WRUA on water use conflicts | 0.702 | 5 |
| Average (All Scales) | 0.826 | 22 |

As shown in the table 3.2, all the four variables have reliability above the required threshold of 0.6, meaning that all the four are significant to the dependent variable

3.6.2 Validity of the instrument

The instrument was pre-tested for validity by the pilot study of 20 respondents to ensure it measured what was intended. This helped to predict the warnings and risks about the research project especially when the proposed methods or instruments are inappropriate or too complex. Valid results are those which make sense, are persuasive and have appearance of truth and reality.

3.6.1 Primary data

Primary data was collected using standardized questionnaires which were administered on the sample respondents and personal interviews to supplement the information obtained through the questionnaire. A series of yes/ no questions followed by an open ended and a matrix question have been designed on each study variable. The respondents to the questionnaire were registered to members in the sample. The questionnaire focused on the specific variables of the project.

3.7 Data Collection Procedures

The researcher obtained a letter of introduction from WRMA regional office Nanyuki. The researcher then collected the data in person. The process involved handing over the questionnaires to the respondents. Personalized interviews were conducted among the committee members and officials who could not read.

3.8 Data Analysis and Presentation Procedure

Both qualitative and quantitative analysis techniques were used. Data from structured questionnaires was edited for completeness and consistency. The data was thereafter coded so that responses could be grouped and analyzed using SPSS statistical methods to yield percentages. Data was also put in tables and trends established.

3.9 Operationalization Table

Operationalization of variables is the construction of actual, concrete measurement techniques or the creation of “operations” that will result in the desired measurements. It is the development or choice of specific research procedures (operations) that will result in representing the concepts of interest. (Artachariya, 2008).

Table 3. 2: Operationalization Table

| Objective | Type of variable | Indicators | Measurement scale | Research instrument | Data collection | Method of analysis |
|---|--|---|-------------------|---------------------|--------------------|--------------------|
| 1.To determine the influence of water sources on water use conflicts | Independent Watersources | · Springs · Rivers · Boreholes · Rainwater harvesting · Dams | Ordinal | Questionnaire | Descriptive survey | Quantitative |
| 2.To determine the influence of water access on water use conflicts | Independent Water access | · Distances to water points · Membership fees · Project permits | Ordinal | Questionnaire | Descriptive Survey | Quantitative |
| 3.To determine the influence of water demand per household on water use conflicts | Independent Water demand per household | · No. of people per hh · No. of livestock per hh · Irrigation acreage | Ordinal | Questionnaire | Descriptive survey | Quantitative |
| 4.To determine influence of WRUA on water use conflicts in the study area | Independent WRUA powers | Access regulation Demand control Conflict resolution | Ordinal | Questionnaire | Descriptive survey | Quantitative |

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter discussed the analysis of data, interpretation and the presentation of the research findings. Apoyo (2011) defined data analysis as the process of reducing large amount of collected data to data that addresses the initial proposition of the study. The research findings relate to the research questions that guided the study. The data from the completed questionnaires was analyzed and summary of key findings presented.

The research aimed at: determining the influence of water sources on water use conflicts in Ngarendare and Ngareniti WRUAs: determining the influence of water access to water use conflicts in the two study areas: estimating the influence of water demand per household on water use conflicts in the two WRUAs and determining the influence of WRUA on water use conflicts in the study area.

4.1.1 Response Rate

The study targeted 87 respondents in collecting data with regard to the factors influencing the water conflicts in WRUAs of upper Isiolo region and whether their efforts to regulate water demand, access and use chain has born any success in mitigating water related conflicts in the neighbouring communities. From the study, 65 out of the 87 sample respondents filled in and returned the questionnaires making a response rate 74.71%. This reasonable response rate was made a reality after the researcher made personal calls and visits to remind the respondents to fill in and return the questionnaires. According to Mugenda and Mugenda (1999) a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent; therefore, this response rate was excellent for analysis and reporting.

4.2 Respondents Demographic Information

4.2.1 Respondents Age

On the age of the respondents, the study found that the majority of the respondents were between 35- 39 years (27.7%), 15.4% were aged between 30- 34 years, 13.8% were aged between 25- 29 years, 12.3% were aged between 40- 44 years, 9.2% were aged between 45-49 and 50-54 years respectively, 6.2% were aged between 55- 59 years while 3.1% were aged below 24 and above 59 years respectively as indicated in Table 4.1.

Table 4. 1: Respondents Age

| Age interval | Frequency | Percentage |
|---------------------|------------------|-------------------|
| 18-24 years | 2 | 3.1 |
| 25 – 29 years | 9 | 13.8 |
| 30 – 34 years | 10 | 15.4 |
| 35 – 39 years | 18 | 27.7 |
| 40 – 44 years | 8 | 12.3 |
| 45 – 49 years | 6 | 9.2 |
| 50 – 54 years | 6 | 9.2 |
| 55 – 59 years | 4 | 6.2 |
| Above 59 years | 2 | 3.1 |
| Total | 65 | 100 |

As presented in the table 4.1 it shows that majority of the members of Ngarendare and Ngareniti WRUAs within Isiolo sub-region are middle aged. It means the biggest number of water users are in the 24-65 age bracket.

4.2.2 Respondents Gender Table 4. 2: Respondents Gender

| Gender | Frequency | Percentage |
|---------------|------------------|-------------------|
| Male | 55 | 84.6 |
| Female | 10 | 15.4 |
| Total | 65 | 100 |

The findings in Table 4.3 show the gender of the respondents. From the findings, the study established that the majority of respondents were male as shown by 84.6% while females were 15.4% of the respondents. This shows that there are more male than females registered as water project members within Ngarendare and Ngareniti WRUAs as indicated in Table 4.3

4.2.3 Marital Status

On the marital status of the respondents, the findings in table 4.4 show that 85.0% of the respondents were married, 9.7% of the respondents were single, 4.5 % were divorced while 0.7 were widowed as shown in the table 4.3.

Table 4. 3: Marital Status

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Married | 59 | 86.2 |
| Single | 6 | 13.8 |
| Total | 65 | 100.0 |

The results show that majority of the respondents were married and therefore responsible and accountable. This implies that water can be put under responsible use in the two WRUAs if all other conditions are observed.

4.2.4 Period of Membership at the Water Project

The period of membership in a water project refers to the period one has been a member in a water project. The responses are as shown in table 4.4.

Table 4. 4: Periods of Membership at the Water Project

| Period | Frequency | Percentage |
|----------------|------------------|-------------------|
| 1-3 years | 7 | 10.8 |
| 4 – 10 years | 40 | 60.0 |
| 11 – 20 years | 13 | 20.0 |
| Above 21 years | 5 | 7.7 |
| Total | 65 | 100 |

On the period of membership of the respondents, the table above shows that the majority of the respondents had been members for between 4- 10 years (60.0%), 20.0% had been members between 11- 20 years, 10.8% had been members below 3 years while 7.7% have been members for more than 21 years. This means that majority of the water projects in this region are young with recent registrations and this could be attributed to not only increasing scarcity and demand for water, but also sensitizations from various water stake holders as indicated in Table 4.4.

4.2.5 Highest Level of Education

The table 4.6 shows the levels of education of the respondents. This was intended to enhance the understanding how the communities grasp the issues of water use conflict. From the findings, 55.4% of the respondents indicated that secondary was their highest level of education, 32.3% of the respondents indicated that primary was their highest level of education, and 7.7% had a certificate as the highest level of education while 4.6% had a diploma as the highest level of education as indicated in the Table 4.6

Table 4. 5: Respondents’ Level of Education

| Level | Frequency | Percent |
|--------------|------------------|----------------|
| Primary | 21 | 32.3 |
| Secondary | 36 | 55.4 |
| Certificate | 5 | 7.7 |
| Diploma | 3 | 4.6 |
| Total | 65 | 100.0 |

This implies that majority of the respondents are trainable on water related issues and can understand the issues surrounding the water use conflicts as shown in the Table 4.5.

4.2.6 Positions held in the water projects

The study also sought to establish the positions held by the respondents Table 4. 6 below Positions held in the water project.

Table 4.6 Positions held in water projects

| Position | Frequency | Percent |
|-----------------|------------------|----------------|
| Chairman | 6 | 9.2 |
| Secretary | 9 | 13.8 |
| Treasurer | 7 | 10.8 |
| Member | 43 | 66.1 |
| Total | 65 | 100.0 |

It was found that 66.1% of the respondents were ordinary members,13.8% of the respondents indicated that they were secretaries,10.8% of the respondents indicated that they were treasurers of water projects while 9.2% of the respondents indicated that they were chairmen of the water projects as shown in Table 4.6.

4.2.7 Formal Training in Water Management

The study aimed to establish whether the respondents had any formal training in water management. According to the findings, majority of the respondents (72.3%) didn't have any formal training while 27.7% had formal training as indicated in Table 4.7.

Table 4.7: Any Formal Training in Water Management

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Yes | 18 | 27.7 |
| No | 47 | 72.3 |
| Total | 65 | 100.0 |

From these results we can therefore state that majority of the respondents weren't trained in water management, and therefore there was little or no awareness on the ground about water use conflicts and other water related issues as per the research questions as shown in Table 4.7.

4.3 Water Sources and Ways of Water Access

The study also sought to establish the sources of water for the project. The table 4.8 shows the findings in the research.

Table 4. 8: Sources of Water for the Project

| Source | Frequency | Percent |
|---------------|------------------|----------------|
| Rivers | 12 | 18.5 |
| Dams | 1 | 1.5 |
| Boreholes | 8 | 12.3 |
| Springs | 41 | 63.1 |
| Wetlands | 3 | 4.6 |
| Totals | 65 | 100.0 |

From the findings, 63.1% of the respondents indicated springs as the sources, 18.5% of the respondents indicated rivers as the sources, 12.3% of the respondents indicated boreholes as the sources, 4.6% of the respondents indicated wetlands as the sources while 1.5% of the respondents indicated dams as the sources. This implies that majority of the water projects get their water from springs-based intakes as shown in the Table 4.8.

4.3.2 Whether all The Project Members Get Their Water from the Project

Pertaining whether the projects members got their water from the project, 60% of the respondents indicated that they got their water from their project while 40% indicated that they didn't get all their water from their project.

Table 4. 9: Whether the project members get all their water from the project

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Yes | 39 | 60.0 |
| No | 26 | 40.0 |
| Total | 65 | 100.0 |

This therefore means that a significant number of members (40%) have other sources of the water they use apart from their own water projects as shown in Table 4.9.

4.3.3 Adequate Water for All the Project Members

With regard to whether the water was enough for all the project members, 60% of the respondents indicated that the water was rarely enough for all the project members, 20% indicated that the water was not at all enough for all the project members, 16.9% of the respondents indicated that the water was just enough for all the project members while 3.1% of the respondents indicated that the water was very much enough for all the project members.

Table 4. 10: Adequate water for all the project members

| Adequacy | Frequency | Percent |
|-----------------|------------------|----------------|
| Very adequate | 2 | 3.1 |
| Adequate | 11 | 16.9 |
| Rarely | 39 | 60.0 |
| Not at all | 13 | 20.0 |
| Total | 65 | 100.0 |

From these findings we can therefore deduce that there is need to manage available water resources effectively so as to make more water available for domestic, agricultural, industrial and environment as shown in Table 4.10.

4.3.4 Paying for the water use

With regard to whether they paid for the water, 83% of the respondents indicated that they paid for the water while 17% of the respondents indicated that they didn't pay for the water use.

Table 4. 11: Pay for the water use

| | Frequency | Percent |
|--------------|------------------|----------------|
| Yes | 54 | 83.0 |
| No | 11 | 17.0 |
| Total | 65 | 100.0 |

This implies that the WRUAs and the WRMA get a bigger percentage of their intended water revenue from the water projects as shown in Table 4.11.

4.3.5 Water Affordability

The study sought to find out whether the water was available to the members. From the findings, 78.5% of the respondents indicated that the water was not affordable while 21.5% of the respondents indicated that the water was very affordable.

Table 4. 12: Water affordability

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Very affordable | 14 | 21.5 |
| Not affordable | 51 | 78.5 |
| Total | 65 | 100.0 |

The Table 4.12 shows that a very large number of project members find their water unaffordable. This means there is a significant number of people who have to rely on other means of getting water other than the water projects.

4.3.6 Members Support to their Project

From the findings, 32.3% of the respondents indicated that the members supported the project very much and 26.2% of the respondents indicated that the members much supported the project. Also, it was found that 32.3% per cent rarely respectively while 9.2% of the respondents indicated that the members didn't support the project at all.

Table 4. 13: Members Support the Project

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Very much | 21 | 32.3 |
| Much | 17 | 26.2 |
| Rarely | 21 | 32.3 |
| Not at all | 6 | 9.2 |
| Total | 65 | 100.0 |

From the Table 4.13, it shows that a significant number of water project members (41.5) give very either little or no support at all to their water projects either.

4.4 Water Demand

As one of the research questions was whether water demand per house influences water use conflicts in the study area, it was necessary to identify the areas of water need within an household.

Table 4. 14: Number of households registered as project members

| No. of households | Frequency | Percent |
|--------------------------|------------------|----------------|
| 10-20 households | 15 | 23.1 |
| 20-30 households | 6 | 9.2 |
| 30-40 households | 6 | 9.2 |
| 40 and above households | 38 | 58.5 |
| Total | 65 | 100.0 |

The table 4.15 shows that 58.5% of the respondents indicated that 40 and above households were registered as members of their water project. 23.1% of the respondents indicated that between 10-20 households were registered as members of the project while 9.2% of the respondents indicated that between 20-30 and 30-40 households were registered as members of their water projects.

4.4.2 Are there non members depending on the water project?

The study sought to find out whether there were non- members depending on the water project. From the findings, 75.4% of the respondents indicated that there were non-members while 16% indicated that there weren't non members.

Table 4. 15: Non members depending on the water project

| Responses | Frequency | Percent |
|------------------|------------------|----------------|
| Yes | 49 | 75.4 |
| No | 16 | 24.6 |
| Total | 65 | 100.0 |

This indicates that there were unregistered households getting water from water projects in both WRUAs. This is a potential avenue of conflict as water is not enough to serve the non members as indicated in the Table 4.4.2.

4.4.3 How non members get water from the project

Pertaining how the non members got water from the project.76.9% of the respondents indicated that the non members got water from the project through illegal abstraction while 15% of the respondents indicated that the non members got water from the project through buying in both WRUAs.

Table 4. 16: How non members get water from the project

| Category | Frequency | Percent |
|---------------------|------------------|----------------|
| Buying | 15 | 23.1 |
| Illegal abstraction | 50 | 76.9 |
| Total | 65 | 100.0 |

4.4.4 Number of people in a household

With regard to the number of people in a household the Table 4.17 shows the responses.

Table 4. 17: Number of people in a household

| No.of pepole in hh | Frequency | Percent |
|---------------------------|------------------|----------------|
| 3-5 people | 18 | 27.7 |
| 6-10 people | 40 | 61.5 |
| 10 and above people | 7 | 10.8 |
| Total | 65 | 100.0 |

As the Table 4:18 shows, 61.5% of the respondents indicated that there were between 6-10 people, 27.7% of the respondents indicated that there were between 3-5 people while 10.8% % of the respondents indicated that there were 10 and above people in the household.

4.4.5 Number of Livestock per household

Water is demand arise due to various needs. Livestock drinking is one of the uses. In order to enhance the answer to the question of water demand per household, it was important to ascertain the number of livestock per household.

4.4.5.1 Sheep and goats

Pertaining the number of sheep and goats the members had per household, 53.8% of the respondents indicated that they had between 3-10 sheep and goats, 27.7% of the respondents indicated that they had between 10-20 sheep and goats while 18.5% of the respondents indicated that they had 20 and above sheep and goats.

Table 4. 18: Sheep and Goats

| Category | Frequency | Percent |
|------------------------------|------------------|----------------|
| 3-10 sheep and goats | 35 | 53.8 |
| 10-20 sheep and goats | 18 | 27.7 |
| 20 and above sheep and goats | 12 | 18.5 |
| Total | 65 | 100.0 |

Hence it is easy to determine the daily water requirements for the sheep and goats as per the water demand objective as indicated in the Table 4.18

4.4.5.2 Cows/Donkeys/Camels/Horses

To avail more understanding of water demand objective, the researcher looked at the number of cows/donkeys/camels/horses the members had per household.

Table 4. 19: Cows/Donkeys/Camels/Horses

| Cows/Donkeys/Camels/Horses | Frequency | Percent |
|-----------------------------------|------------------|----------------|
| 3-10 | 48 | 73.8 |
| 10-20 | 13 | 20.0 |
| 20 above | 4 | 6.2 |
| Total | 65 | 100.0 |

From the study, 73.8% of the respondents indicated that they had between 3-10 cows/donkeys/camels/horses, 20% of the respondents indicated that they had between 10-20 cows/donkeys/camels/horses while 6.2% of the respondents indicated that they had 20 and above cows/donkeys/camels/horses. Each of the above categories are allocated 50lt per day therefore the researcher was able to ascertain their daily water demand as indicated in the Table 4.19.

4.4.6 Number of acres of land possessed by each member

The study sought to find out the number of acres each member of the household possessed.89.2% of the respondents possessed 0.5-5 acres,9.2% of the respondents possessed 5-10 acres while 1.5% of the respondents possessed 10 and above acres.

Table 4. 20: Number of acres possessed by each member

| Acres | Frequency | Percent |
|--------------|------------------|----------------|
| 0-5 | 58 | 89.2 |
| 5-10 | 6 | 9.2 |
| 10 and above | 1 | 1.5 |
| Total | 65 | 100.0 |

As indicated in the Table 4.20, majority of the project members possess below 5 acres of land in the study area.

4.4.7 Number of acres under irrigation

With regard to the number of acres under irrigation, majority of the respondents (95.4%) indicated that they had 0.5-5 acres under irrigation, 3.1% of the respondents indicated that they had 5-10 acres under irrigation while 1.5% of the respondents indicated that they had 10 and above acres under irrigation.

Table 4. 21: Number of acres under irrigation

| Acres | Frequency | Percent |
|--------------|------------------|----------------|
| 0-5 | 62 | 95.4 |
| 5-10 | 2 | 3.1 |
| 10 + | 1 | 1.5 |
| Total | 65 | 100.0 |

Therefore water demand for irrigation mainly goes to the small holder farmers in the area as shown in Table 4.21.

4.5 Water use

These are the diverse purposes under which water is put by various groups or individuals

4.5.1 How project members use their water

The study sought to find out how the members used their water. The Table 4.22 shows the responses as to the question of how project members use their water.

Table 4. 22: How project members use their water

| Water use | Frequency | Percent |
|------------------|------------------|----------------|
| Domestic | 54 | 81.5 |
| Livestock | 5 | 9.2 |
| Irrigation | 6 | 9.2 |
| Total | 65 | 100.0 |

From the findings the study established that in all the projects in both WRUAs 81.5% of the respondents used the water for domestic purposes while 9.2% of the respondents used the water for their livestock and irrigation respectively as indicated in the Table 4.22

4.5.2 Whether the Water was enough for the members use

Table 4. 23: Whether the water was enough for the members use

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Yes | 18 | 27.7 |
| No | 47 | 72.3 |
| Total | 65 | 100.0 |

The Table 4.23 shows the responses as to whether the water was enough for all the project members. From the findings, 72.3% of the respondents indicated that the water wasn't enough while 27.7% of the respondents indicated that the water was enough.

4.6 Water Related Conflicts

These are conflicts between countries, states or groups over an access to water resources. This question was very important in order to underscore the respondents understanding of water use conflict in his/her project.

4.6.1 Any water conflicts in the project

The study sought to find out whether there were any water conflicts in the projects of both WRUAs. From the findings, 67.7% of the respondents indicated that there were water conflicts in the projects while 32.3% of the respondents indicated that there were no water conflicts in the projects.

Table 4. 24: Any water conflicts in the project

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Yes | 44 | 67.7 |
| No | 21 | 32.3 |
| Total | 65 | 100.0 |

As shown in the Table 4.24, majority of water projects (67.7) are experiencing some forms of water use conflicts in the study area as indicated in the Table 4.24

4.6.2 Illegal water abstractions in the Project

With regard to whether there had been any illegal abstractions in the project, in the last three months.66.2% of the respondents indicated that there had been no cases of illegal abstractions in the project , in the last three months,21.5% of the respondents indicated that there had been cases of illegal abstractions in the project , in the last three months while 12.3% of the respondents indicated that they didn't know of any cases of illegal abstractions in the project , in the last three months.

Table 4. 25: Illegal abstractions in the project

| | Frequency | Percent |
|--------------|------------------|----------------|
| Yes | 14 | 21.5 |
| No | 43 | 66.2 |
| Don't Know | 8 | 12.3 |
| Total | 65 | 100.0 |

Illegal abstractions of water are known to cause water use conflicts hence a bigger number of water projects in the WRUAs experience water use conflicts, as shown in Table 4.25.

4.6.3 Over abstraction of the project

The issue of over abstraction of water is known to fuel water use conflicts. The Table 4.26 indicates the responses as to whether there have been over abstraction of water in the projects.

Table 4. 26: Over abstraction of the project

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Yes | 13 | 20.0 |
| No | 46 | 70.8 |
| Don't Know | 6 | 9.2 |
| Total | 65 | 100.0 |

The respondents indicated that 70.8% of the respondents indicated that there had been no cases of over abstractions in the projects, in the last three months, 20% of the respondents indicated that there had been cases of over abstractions in the projects, in the last three months while 9.2% of the respondents indicated that they didn't know of any cases of over abstractions in the projects, in the last three months as indicated in the Table 4.26.

4.6.4 Destruction of pipes, intakes, etc in the project

The conflicts over water can arise as a results of, or can lead to members destroying pipes, intakes etc belonging to other members. The Table 4.27 shows the responses to this question

Table 4. 27: Destruction of pipes, intakes, etc in the project

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Yes | 30 | 46.2 |
| No | 33 | 50.8 |
| Don't Know | 2 | 3.1 |
| Total | 65 | 100.0 |

The table 4.28 shows cases of destruction of pipes, intakes and other water installations in the projects in the last three months. 50.8% of the respondents indicated that there had been no cases of destruction of pipes, intakes in the project, in the last three months, 46.2% of the respondents indicated that there had been cases of destruction of pipes, intakes in the project, in the last three months while 3.1% of the respondents indicated that they didn't know of any cases of destruction of pipes, intakes in the project, in the last three months as shown in the Table 4.27

4.6.5 Trespassing by others to the project

The study sought to find out whether there had been trespassing by others in the project, in the last three months.

Table 4. 28: Trespassing by others to the Project

| Category | Frequency | Percent |
|--------------|-----------|--------------|
| Yes | 13 | 20.0 |
| No | 50 | 76.9 |
| Don't Know | 2 | 3.1 |
| Total | 65 | 100.0 |

The study found that 76.9% of the respondents indicated that there had been no cases of trespassing by others in the project, in the last three months, 20% of the respondents indicated that there had been cases of trespassing by others in the project, in the last three months while 3.1% of the, respondents indicated that they didn't know of any cases of trespassing by others in the project in the months as indicated in the Table 4.28.

4.7 The Influence of the WRUA

Pertaining to the influence of the WRUAs, the study sought to find out how the WRUAs executed their powers in the issue of water use conflicts and whether they influenced the conflicts in any way.

4.7.1 Water projects' membership to the WRUA

To determine whether the water projects were members of the WRUAs, the responses are as shown in Table 4.29

Table 4. 29: Water project membership to the WRUA

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Yes | 50 | 76.9 |
| No | 13 | 20.0 |
| Don't Know | 2 | 3.1 |
| Total | 65 | 100.0 |

4.7.2 Attendance the WRUA meetings

The study sought to find out whether the members attended the WRUA meetings. According to the findings, 50.8% of the respondents indicated that they didn't attend the WRUA meetings while 49.2% of the respondents indicated that they attended the WRUA meetings.

Table 4. 30: Attendance of the WRUA meetings

| | Frequency | Percent |
|--------------|------------------|----------------|
| Yes | 32 | 49.2 |
| No | 33 | 50.8 |
| Total | 65 | 100.0 |

The Table 4.30 shows that more than half of the respondents did not attend WRUAs meetings in the study area. This could be a reason for dwindling WRUA support in the study area

4.7.3 Number of times the WRUA officials visit the water project

Pertaining to number of times the WRUA officials visited the water project.67.7% of the respondents indicated that the WRUA officials had not visited the water project, in the last three months, 26.2% of the respondents indicated that the WRUA officials visited the water project between 0-5 times, in the last three months while 6.2% of the respondents indicated that the WRUA officials visited the water project more than 5 times, in the last three months.

Table 4. 31: Number of times the WRUA officials visited the water project

| No. of imes | Frequency | Percent |
|--------------------|------------------|----------------|
| Zero times | 44 | 67.7 |
| 0-5 times | 17 | 26.2 |
| More than 5 times | 4 | 6.2 |
| Total | 65 | 100.0 |

This means that the biggest percentage of project members feel that the WRUA officials do not visit the water projects at all as indicated in the Table 4.31.

4.7.4 Whether WRUA issues water allocation permits to water projects

On whether the WRUA issued water allocations permits to water projects.

Table 4. 32: Whether WRUA issues water allocations permits to water Projects

| | Frequency | Percent |
|--------------|------------------|----------------|
| Yes | 36 | 55.4 |
| No | 29 | 44.6 |
| Total | 65 | 100.0 |

According to the findings, 55.4% of the respondents indicated that WRUA issued water allocations permits to water projects while 44.6% of the respondents indicated that WRUA didn't issue water allocations permits to water projects as shown in Table 4.32

4.7.5 Whether WRUA monitors water use in the project

The study sought to find out whether WRUA monitored water use in the project. The table 4.33 shows the findings:

Table 4. 33: Whether WRUA monitors water use in the project

| | Frequency | Percent |
|--------------|------------------|----------------|
| Yes | 41 | 63.1 |
| No | 18 | 27.7 |
| Don't Know | 6 | 9.2 |
| Total | 65 | 100.0 |

From the findings,63.1% of the respondents indicated that WRUA monitored water use in the project,27.7% of the respondents indicated that WRUA didn't monitor water use in the project while 9.2% of the respondents indicated that they didn't know whether WRUA monitored water use in the project as shown in Table 4.33.

4.7.6 Rating the WRUA on water conflicts resolution

The study sought to find out how WRUA was rated as far as water conflict resolution was concerned. These are shown in the table 4.35 below:

Table 4. 34: Rate WRUA Water Conflict Resolution

| Conflict resolution | Frequency | Percent |
|----------------------------|------------------|----------------|
| Efficient | 40 | 61.5 |
| Inefficient | 25 | 38.5 |
| Total | 65 | 100.0 |

According to the findings, 61.5% of the respondents rated WRUAs water conflict resolution as efficient while 38.5% of the respondents rated WRUAs water conflict resolution as inefficient.

4.7.7 Cases of water conflicts the WRUA solved

The cases of water conflicts the WRUA solved in the period of three months are shown in the Table 4.35

Table 4. 35: Cases of water conflicts the WRUA has solved

| | Frequency | Percent |
|--------------------|------------------|----------------|
| 0 cases | 24 | 36.9 |
| 1-5 cases | 33 | 50.8 |
| 6-10 cases | 5 | 7.7 |
| 11-20 cases | 2 | 3.1 |
| 21 and above cases | 1 | 1.5 |
| Total | 65 | 100.0 |

According to the above findings, 50.8% of the respondents indicated that WRUA had solved 5 cases, 36.9% of the respondents indicated that WRUA had not solved any cases at all, 7.7% of the respondents indicated that WRUA had solved 10 cases, 3.1% of the respondents indicated that WRUA had solved 20 cases while 1.5% of the respondents indicated that WRUA had solved 40 and above cases. Although a bigger number of respondents felt that WRUAs was solving their water conflicts, a significant number (40%) felt that WRUAs was not effectively solving their problem of water conflict problems. This calls for a concerted effort from the WRUAs to ensure they reach to this population to create awareness and establish their availability.

4.8 Government Policy

4.8.1 Advice on water use from WRMA (Government officials)

The study sought to find out whether the members received advice on water use from WRMA.

Table 4. 36: Receiving advice on water use from WRMA

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Yes | 35 | 53.8 |
| No | 19 | 29.2 |
| Not aware | 11 | 16.9 |
| Total | 65 | 100.0 |

According to the findings,53.8% of the respondents indicated that they received advice on water use from WRMA,29.2% of the respondents indicated that they didn't receive advice on water use from WRMA while 16.9% of the respondents indicated that they were not aware on whether WRMA gave advice on water usage.

4.8.2 WRMA visits to water project in a month

Pertaining to how often WRMA visited the water WRUA in a month. From the findings 66.2% of the respondents indicated that the WRMA didn't visit the water WRUA, 26.2% of the respondents indicated that the WRMA visited the water WRUA once in a month while 7.7% of the respondents indicated that the WRMA visited the water WRUA twice in a month.

Table 4. 37: WRMA visits in a month

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Once | 17 | 26.2 |
| Twice | 5 | 7.7 |
| None | 43 | 66.2 |
| Total | 65 | 100.0 |

This means that WRMA influence as a Government authority is weakly felt in the study area as 66% of respondents said as indicated in the Table 4.37

4.8.3 Whether WRMA offers training on water use to members

On whether the WRMA offered training on water use to the members, 60% of the respondents indicated that WRMA didn't offer training on water use to the members while 40% of the respondents indicated that WRMA offered training on water use to the members.

Table 4. 38: Whether WRMA offers training on water use to members

| Category | Frequency | Percent |
|-----------------|------------------|----------------|
| Yes | 26 | 40.0 |
| No | 39 | 60.0 |
| Total | 65 | 100.0 |

The Table 4.38 shows that a big number (60 %) of respondents said that WRMA does not offer trainings on water related issues in the study area as shown in the study area

4.9 Correlation Analysis

In order to establish the relationship between the dependent and independent variables, Pearson correlation analysis was used. Pearson's correlations analysis was then conducted at 95% confidence interval and 5% confidence level 2-tailed. The table 4.39 below indicates the correlation matrix between the factors (water sources, water access, water demand, Influence of the WRUA) and water use conflicts. According to the table, there is a positive relationship between water use conflicts and water sources, water access, water demand, Influence of the WRUA of magnitude 0.790, 0.878, 0.886 and 0.609 respectively. The positive relationship indicates that there is a correlation between the factors and the water use conflicts. This infers that water demand has the highest effect on water use conflicts, followed by water access, then water sources while influence of the WRUA having the lowest effect on the water use conflicts. This notwithstanding, all the factors had a significant p-value ($p < 0.05$) at 95% confidence level. The significance values for relationship between water use conflicts and water sources, water access, water demand, Influence of the WRUA were 0.006, 0.004, 0.003 and 0.009 respectively. This implies that water demand was the most significant factor, followed by water access then water sources while influence of the WRUA was the least significant.

Table 4. 39: Correlation Matrix

| | | water use conflicts | water sources | water access | water demand | Influence of the WRUA |
|-----------------------|---------------------|---------------------|---------------|--------------|--------------|-----------------------|
| water use conflicts | Pearson Correlation | 1 | | | | |
| | Sig. (2-tailed) | . | | | | |
| water sources | Pearson Correlation | .790 | 1 | | | |
| | Sig. (2-tailed) | .006 | . | | | |
| water access | Pearson Correlation | .878 | .562 | 1 | | |
| | Sig. (2-tailed) | .004 | .010 | . | | |
| water demand | Pearson Correlation | .886 | .706 | .801 | 1 | |
| | Sig. (2-tailed) | .003 | .007 | .008 | . | |
| Influence of the WRUA | Pearson Correlation | .609 | .546 | .621 | .502 | 1 |
| | Sig. (2-tailed) | .009 | .020 | .034 | .024 | . |

4.10 Findings of the study From the Interview Guide

The following subsections discuss the findings of the study from the interview guide.(see schedule appendix iii).

4.10.1 Water sources and ways of water access

With regard to where else the members got their water for their use, the interviewees indicated that they got their water from harvesting rain water, from neighboring projects, stream and dams, springs, rivers and wetlands.

4.10.2 Water use

On the question on how else the members used their water, the responded said that they use the water in doing crop and livestock farming, for domestic use and for feeding the wild animals.

4.10.3 Water use conflicts

With regard to the kind of water conflicts that existed in the project, the interviewees indicated that there was misuse of funds , destroying pipes, stealing pipe, claim by other members that they have no enough water ,pipe blockages, time on shifts, water use fines, disconnection of water by

other people during dry season, ideological differences on meter charges, illegal tapping of water by non members, different opinions ,lack of equity in water use and discrimination between members and non members.

4.10.4 Influence of the WRUA

The respondents further pointed out that there were two conflicting understandings of the name of their WRUA which is Ngare Niti and Ngare Nithing.

On the question on the major challenges the WRUA faces the interviewees indicated that the WRUA faced the following challenges: Poor management, poor transport means, white people pump a lot of water than the locals, water scarcity, failure of groups to attend meetings, failure to register with WRUA, failure to educate community on the importance of water conservation and how to use it efficiently, high ratio of population to water, water rationing, communication barrier and misuse of the water by the community.

4.10.5 Government Policy

On the question on the kind of formal training in water management, the interviewees indicated that they were trained on small scale irrigation, water catchment conservation, wet land conservation, group dynamics, water harvesting, operation and maintenance course, motorized pumping water supply system and water conservation.

With regard to ways in which the challenges could be overcome, the interviewees proposed that the community should be trained on water management, increased borehole drilling, all projects to register with WRUA ,members of the projects should start attending meetings, educate community on the importance of proper uses of water without wastage, government should avail funds for building more water projects, look for new water sources, dam Construction, donation and government support, ensure equity of distribution of water and subcommittees should be formed to assist WRUA.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter offers summary, the discussion of key data findings, conclusions and recommendations of the research on the factors influencing the water conflicts in WRUAs of upper Isiolo region.

5.2 Summary of the Findings

The study found out that springs were the major sources of water for the project (63.1%) and that a bigger number of members got their water from their projects (60%). The study also found out that the water was rarely enough for all the project members (60 %) and that a greater number (83%) of members paid for the water. The study further found out that the water was not affordable to many members (78.5%).

The study revealed that projects had 40 and above households registered as members of the projects. The study also revealed that there were non-members who were depending on the water projects. The study further revealed that the non members got water from the project through illegal abstraction.

The study established that the members mostly used their water for domestic needs, for their livestock and irrigation in that order. The study also established that the water wasn't enough for the members (72.3%). The study found out that there were 67.7 % water conflicts in the water projects in both WRUAs. The study further found out that there had been minimal cases of illegal abstractions, over abstractions, destruction of pipes, intakes and trespassing by others in the project, in the last three months.

The study also revealed that most water projects (787%) were members of the WRUA. The study further revealed that most members didn't attend the WRUA meetings. The study found out that the WRUA officials had not visited the water project in the last three months. The study also found out that WRUA issued water allocations permits to water projects and that WRUA monitored water use in the project. The study further found out that WRUAs water conflict resolution was efficient. A significant number (39%) felt that WRUA conflict resolution rate was inefficient and this must be looked into and resolved.

Finally, the study established that members received advice on water use from WRMA. The study also established that WRMA didn't visit the water WRUA. The study further established that WRMA didn't offer training on water use to the members.

5.3 Discussions of Key Findings

5.3.1 Water sources and ways of water access

The study found out that springs were the biggest sources of water for the projects (63.1 %). According to Water Act 2002, Water source means any lake, pond, swamp, marsh, stream, water course, estuary, aquifer, artesian, basin or other body of flowing or standing Water, whether above or below ground. Water Resources Management Authority aims at optimizing the available natural water flows, including surface water and groundwater, to satisfy these competing needs. The study also found out most of the members got their water from their water projects. Improved accessibility of water through mechanisms such as water projects as been found to contribute towards poverty alleviation in Kenya and in other parts of the world. (World Bank.2013).The study also found out that the water was rarely enough and unaffordable for all the project members. This collates with the literature review where (UNDP, 1998) stated that lack of affordable and enough water and sanitation is said to cost sub-Saharan Africa around 5% of its Gross Domestic Product (GDP) each year.

5.3.2 Water Demand

The study revealed that the projects had 40 and above households registered as members of the projects. IWRMI asserts that with higher rates of urbanization, increasing demand for drinking

water will put stress on existing water sources. The study also revealed that there were non-members who were depending on the water projects and that they got water from the projects through illegal abstraction. IWRMI asserts that with water security declining in many parts of the world, strengthening the resiliency of the poorest countries and populations to climate change impacts becomes crucial, not only to ensure future water supply but also to combat food and energy price volatility.

5.3.3 Water Use

The study established that most of the members used their water for domestic, for their livestock and irrigation needs. According to Speelman et al (2006), the following categories of water use by rural households can be identified: Water for basic needs-these are the uses focused on survival, providing water for drinking, cooking, sanitation and hygiene, with many health impacts and benefits; water for productive activities-these impacts on food security and income. WRMA (2012) on the other hand, the considered most water as being used for irrigation, domestic and livestock. The study also established that the water wasn't enough for the members. IWRMI asserts that with higher rates of population, increasing demand for drinking water will put stress on existing water sources.

5.3.4 Water Related Conflicts

The study also found out that there were water conflicts in the projects of both WRUAs. According to the 1992 International Conference on Water and the Environment water conflicts occur because the demand for water resources and potable water extend far beyond the amount of water actually available. Elements of a water crisis may put pressures on affected parties to obtain more of a shared water resource, causing diplomatic tension or outright conflict.

5.3.5 The Influence of the WRUA

The study revealed that most of the water project were members of the WRUAs. The involvement of the WRUA is a concept that was formulated to ensure that water resource management is participatory. But the study further revealed that the members didn't attend the WRUA meetings. According to the National Development Plan (2002-2008) project

beneficiaries should participate in initiations of projects, work plans, budgets, progress reports and monitoring and evaluation in order for such projects to have a positive impact in the community's development. Therefore there is need for sensitizations of the members to attend and make decisions in WRUA meetings. The study also found out that WRUA issued water allocations permits to water projects and that WRUA monitored water use in the project. The WRMA Report 1 (2010) postulates that since the WRUAs are the immediate beneficiaries in their locality, they are also able to participate in corporate management so as to monitor the water resource and in the process enhance quantity and quality of the resource. These activities are regulated by WRMA through a working arrangement with the WRUAs. The study further found out that WRUAs water conflict resolution was efficient. The Water Act 2002 recognizes River Water Users Associations (through the Water Resources User Associations (WRUAs)) as the grassroots institutions for conflict resolutions and community mobilization towards better and sustainable water resource management in their respective catchments areas.

5.4 Recommendations of the study

1. Recommendations for the Water Projects and the WRUA : The study recommends that community members be encouraged to participate by mobilizing their own resources, initiating and taking responsibility for their own development activities. People must be given opportunities to participate in projects that benefit them. Activities especially in the initial stages of development should meet the felt water needs by a significant proportion of the communities. This is because it enhances social acceptability. It also ensures that the impacts of development projects favor the economically weaker groups. There should be exploring of different alternative sources of water to reach as many members as possible.
2. Recommendation for Management and Government Policy: The WRMA should help in drilling more boreholes and rehabilitating the old ones, household based water pans, more dams, roof catchment and more and affordable storage facilities. The study further recommends that the Ministry of water should participate in creating awareness on of water use and its significance to human existence and socio-economic growth of the nation. Finally, the study recommends that there is need to educate the community on the importance of proper uses of water without wastage and that the government should avail

funds for building more water projects and strengthening the WRUAs.

3. **Suggestions for Further Studies:** Based on the findings and conclusions, the study recommends that another study should be done to investigate on the factors influencing the water conflicts in WRUAs in other districts to allow for generalization. Further studies should be done on the challenges facing the water management systems around the WRUAs of the Ewaso Ngiro catchment to enhance this study. There are gaps generated as to why the projects were members of the WRUAs while a big percentage (51%) of them never attended WRUA meetings. These were not clarified in the literature review and therefore needs more study.

5.5 Conclusions

The study found that within Ngarendare and Ngare Niti WRUAs there is a positive relationship between water sources and water use conflicts. This is to mean that there is less water is sources for socio-economic development and for maintaining healthy ecosystems. This leads to conflicts over water sources in the two WRUAs. The study found that in Ngarendare and Ngare Niti WRUAs, there is a positive relationship between water demand and water use conflicts. This concludes that the mounting challenges posed by the increasing demand for and less supply of the resource is a major cause of water use conflicts in the area. This water conflicts is manifested in various ways as found out in the study. The study further found out that there is a positive relationship between water access and water use conflicts. This concludes there need for better understanding and analysis on how water access affects the livelihoods of the people in the area and how water access has a huge potential to add to the goal of reducing rural poverty. Hence, benefits from productive water uses should not only be taken into account within water resources management but also within poverty reduction strategy. The study also concludes that there is a positive relationship between WRUA and water use conflicts. This means the role of the WRUAs to ensure that water sharing is done in harmony without any conflicts in the projects needs to be more enhanced and felt on the ground.

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APPENDICES

Appendix I: Letter of Transmittal

Dominic Maringa Ikuathu

P.O.BOX 604 NANYUKI-10400

Date.....

To.....

Dear Sir/Madam

RE: LETTER OF TRANSMITTAL OF DATA COLLECTION INSTRUMENT

This is to inform you that I am carrying out a research that will lead to the award of Master of Arts Degree in Project planning and Management of the University of Nairobi. The Focus of this study is the factors influencing water use conflicts in Ngarendare and Ngareniti WRUAs.

Once the research is completed, the findings will offer lessons leading water use conflicts mitigation. It will be useful to the WRUAs, government, donors and project management teams. Attached please find a question and fill it honestly, objectively. The information will be used for this study only and utmost confidentiality will be observed. Do not write your name. Kindly please cooperate with my Research Assistant whenever approached by him or her.

Yours faithfully,

Dominic Maringa

Appendix II: Questionnaire

Instructions

Kindly respond by ticking or writing briefly where applicable

Section A: Demographic Information

1. What is your age group:

| | | | | | |
|--------------|--|-------------|--|-------------|--|
| Below 24 yrs | | 35 – 39 yrs | | 50 – 54 yrs | |
| 25 – 29 yrs | | 40 – 44 yrs | | 55 – 59 yrs | |
| 30 – 34 yrs | | 45 – 49 yrs | | Above 59 | |

2. Gender: Male Female

i) Marital Status: Married Single Divorced

3. What is the name of your water project.....

4. How long have you been a member of your water project?

| | | | | | | |
|-------------|--|----------------------|--|-----------------------|--|--------------|
| Below 3 yrs | | Between 4 and 10 yrs | | Between 11 and 20 yrs | | Above 21 yrs |
| | | | | | | |

5. What is your highest level of education?

| | |
|---------------------------|--|
| Primary level | |
| Secondary schooling level | |

| | |
|-----------------|--|
| Certificate | |
| Diploma Holder | |
| University | |
| Others(specify) | |

6. What position do you hold in your water project?

Chairman Secretary Treasurer Any other

7.i) Have you had any formal training in water management?

Yes No

ii) If yes, please specify.....

SECTION B. Water sources and ways of water access

8 i).What are the sources of water for your project? (Please tick)

River Dam borehole spring wetland

ii) Any other (Please indicate).....

9. How many members are in your water project.....

10. Do all your project members get their water from your project?

Yes No

11. Is the water enough for all your project members?

| | | | |
|-----------|------|--------|------------|
| Very much | Much | Rarely | Not at all |
| | | | |

12. Do you pay for your water? Yes No

13. In your opinion is the water charges affordable

a) very affordable b) not affordable

14. In your opinion, do all your members support the project?

| Very much | Much | Rarely | Not at all |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Section C: Water Demand

15. How many households are registered as members of your project?

| 10-20 | 20-30 | 30-40 | 40 and above |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

16. Are there non members depending on your water project?

Yes No

i) How do non members get water from your project?.

Buying Illegal abstraction

17. On average, how many people are there per household in your project

| 3-5 | 6-10 | 10 and above |
|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

18. On average, how many livestock do your members have per household ?

i) Sheep and goats

| | | |
|------|-------|--------------|
| 3-10 | 10-20 | 20 and above |
| | | |

i) Cows/donkeys/camels/horses/

| | | |
|------|-------|--------------|
| 3-10 | 10-20 | 20 and above |
| | | |

19. On average, how many acres of land do each of your members possess?

| | | |
|-------|------|--------------|
| 0.5-5 | 5-10 | 10 and above |
| | | |

20. On average how many of these acres are under irrigation per household

| | | |
|-------|------|--------------|
| 0.5-5 | 5-10 | 10 and above |
| | | |

Section D: Water use

21. How do your project members use their water?

Domestic Livestock Irrigation Others (Please specify.....

.....

22. Is the water enough for the members use?

Yes No

23. Where else do your members get their water for their use

(Please specify.....)

24. How else do your members use their water?

Please Specify.....

Section E: Water related conflicts

25. Are there any water conflicts in your project?

Yes No

26. What kind of water conflicts exist in your project (Please specify.....)

.....

27. In the last three months, were there illegal abstractions in your project?

Yes No Do not know

28. In the last three months, was there over abstraction of your project

Yes No Do not know

29. In the last three months, were there any destruction of pipes, intakes, etc in your project

Yes No Do not know

30. In the last three months, were there any trespassing by others to your project

Yes No Do not know

Section F: The Influence of the WRUA

31. Is your water project a member of the WRUA

Yes No Do not know

32. What is the name of your WRUA

Please Specify-----

33. Do you attend your WRUA meetings? -----

Yes No

30. In the last 3 months, how many times has the WRUA officials visited your water project

a) Zero times b) 0-5 c) more than 5 times

31. Does your WRUA issue water allocations permits to water projects?

32. Does your WRUA monitor water use in your project

Yes No Do not know

33. How can you rate your WRUA as far as water conflict resolution is concerned?

Efficient inefficient

34. In the last three months, how many cases of water conflicts has the WRUA solved (please tick)

a) 5 b) 10 c) 20 d) 40+

33. What two major challenges does this WRUA face?

(a) -----

(b) -----

34. How can they be overcome?

Specify -----

Specify-----

Section G: Government Policy

i) Do you receive advice on water use from WRMA

a) Yes b) No c) Not aware

ii) How often does WRMA visit your water WRUA in a month

a) Once b) Twice c) None

iii) Does WRMA offer training on water use to your members

a) Yes b) No

Appendix III. Interview Guide

To enable me to enhance my questionnaire and completely benefit from our encounter, please give accurate and true answers to the following questions:

1. a) Where do you get your water from.....
b) How far is the water from your homestead.....
2. a) How many are the members of your project.....
c) Do all of them get water from your source.....
d) Is the water enough for all your members.....
3. a) How many are you in your house hold.....
b) How many livestock do you have in your household.....
c) How many acres of land do you have.....
d)How many acres of your land are under irrigation.....
4. a) Are is your project a member of a WRUA.....
b) Does your hold meetings with your water project.....
c) Does the WRMA hold meetings with your WRUA.....

‘Thank you for the time and co-operation in answering the questionnaire’