

**ASSESSMENT OF WATER SCARCITY AND CONFLICTS AND ITS
IMPACT ON LIVELIHOODS, A CASE STUDY OF BARINGO
COUNTY**

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DECLARATION

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

Sign.....

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This research project has been submitted for examination with my approval as the University Supervisor.

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DEDICATION

I dedicate this research project to my Late Dad who supported me through the course and who taught me that even the gigantic task can be achieved if it is done one step at a time.

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ABSTRACT

The dwindling supply of water has been noted to be a precursor to very many conflicts in the globe today as many communities and countries are seeking to control the sources of this commodity. This study focused on assessing the impacts of water scarcity and conflict in Baringo County, a semi-arid region within the expansive Rift valley in the South-Western sections of Kenya and its effects on livelihoods. The major objectives of the study were to assess some of the factors that have led to water scarcity, to explain the extent to which scarcity of water might have led to conflicts as well as to evaluate some of the challenges that are facing Baringo county based on water scarcity and the consequences on the livelihoods of the residents of Baringo county and to assess the input of the local county government in promoting the distribution of water resources within Baringo county. The study undertook a quantitative strategy to establish the reasons behind water scarcity in the county. The methods of data collection used were questionnaires for the primary data and books, journals, and the internet for secondary data. A total sample of 120 respondents in Baringo County were sampled through stratified random sampling then interviewed through structured questionnaires to establish their response regarding water scarcity in the region. All the administered questionnaires were sorted and entered into the SPSS statistical software for analysis. The study concluded that water scarcity is an evident issue in Baringo County that results to feuds among communities. The study recommends the government to drill more boreholes at strategic points such as in schools and near homesteads to enhance accessibility of water. The study also recommends that the Baringo county communities get education on the significance of sustainable growth and development to alter their economic activities. The study recommends further studies to be done within the constituencies of Baringo County to establish the extent to which conflicts have been fuelled by water scarcity although these efforts have not yet achieved the intended supply level.

ABBREVIATIONS

EWI	-	Early Warning Bulletin
FAO	-	Food and Agriculture Organization
KNBS	-	Kenya National Bureau of Statistics
SPI	-	Standard Precipitation Index
UN	-	United Nations
UNEP	-	United Nations Environmental Program
UNDP	-	United Nations Development Program
WHO	-	World Health Organization
SDG	-	Sustainable Development Goals
SPSS	-	Statistical Package for Social Sciences

CHAPTER ONE: INTRODUCTION

1.0 Background to the Study

Although a significant percentage of the globe is covered by water, the globe is currently facing the threat of water scarcity. In fact, according to a report by the UN, *Water for sustainable world*, the proliferation of the crisis of water as a major global resource is a major security threat to the world (UN water, 2011). Based on the findings of major global reports on water like Van Vuuren et al (2009) and UN water (2011), slightly more than half of the global population faces a severe water scarcity that threaten the very existence of humans (Thomasson, 2004). Four billion people, based on the findings of Thomasson (2004), have been found to be living in extreme conditions where their accessibility to water resources is quite strained at least in one month (UN water, 2011). Moreover, the findings have revealed that within one year, close to half a billion people in the globe are exposed to water scarcity yearly (Sombroek et al, 2002).

With the trends that the globe has experienced in its climatic patterns, largely blamed on global warming, the problem of water scarcity has been compounded. The demand of water is gradually increasing in the globe yet there is a systematic death of the supply chain of water into the globe posing a very huge risk for the globe in the near future. As UN Water (2007) notes, other than the scarcity brought forth through global warming, freshwater resources have been found to be largely overexploited in the globe. The maximum potential for the globe for what he refers to as “consumptive use for freshwater” is rapidly approaching and regardless of the estimations or the rationing that is being

implemented by stakeholders in the sector, the problem seems to be advancing (Tortajada et al 2013).

In Africa, water is considered as a very essential resource forming the spine of major economies in the continent (Van Vuuren et al, 2009). Since majority of the economies in Africa relies on agriculture as their crouch, the reliance on water is quite intensive to say the least. The strain on water as a resource is thus increasing and may not be reduced any time soon. In fact, Zhang et al (2014) mention that with the population morphology in Africa and the lifestyle of most of the indigenous communities for instance, the dearth of water as a resource is at its all-time highest, and the real issue with the dwindling supply of freshwater in the globe has been noted to be conflict. The absence or the dwindling supply of water resources is threatening to scale up the global conflicts.

Water scarce countries in sub Saharan Africa

Many communities in the globe today have been profiled to be engaged in a cyclic conflict in defending their meager water reserves from others whom they consider as “strangers.” Adams & Anderson (2008) affirm this in his mapping of the water global conflicts that the dwindling global reserves of water is increasingly fueling tensions amongst communities especially within Africa where large-scale pastoralist is still practiced on a wider scale (Adams & Anderson, 2008).

SUB-SAHARAN COUNTRIES AFFECTED BY WATER SCARCITY
NIGERIA
ETHIOPIA
ANGOLA
NIGER
TANZANIA
RWANDA
SENEGAL
KENYA
SOMALIA
MAURITANIA

Source: (Christopher 2006)

A UN report released in 2012 concluded that with the trends currently witnessed in the globe concerning scarcity of water, there is need to develop an action plan to manage the problem if a full-scale conflict is to be avoided (Aaron, 1998). Many research publications have been at the forefront of developing a deeper understanding in the manner in which the supply of water can be harnessed to ensure that the conflicts are avoided. Moreover, water is considered a key pillar of a country's growth and thus to ensure that the living standards of the global population are improved, a proper action plan must be drafted to ensure that a management plan for this resource is established (Hickley et al, 2004).

The United Nations, in its policy document, vision 2050 envisages a sustainable world where the water reserves in the globe will be managed in a sustainable manner. The document lays down a series of management procedures that it seeks to employ to ensure that the dwindling supplies are taken care of in a more practical manner. In fact, based on the fact that the globe has been keen on enhancing its management plan for water resources, the World Bank has been at the core of funding several projects dealing with the enhancement of water supply and even those programs that seek to lay a lot of emphasis on sustainable growth in the society today. This is because the globe has identified that the

fulcrum of sustainable development is water. The progress of the three development dimensions – social, political, and economic developments are all connected to the supply of water in an inextricable manner. Thus, the need to ensure that the management of the existing water systems is enhanced is as urgent as can be. Moreover, the need to empower the globe to pursue sustainable growth as a way of promoting sustainable use of this resource is becoming a necessity in the globe today.

There have been many factors that have pointed out to be responsible for the dwindling water supply in the globe today. According to the findings of Adams & Anderson (2008), the biggest “culprit” of the depreciating water supply in the globe is the huge population explosion in the globe today. According to various studies like Keesstra et al (2016) and Helle Munk Ravnborg (2004), the global population at the current state has been noted to be growing at 1.2% per month which translates to an approximated 78 million individuals for every year. This massive growth in population has translated into massive pressure on water resources as many are seeking water either for their domestic use, or even for economic production as well (Hassan, 2011). Griggs et al (2013) also asserts that unsustainable growth patterns have been responsible for the dwindling water supplies in the globe. Essentially, the production modalities that are currently being used especially in the agricultural sector are fueling the progression of water scarcity in the world. Moreover, weather, as earlier mentioned, has been a key player. The weather patterns in the globe today have significantly changed (Zhang et al 2014).

Based on the findings of (Keesstra et al 2016), the competition for resources is a major cause of global conflicts. Resources that are hard to find are considered as very effective generators of conflicts in the society today. The UN has documented several conflicts that have risen due to water. The Jordan River conflict in the Middle East pits Israel against its neighbors such as Lebanon and Jordan and Palestine. Disputes have equally been noted in between Turkey, Syria and Iraq over the use of Tigris river. Central Asia has equally experienced a lot of conflicts regarding water. Uzbekistan, Tajikistan, Turkmenistan and Kazakhstan have all been embroiled in a very serious dispute regarding the use of Aral Sea.

Water related conflicts are not limited to Middle East alone. In Africa, the use of river Nile has generated a lot of conflicts amongst the countries that border the river in one way or the other. While these conflicts have not reached a full-scale war, there are fears that if these conflicts are not adequately solved, the outcome could be disastrous in terms of peace and stability. Egypt, Sudan, and Ethiopia have hostile relations based on their approaches towards the river Nile issue.

In Kenya, notes Gichuki and Tefera (2009), is no different from the other parts of the globe. The dwindling supply of freshwater resources has been attributed to several factors. Moreover, the problem has equally escalated conflicts amongst the communities especially those that are traditionally pastoralists. Baringo's case is a quintessential depiction of how water resources are fueling ethnic animosities and fanning conflicts within Kenya (Gichuki and Tefera, 2009).

A qualitative study undertaken by Kipketer (2014) on the risks of drought within the expansive Rift Valley disclosed that the pastoralists' communities in Baringo county have been involved in several disputes regarding the "water points" for their livestock. In fact, a study undertaken by Aaron (1998) confirmed this when it noted that the major epicenters of these conflicts are regions that are considered as possible sources of water (Gichuki and Tefera, 2009). A systematic review of several publications done by major international non-governmental organizations has revealed that the hotspots of community conflicts are regions endowed with massive water resources. These have been effectively affirmed by Wheeler & Beatley (2014).

Many studies aver that there is a general water scarcity in Baringo county, although the major causes of the scarcity are varied, Gichuki and Tefera (2009) disclose that Baringo County is considered as one of the regions in Kenya where the problem of freshwater scarcity is quite rife. However, he notes that the county has immense supply of "hard water" that could be well exploited if proper measures are put in place (Aaron, 1998). With the scarcity, the region has witnessed several episodes of security lapses mainly pointed out to the competition between resources of which water has been constantly pointed out to be the major resource fueling the conflict in the region (Wheeler & Beatley, 2014).

Generally, more than half of the global population faces a severe water scarcity that threaten the very existence of humans. In Africa, water is considered as a very essential resource forming the spine of major economies in the continent (Van Vuuren et al, 2009). Since majority of the economies in Africa relies on agriculture as their crouch, the reliance

on water is quite intensive to say the least. In Kenya, notes Gichuki and Tefera (2009), is no different from the other parts of the globe. The dwindling supply of freshwater resources has been attributed to several factors, moreover, the problem has equally escalated conflicts amongst the communities especially those that are traditionally pastoralists (Gichuki and Tefera). Baringo County is considered as one of the regions in Kenya where the problem of freshwater scarcity is quite rife. However, he notes that the county has immense supply of “hard water” that could be well exploited if proper measures are put in place (Aaron, 1998

1.1 Problem Statement

Baringo County has witnessed a lot of conflicts related to water scarcity in the area. Water related conflicts have been noted to be the biggest driver of security issues in the county of Baringo. Coupled with the socio-economic practices of Baringo, the problem of water scarcity in the county will most definitely play a very pertinent role in fueling conflicts within the county. Members of various communities are engaged in a fierce controversy over who controls the few water resources in the county of Baringo thus pitting various communities against each other. This study will delve deeper into the problem of water scarcity within the county of Baringo and how exactly has water scarcity in the country stimulated conflicts within the county of Baringo.

1.2 Research Questions

1. Which factors have caused the scarcity of water in Baringo County?
2. Which factors have been at interplay in fuelling water resource related conflicts in Baringo County?
3. Does Baringo County experience challenges from the scarcity of water in terms of their livelihoods?
4. How has the local government of Baringo County enhanced the distribution of water resource within Baringo County?

1.3 General Objective

The study aimed to evaluate scarcity of water in Baringo County and further discuss how the scarcity led to conflicts within Baringo County

1.3.1 Specific Objectives

1. To assess some of the factors that have led to water scarcity within Baringo county
2. To explain the extent to which scarcity of water in Baringo county might have led to conflicts within the region
3. To evaluate some of the challenges that are facing Baringo county based on deficiency of sufficient water and the consequence on the livelihoods of the residents of Baringo county
4. To assess the input of the local county government in promoting the distribution of water resources within Baringo county

1.4 Justification of Study

The relevance of water in enhancing development in the society cannot be overemphasized. In fact, as discussed by Aaron (1998), accessibility to fresh water for domestic use has been outlined as a very important component of human rights declaration. Based on the fact that accessibility to fresh water is considered a fundamental right, this study thus becomes quite essential in the promotion of these rights (Adams & Anderson 2008). Essentially, through the conclusions of this study, various aspects of human rights have been discussed. Moreover, within the precincts of sustainable development, a development rubric that are currently being promoted in the globe, by SDGs this study is quite essential in developing further these principles of sustainable development. The study is cognizant of the dwindling volumes of water in the globe and thus it will promote sustainable use and even sustainable management of the water resources as a way of ensuring steady supply of the resource. The study has offered very practical modalities to Baringo County to enable them to conserve its water.

The perennial conflicts in Baringo County and the expansive South Rift have partially been attributed to the resources in the county. It is anticipated that through this study, a deeper understanding of the way these conflicts occur will help in providing a clear roadmap to solving these conflicts in the area. The study is likely to give a different, yet insightful understanding to the nature of these conflicts and perhaps offer the policy makers and other stakeholders an opportunity to address these problems within the context of resource distribution and management.

1.5 Scope of Study

The scope of this study was limited to evaluating the water scarcity situation within Baringo County. Further, the study is limited to the assessment of the implications of the scarcity of water in Baringo County on the general livelihoods of the inhabitants of Baringo County. Additionally, the study was confined to evaluating the manner in which the scarcity of water in Baringo county has been responsible for the conflicts within the county and the efforts therein that the county is putting into place to limit these conflicts that emerge as a result of scarcity of water in the county of Baringo.

1.6 Limitations of Study

1. It was not possible to study the whole Baringo County due to the wide geographical area. To overcome this, stratified sampling was employed to represent the whole population under study, thus assured that the population of Baringo county was evenly sampled.
2. It was difficult to communicate to some members of the community living in Baringo County due to language barrier. Community leaders and administrators assisted in language translation thus, circumventing the problem.

1.7 Definition of Concepts

Water scarcity: The concept of water scarcity has been noted to be those kinds of situations where the supply of water within a specific setup falls short of the domestic and production needs of the society (Pegasys, 2010). Water scarcity entails all those factors

that led to a situation where there is very little in a specific society to meet the needs of that specific society (Kraljevic 2012).

Water conflict: Zhang et al (2014) assert that, conflicts over water encompass all those disputes that arise between individuals regarding the use of water resources. In situations where scarcities of resources are rife, there are bound to be several instances of quarrels and disagreements over the usage of the resource. In the case of water, disagreements are bound to occur if the resource is scarce as each entity will be seeking to gain from the resource more than the other.

Water Severity Index: According to California Water Sustainability, Water Severity Index is a function of water accessibility and water use. It is used by the global Environmental Protection Index and represents the over-use of water in an area. The indicator value is calculated by “subtracting the recommended use fraction (0.4) from the ratio of total freshwater withdrawals (including surface and both renewable and fossil ground water) to total renewable water resources” (EPI).

Indicator is an instrument that gives the information on the status of something

Index is the standardized value providing the measure of a physical parameter

1.8 Outline of chapters

This study is segmented into several chapters. The first chapter gives a prologue of the problem of water scarcity in Baringo and an overview of the problem associated with water scarcity. The objectives of the study, aim and even the questions that have been proposed to be answered by the study have been outlined in the first chapter. Moreover, the first chapter highlights the likely limitations that the researcher likely faced and the modalities of circumventing them.

In the second chapter, the relevant literature was reviewed as a way of establishing the theoretical concept of the study. The chapter equally identified the existing research gap after an in-depth analysis of the existing knowledge gap further exploring the way the study filled the existing research gap. In the third chapter, the research methods used in the collection, analysis and the reporting of the data was stated. This entailed the respective research paradigms, approach, designs and strategies used. Moreover, the data collection and sampling models used in the study were expressed in the third chapter.

The fourth chapter of the study reports the findings of the data analysis undertaken in the study. Since the study is largely descriptive, bar graphs, frequency distribution tables, and pie charts were used to give summary of the findings of the study. The fifth chapter discusses the findings of the study and gives the relevant recommendations and the conclusive remarks of the study. The sixth chapter entails the questionnaire and the references.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This section of the study discusses the water scarcity measurements and water as a human right. This section also examines and analyses water scarcity and local conflicts issues to build a conceptual framework within which the study was undertaken.

2.1 Measurements of water scarcity

According to California Water Sustainability, water is measured in the following indices;

- Basic Human Needs Index

The Basic Human Needs Index is a water stress index developed by Gleick (1996),It evaluates the water used to satisfy the basic human needs such as water for cooking , drinking and hygiene. It is presumed that 50 litres in total of water per day is required, that is imprecise 5 litres per person per day for drinking, at least 35 litres per person per day for hygiene and sanitation, and 10 litres per person per day for cooking. These minimum requirements are recommended as thresholds for water supplier's regardless the demand determined by climate or culture.

- Water Travel Distance

This the distance traveled for units of irrigation and drinking water.

- Water Footprint

This is the sum of the water used directly or indirectly to produce goods and services consumed by people. Agricultural production accounts for most of the global water use.

- Water Risk (WRI)

Water Risk refers to the risk to water supplies from water withdrawals and changes in climate

- Water Scarcity Index

Water scarcity is a function of water use and water availability. It is used by the Global Environmental Protection Index and represents the over-use of water in an area.

- Water Stress Index

Water stress index is defined as the relationship between total water availability and water use. The closer the water use is to water supply; more stress will occur in human and natural systems. According to (Rijsberman 2006), Water stress index is measured on the following indices;

Index(m³/capita/year)	Class
>1,700	No Stress
1,000-1,700	Stress
500-1,000	scarcity
<500	Absolute scarcity

- Aquifer Declines

This is the number and estimated capacity of basins with long years of aquifer declines or expected future declines.

- **Baseline Water Stress (WRI)**

It measures the total annual water withdrawals (Agricultural, Industrial, and Municipal) expressed as a percentage of the total yearly available flow. Higher values stipulate more competition among users.

- **Benefits from Water Management**

Equitable distribution of economic and health benefits from water management. Society expects that public trust resources like water are provided equitably. Although inequity may accrue when water is used in particular businesses, the original supply is expected to be managed and delivered in a way that provides equitable distribution of benefits.

- **Water Demand**

Total agricultural, residential, and commercial water demand, i.e. demand for all uses other than environmental needs and basic human drinking water requirements.

2.2 Water as a Basic Human Right

A right to water is the ability to exercise as of right the right which is available to all members of the public to use running water (Kenya Legal Resources, 2011). According to (Langford 2005), The first issue that arose in the drafting process of the General Comment was the collective nature of the human right. Some members stated in that water is not only an individual right, but also a public good. There is a strong universal interest in water since it's a common good. (Committee on Economic, Social and Cultural Rights, 2002).

The second issue that arose was ‘water for what’? Most specialists agree that everyone requires imprecisely 50 litres of water per day for domestic and personal needs, 20 litres at a minimum (Gleick, 1996). Although water is also needed for food, work and environmental protection, some people do not need water for these purposes, while others need large quantities. It is thus difficult to ascertain the exact entitlement for these water uses. Furthermore, in water-scarce countries, there are often water conflicts between such uses. The Committee agreed on the following water uses; water for domestic and personal uses: cooking, consumption, hygiene and, sanitation (Committee on Economic, Social and Cultural Rights, 2002).

Third requirements are uses of water, e.g. water needed by poorer groups for growing food, relevant to rights to food and livelihood. The right to food meant that efforts should be directed towards ‘ensuring that disadvantaged and marginalized farmers, including women farmers, have equitable access to water and water management systems, including sustainable rain harvesting and irrigation technology’ (Committee on Economic, Social and Cultural Rights, 2002).

The fourth issue was equal access of water. This is one of the advantages of the human rights proposal; it looks at the category that are suffering and those at the peril of discrimination. The government is to confront the obstacles faced by an extensive range of groups in accessing water, including women, people with disabilities, children, refugees, prisoners and nomadic communities.

The fifth issue was the price of water. Water should be low priced. Agenda 21 states that water should be free, while other international rubrics indicate that water should be priced (Committee on Economic, Social and Cultural Rights, 2002).

In South Africa, each person is to receive, without cost, 25 litres of water per day free, but is obliged to pay for any excess used. In Chile, with World Bank guidance, water was charged at the full price, but subsidies were provided to water companies in order to provide a free basic amount to low-income groups (Gomez-Lobo & Contreras, 2000). In contrast, Colombia allocate subsidized water to all individuals living in low-income neighborhoods. In Ghana, the price of water doubled overnight as the public water utility was being prepared for privatization (Langford 2005).

In 2002 in Kenya, the Water Act was repealed and replaced by new law which is presently known as the Water Act 2002 and does not have a Chapter number. Kenya's statutory law on management of water resources is based on the common law and under the common considers running water, air and light to be things the property of which belongs to no person but the use to all persons (Kenya Legal Resources, 2011).

2.3 Causes of water scarcity and conflict

According to (Nepomilueva 2017), There are two main causes of water scarcity:

- Physical scarcity which begins naturally in arid or desert regions where availability of water is limited by nature.
- Economic scarcity is noted as to a scarcity when water cannot be utilized due to the poor water management or lack of resources.

Molle and Mollinga distinguish three more factors:

- Managerial scarcity where there is poor management of water resources, such as water pollution due to the introduction of external substances in the water resources due to a malfunctioning water system as well as damages along the distribution water network.
- Institutional scarcity-This is where the scarcity of water is brought about by poor management inability to cope with change and predict the demand and supply and to provide the required technologies.
- Political scarcity is where people are hindered from water resource access under a political prohibition

Afghanistan Human Development Report (2011) has developed a long discourse on the major causes of scarcity of water in the globe. It segments these causes into human causes of water scarcity which entail the activities of human beings that facilitate the problem of scarcity of water. Further, he notes that climatic factors have been at the forefront of the problem of water scarcity. These findings affirm the discourse by Houdret (2009) who noted that the current problem of water scarcity in the globe can be effectively narrowed

down to climate change and human factors. Climate change, furthers Van Gelder (2012), has been attribute to the problem of global warming which has been cited to be the biggest contributor to the water problem being experienced in the globe today. Global warming is gradually spreading aridity and thus lowering the levels of precipitation in the globe (Ayre, & Callway, 2013). The severity of this problem has been outlined by Ayre & Callway (2013) who noted that with the changing climatic patterns, the security of the globe, in terms of water may not be guaranteed in the next century (Barron, 2004).

But while climatic factors have had significance influences on the hydrological patterns in the globe, Houdret (2009) notes that human actions have for a long time been at the center of global water problem. Issues such as population explosions, note Barron, Rockström, & Gichuki, (1999), can be directly attributed to humans. Moreover, engagement in various economic activities like production, manufacturing and other factory activities have been noted to be the greatest impediments to predicable weather patterns through the huge emissions in the atmosphere that is advancing the green house effects in the atmospheres (Beisheim & Liese, 2014). Developing a plan to curb the problem of water scarcity thus requires a double thronged strategy where the human factors, the climatic factors and other factors are dealt with effectively (Afghanistan Human Development Report, 2011).

Many scholars, including Barron (2014) and Beisheim & Liese (2014), avers that the only strategy of gaining success in the fight against water scarcity is developing an integrated plan that focuses on all the causes of water scarcity in the globe. Barron (2014) agrees to this assertion by disclosing that the globe does not require a singular water resource

management model, but rather, an integrated approach where the human factors leading to scarcity are addressed, as well as the economic and the climatic factors. But while this has been achieved in some regions in the globe, many countries, especially those in the third world, are grappling with the development of modalities of dealing with the problem. In fact, as Biamah (2005) rightly observes, Africa's conflicts due to water resources have been precipitated by lack of an integrated water management plan which focuses on all the factors that have been responsible for water scarcity in the continent. Biggs et al (2015) corroborates this assertion by noting that majority of the African countries like Kenya and other countries with semi-arid regions have only been keen on treating symptoms of water problem other than tackling the main problem in an actual sense.

2.4 Water resource related conflict

According to Barron, 2004, the irregular spatial distribution of water resources in the globe, coupled with the immense competition that is being experienced amongst several consumers of the resources has effectively precipitated conflicts of water (Barron, 2004). In fact, as noted by Kraljevic (2001), there is a probability of a full-scale water conflict based on the dwindling resources of fresh water in the globe. Many scholars have projected that with the current trends in population and the stress on natural resources, there is likely to be "water wars (Kraljevic, 2001)."

As discussed in the Afghanistan Human Development Report (2011), there is growing water scarcity based on many factors. A mounting demand for water, admits Blewitt (2014), has evoked a sharp competition for the resource in the globe.

2.5 Challenges that result from water scarcity and conflict and their impact on livelihoods

There are two key roles that water scarcity plays in promoting conflicts (Blewitt, 2014). This has been categorized into water as the “object” to mean that societies are inclined to have a conflict over water resources or over pollution of these resources. Secondly, water can act as an “instrument” to fuel conflicts as well (Blewitt, 2014). While writing about water resources conflicts (Kraljevic 2012) noted that Trans boundary disputes regarding water often occur in cases where many other interests share the resource.

The significance of water resources in sustaining the livelihoods of individuals in the society can be linked directly to conflicts (Biggs et al, 2015). Water is considered a fundamental resource for enhancing production which incidentally, is the biggest source of subsistence in majority of societies. When such resources diminish, people’s livelihoods are often affected. In cases of pastoralists, the search for resources to sustain their livelihoods has been the biggest cause of conflicts with other members of the society (Beisheim & Liese, 2014). This assertion has been affirmed by Duic et al (2013) who noted that human conflicts as a result of water resources are entangled with livelihoods. Diminishing resources, in the conventional sense, lead to diminishing livelihoods thus necessitating the society to aggressively seek for modalities of supporting themselves thus leading to conflicts (Partow, 2009).

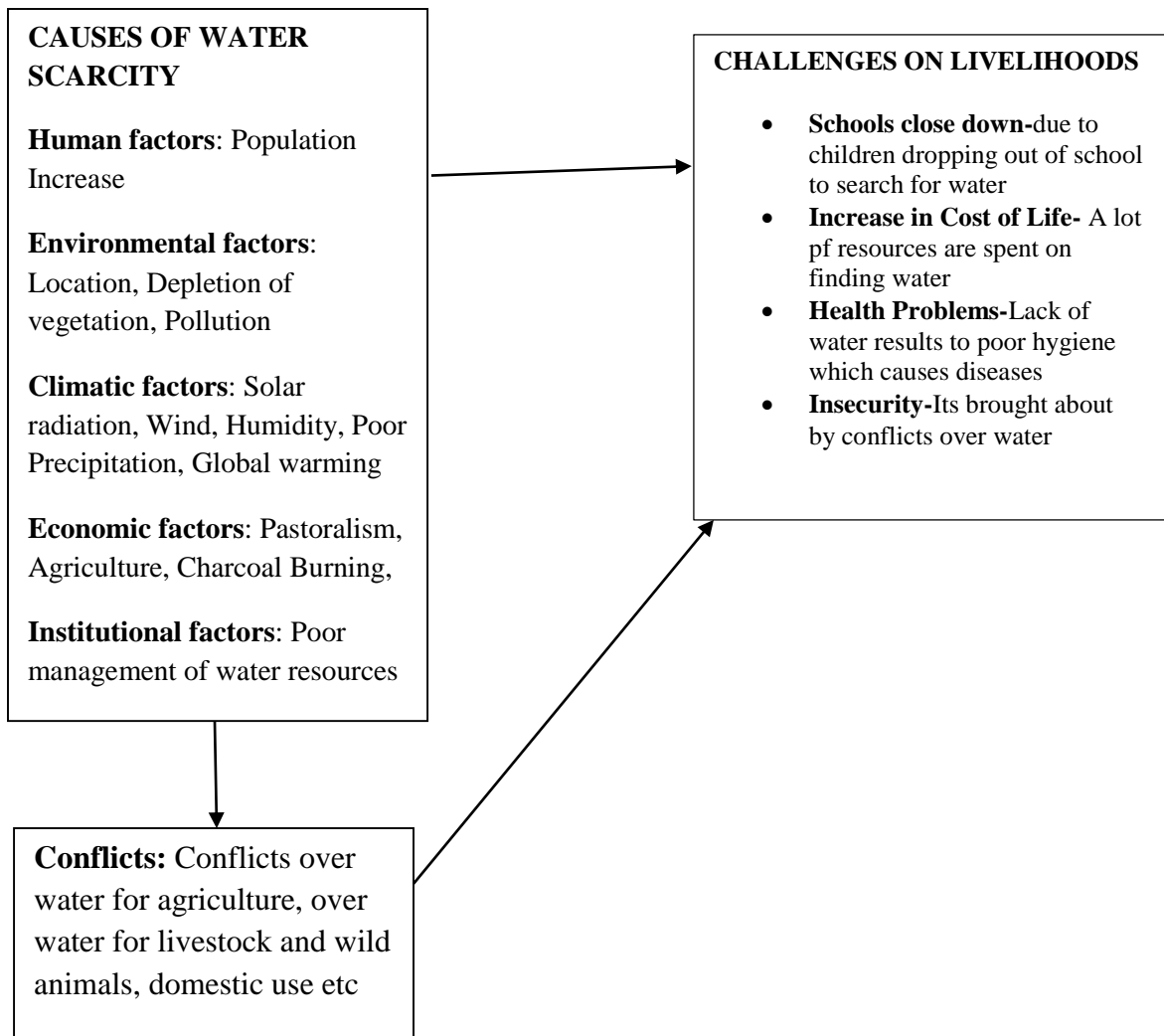
Ravnborg (2004) noted that the absence or presence of resources in the society, in most cases will have a direct implication on the manner in which resources are distributed within the society. This means that whether resources are abundant or scarce, they are likely to have a lot of bearing on the socio-economic and even the environmental policies that could promote friction within the society. Conflicts over resources can thus be addressed through effective legislation that lays emphasis on equitable resource distribution in the society.

2.6 Role of the leadership in ensuring fair distribution of water resources

As disclosed by Kijne et al (2003), the management of the existing water resources has been a very key factor in conflicts over these resources. Kilkis (2016) furthers this discussion by noting that competition over resources can be due to the way the relevant authorities manage these resources. Poorly managed resources are always skewed to favor certain regions while other regions are neglected and this tends to further heighten tensions within the society. In this regard, the role of leadership in resource management is thus critical.

The local government must be able to take the initiative of ensuring that resources of water are fairly distributed within the society (Koppen et al 2008). There is need to develop a clear strategy through which the scarcity of the resource is addressed taking into consideration the need to ensure fairness. In his study, Blewitt (2014) discloses that the local government is under a huge obligation to map the manner in which resources can be distributed fairly as a way of avoiding conflicts but most importantly, the local government is obliged to develop modalities through which the scarcity of these resources can be addressed.

Resource management at the community level principles asserts that mobilization is key to addressing the problem of scarcity (Koppen et al 2008). The local government is mandated to mobilize for resources and aid in mitigating the problems of scarcity of resources in the society. Municipalities or the local government for that matter, are obligated to ensure that the various groups in the society can access water (Koppen et al 2008) through effective service provision, the local government should enhance accessibility to water resources. Moreover, the local government must be engaged in developing key principles through which the causes of water scarcity in the society are addressed. This brings forth the issue of sustainable development (Koppen et al 2008). The local government should be able to control the activities within the society as a way of ensuring that these activities do not further compound the problem of water scarcity in the society today (Koppen et al 2008). Essentially, the role of local government can be segmented into two key roles, legislation where they should conceptualize laws or statutes that would enhance the supply of water in the region. Secondly, service delivery and management of these resources (Koppen et al 2008).



2.7 Conceptual framework

Source: Field Data, 2018

Based on the findings of Gichuki (2000), the fact that the population of Baringo County has witnessed immense growth, more resources are needed to support the economic activities undertaken by the growing population. In this regard, there is an obvious demand for water resources since the major economic activity in the region is agriculture and pastoralism. These causes of water scarcity are considered “economic factors.” In Baringo County, such factors include pastoralism and agriculture as well unequal allocation of water resource, these as a result leads to economic water stress where the demand of water cannot meet the supply due to institutional problems.

As Ombroek et al, 2002) noted, economic activities like charcoal burning gradually depletes the vegetation cover, this as a result causes environmental degradation which results to climate change. The effect of climate on the water scarcity in Baringo County has also been noted to be contributing to the water scarcity in the county. These climate hazards such as global warming cause minimal seasonal changes that decrease rainfall, causes drought and floods and eventually lead to water scarcity (Majal 2010). All these factors are explained as critical factors that have had an influence on the water reserves in the County and thus, a mounting demand for water, admits Blewitt (2014), which has evoked a sharp competition for the resource. This resonates well with the findings of Adams & Anderson (2008) who noted that scarcity of resources is likely to enhance the demand of these resources thus leading to scramble for the resource. This, according to Afghanistan Human Development Report (2011), trigger conflicts. The conceptual framework layout is as represented in the illustration above.

2.8 Study Gaps

There seems to be limited study undertaken to establish the extent to which scarcity of water in Baringo County has impacted on the integration of the inhabitants of the area. Specifically, the literature reviewed in this study lacks a comprehensive discourse on how water as a resource, is partially responsible for the conflicts within Baringo county. Evidently, this is an indication of an existing study gap that this dissertation intended to fill. This study is developed on the notion that the competition regarding resources in Baringo county, and the scarcity of these resources has propagated (and continues to propagate) conflicts within the county.

2.9 Study Limitations

In terms of methodology, there is a sense that the exclusion criterion that was used may have had a lot of implications on the sampling strategy used based on the fact that ten years may not be sufficient time to understand the socio-economic and political dynamics within Baringo. In this regard, the inclusion criteria would have limited the respondents to those who have stayed within Baringo County for the past thirty years without moving elsewhere. Secondly, the adopted quantitative research model could have been prone to several biases one of them being the sampling methods that may not be representative of the population sample that was targeted during the study.

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This section of the study outlined the research model used in the study. The researcher explains how the data and information collected was analyzed and presented to address the research questions and the study objectives. The study further gives justifications and reasons for the research design, research strategy, data sources, data collection and presentation as well as analytical techniques.

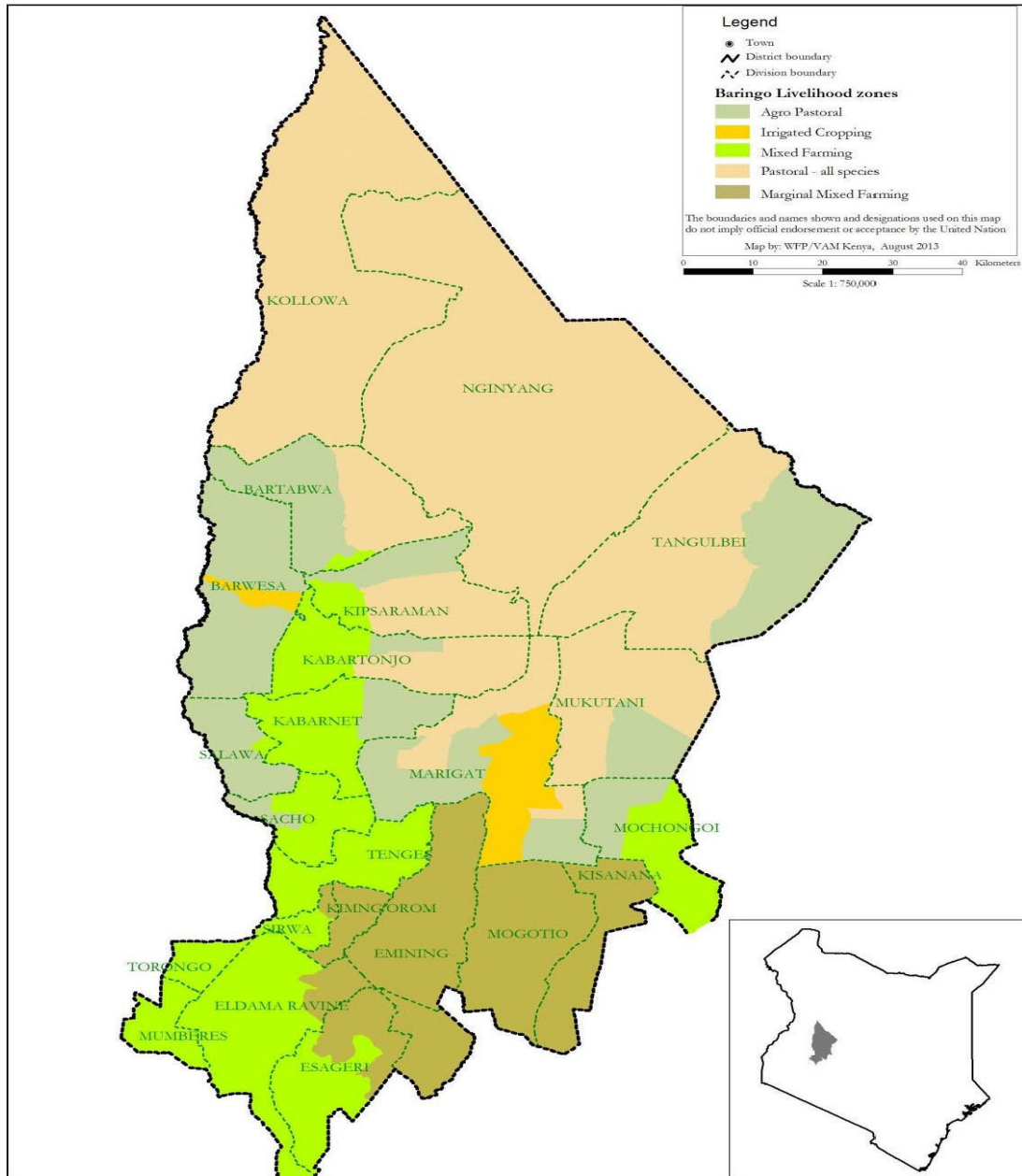
3.1 Study Area

According to the 2009 population census, The County of Baringo is located within the expansive Rift Valley, it is considered as one of the most expansive counties in Kenya stretching from Kabarnet all the way to the borders of Turkana County, West Pokot, Samburu and Laikipia counties. The total area of Baringo County is approximately 11,015.3km² which translates to 4276 square Kilometers. The region is sparsely populated especially on its borders with Turkana country, West Pokot county and Samburu county. Baringo county has an approximated 555,561 individuals (2009 KNBS Census). Administratively, The County is segmented into six key constituencies, namely Marigat, Baringo North, East Pokot, Mogotio, Koibatek and Baringo Central. To the Northern section of Baringo County, lie Turkana County and West Pokot. The Eastern sections of Baringo country have Laikipia County and Samburu County while to the South of Baringo county lies the counties of Nakuru and Kericho. Meanwhile, Uasin-Gishu County borders Baringo County to South West (East Pokot Inter Agency Response Analysis Field Mission

– July 2014). The county is within the co-ordinates of 0° 29' 22.9812" N35° 44' 28.1832"

E.

Check Map 3.1:



Map 3.1: Baringo County Map

SOURCE: BARINGO EW BULLETIN, OCTOBER 2014

3.2 Why Baringo County

The researcher chose to study Baringo county for three reasons, According to Futi et al 2011, Kenya is one of the waters stressed countries especially Baringo County which is situated in an arid and semi-arid region and faces scarcity of water. Baringo county has an average annual rainfall of 650mm with weak bimodal peaks indicated from March to May and June to August with one rainy season from March to August then a prolonged drought (Futi et al 2011). Secondly, Hundreds of Baringo schools face closure as drought persists owing to water crisis brought by prolonged drought (www.the-star.co.ke/news/2018/01/22/water-crisis) and Thirdly there's limited research conducted on the assessment of water scarcity and conflicts and its impacts on livelihoods in Baringo County.

3.3 Research philosophy

Barbie (2011) notes that before carrying out any form of research, the researcher has to have a set of beliefs and ideas on how the research is undertaken. The beliefs could be in terms of the procedure in which the data will be collected, the manner in which the interpretation of the results is done and even in the sampling modalities of the sampled population (Benard, 2011). The set of beliefs is referred to as the philosophy of the study (Barbie 2011). In this study, an interpretivisms approach was used. This approach lays emphasis on the fact that researchers should be able to interpret various elements of the research study. It assumes that to access any form of reality, one need to go through various social constructions like language and shared meanings (Burns, 2009). Interpretivists assert that any study should be cognizant of the individual differences that exist amongst

individuals and the need to explain various phenomena while considering these individual differences (Babbie, 2011).

3.4 Research Design

The overall strategy employed by a study in addressing a specific issue is referred to as the design of the study (Burns, 2009). Mugenda, (2009) explains the design of a research are the techniques that are employed by the researcher in the whole process beginning with the conceptualization of the research topic to the collection and analysis of the data collected. This study is descriptive. Descriptive study designs focus on describing the current statuses of phenomena. Specifically, this study embraced the survey description method of study. As noted by Jackson (2009), descriptive study methods are meant to describe observation during the research. They give a brief overview of the collected data.

3.5 Research strategy

The study was based on the quantitative research strategy. Quantitative research entails the manipulation of various variables to come up with meaningful inferences. Quantitative research strategy, as disclosed by Mugenda (2009), entail numerical assessment and analysis of data through various forms of manipulation to come up with various conclusions. The relevance of this research strategy is that the outcomes of the sampled population are extrapolated to the general population (Cavana et al 2001). Quantitative techniques are also considered as very relevant for large sample sizes (Mugenda, 2009). The quantitative research was used for the purpose of gathering quantitative data from the respondents with regard to water scarcity and conflict.

3.6 Data Collection and Sources

This study depended on both primary and secondary data collection sources. The primary data collection tool employed in the research is questionnaire. The study administered structured questionnaires to the sampled population to get their responses on the study questions. The use of this method in collecting data was considered as very fast and required smaller amounts of resources. However, the data analysis through the questionnaire required a lot of skills especially in the data analysis software. Books, peer reviewed journals and even the internet were used to collect secondary data. Secondary data was used in the study to lay a background for theoretical construct of the study.

3.6.1 Primary data source - Questionnaire

Data was collected through closed-ended questionnaire. Data collected was on the following variables:

- Causes of water scarcity
- Causes of water related conflict
- Challenges facing the Baringo community and their livelihoods with regards to water scarcity and conflict
- Role of the Municipal council in ensuring distribution of water resource between social groups that result to water conflict.

3.6.2 Secondary data sources

Other than the primary data sources, the study employed the secondary data sources to establish the conjectural framework of the study and to undertake an assessment of the relevant literature. Some of the secondary data sources employed in the study included books relevant to the study, peer reviewed journals, internet and maps.

3.7 Targeted population

The population targeted in the study was the residents of Baringo County. The study focused on the residents who are inhabitants of the region and are well conversed with all the issues in the county. In this regard, the study focused on those who have resided in the county for the last ten years without relocating elsewhere. The researcher verbally confirmed this. This study covered the population of the six constituencies in Baringo County.

3.7.1 Sample Size and Techniques

The study was hinged on the precincts of probabilistic sampling model. This study employed Stratified sampling method. In Stratified sampling method, the population is divided into homogeneous subgroups which are independent to one another. These subgroups are termed as strata and this process is called stratification. After stratification, few observations (samples) are to be collected from each stratum by using any suitable sampling method, such as: systematic sampling or simple random sampling ([//www.mathcaptain.com/statistics/stratified-sampling.html](http://www.mathcaptain.com/statistics/stratified-sampling.html)). In this study, the researcher used the simple random sampling to collect the samples.

The population of the entire Baringo county is 555,561 (KNBS,2009), while the population density of six Baringo county constituencies are on the table below, according to the (KNBS 2009). The sample size chosen was 120 respondents. This number was chosen because it reflects the limit of the researcher’s budget and the time taken to distribute questionnaires to respondents. However, the researcher could have also determined the sample size needed using a sample size calculation, which is a particularly useful statistical tool. This may have suggested a larger sample size; perhaps as many as 400 respondents. The county of Baringo was divided into six strata, that is according to the six constituencies. The samples were drawn by Stratified Random Sampling from each of the strata 1, 2, 3 ,4,5 and 6. All the drawn samples combined together constituted the final stratified sample for further analysis.

Notations:

(Sample size of the strata = size of entire sample / population size * layer size)

Strata (Constituency)	No. of people in the Constituency	Sample size of strata
East Pokot	133,189	$120/555,561 * 133,189 = 29$
Baringo Central	89,174	$120/555,561 * 89,174 = 19$
Baringo North	93,789	$120/555,561 * 93,789 = 20$
Marigat	73,177	$120/555,561 * 73,177 = 16$
Mogotio	60,959	$120/555,561 * 60,959 = 13$
Koibatek	105,273	$120/555,561 * 105,273 = 23$
Total	555,561	Total = 120

Simple random sampling was then employed to collect data from the respective constituencies with only respondents above 18 years of age.

3.8 Data limitations

As expected in any quantitative study, the number of respondents selected to represent the general study population may not entirely represent the entire population views. The total population of the residents of the county is above half a million yet the sampled study population is only 120. This essentially has an implication on the validity and the reliability of the responses received for the study and thus creating an error on the data findings. Secondly, most of the data collected from the community to establish their problems are usually exaggerated as the community anticipates some sort of help from the government. This study is cognizant of the exaggeration by the respondents.

3.8.1 Data Analysis/Presentation

The administered questionnaires were sorted to ensure that they all had response in them. All the questions in the 120 questionnaires were filled. The responses were then entered into the SPSS data analysis platform and a descriptive analysis undertaken in line with the research design conceived earlier. The output reports were then used in this report and the relevant inferences made regarding the outcome of the SPSS analysis. The data analyzed was then presented in bar graphs, tabular and pie-charts.

CHAPTER FOUR: DATA ANALYSIS, INTERPRETATION AND DISCUSSIONS

4.1 Introduction

This section of the project paper reports on the findings of the analysed data collected from the respondents in the study. The section gives a description of the study findings and gives a summary of these findings in relation to the data collected. This section uses tabular, graphs and charts to illustrate to detail the findings of the data analysed.

4.2 Demographic attributes of the respondents

4.2.1 Gender

The respondents interviewed in the study were mainly comprised of females (62.5%) as compared to (37.3%) of the respondents who were males. The output summary table below gives the details of the gender of the respondents who were subjected to the study.

Table 4.1 Gender of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	45	37.5	37.5	37.5
	Females	75	62.5	62.5	100.0
	Total	120	100.0	100.0	

Source: Field Data 2018

Roles that Gender plays in Conflict

In many cultures, women are the managers, users and collectors of water in most homes. They use water for house chores such as cooking, washing, drinking, and child nurturing. According to the Global Health and Education foundation, some desert

areas of Gujrat India, where there is scarcity of water, women frequently spend three hours walking 16-20 kilometres daily to and from to collect water. It also mentions that on average, girls and women in the third world countries have to walk to about six kilometres daily in search of water Thus, girls discontinue school (Basnet 2010). The water for general household use is normally situated in remote areas that may be unsafe, thus women here are vulnerable to violence such as kidnapping and even rape. The violence has affected the health, emotional, social, and economic impacts of women and also has effects on their communities and households. In Darfur, for instance, secured and separate water points for agricultural groups and the pastoralists have been provided and has greatly reduced both the risk to women and conflicts between groups (Polk 2011).

According to the UN Water, Women are disproportionately affected by catastrophes such as earthquakes, floods and conflicts over resources compared to men. This is in regards to gender inequalities in political and economic status, education, health and human rights. In disasters, women have higher death rates as compared to men as they do not receive warnings or information about risks and hazards. Furthermore, their flexibility in catastrophes may be restricted due to social and cultural constraints. (UN Water 2005-2015).

4.2.2 Age

Majority of those interviewed in the study were aged between 26 and 30 years. This represented a percentage of (35.8%) as compared to those respondents aged 18-25 years which were represented by a percentage value of (20%). Meanwhile, the ages between 31

and 35 was represented by a percentage value of (28.3%) even as the minority, which were the ages above 35 years represented by (15.8%). Figure 4.1 gives the details of these findings.

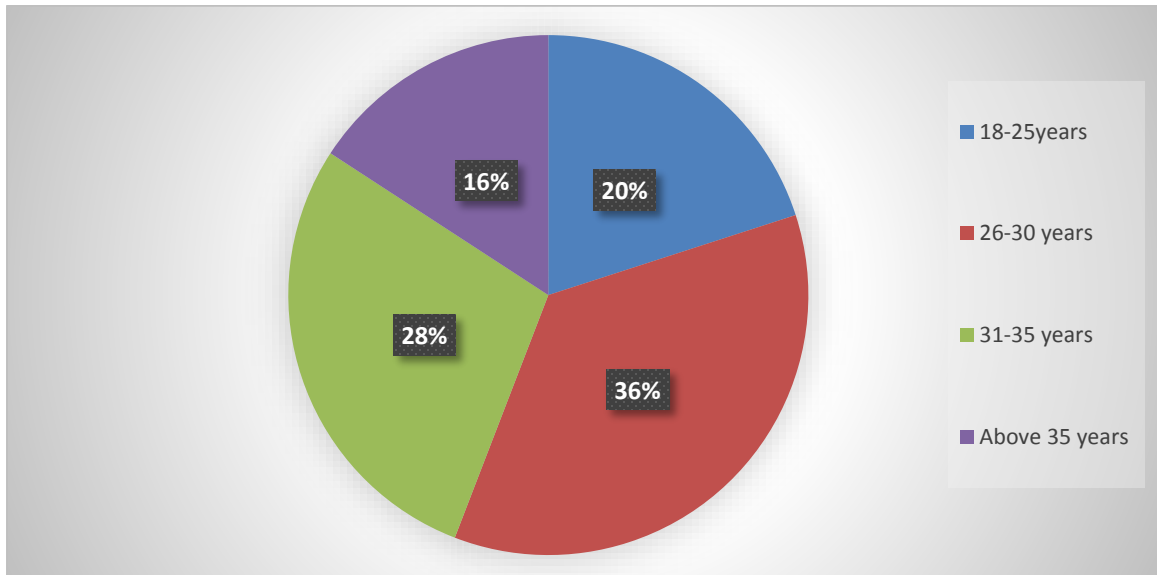


Figure 4.1: Age

Source: Field Data 2018

Roles that Age Play in Conflict

According to World Youth Report 2003, Youth group are normally a target during conflict. The Youth's participation in war is facilitated through the trade of light weapons and small arms. The lack of employment opportunities in their communities gravitate them towards acts of terrorism and violent conflict. (World Youth Report 2003)

In most African culture, elders have structures that are in place for conflict resolution and for preventing these conflicts to escalate into violence. The elders' institution is crucial for resolution of conflict in most African communities, even in countries set-ups with no

recognition of the elders' institution, thus it has remained resilient and continues to exist. (Kariuki 2015)

4.2.3 Constituency of the respondents

The study clustered the respondents into their various constituencies of origin. This was to ensure that all the six geographical locations of Baringo County were covered in the study. The study selected 120 respondents in the six constituencies within Baringo County.

4.3 Source of water

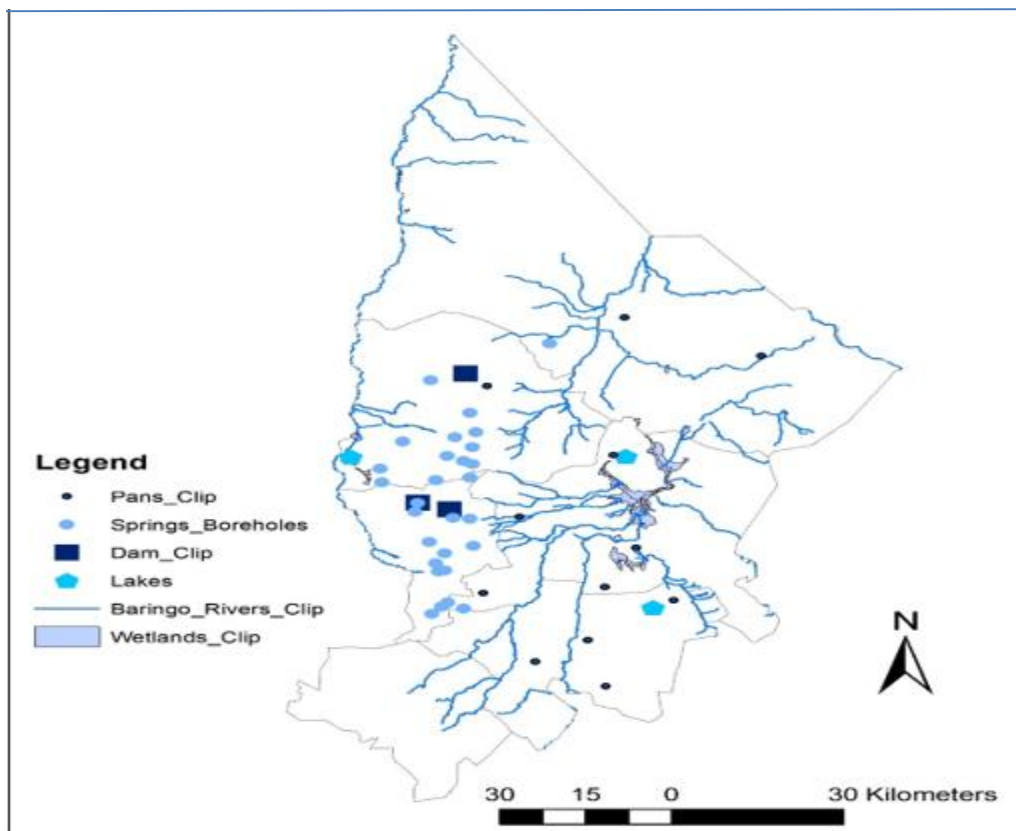
Majority of the respondents subjected to the interview session disclosed that they get their water from the lake (30%). Meanwhile, (28.3%) of the respondents got their water from the river. These rivers are mostly seasonal rivers that dry up as soon as the dry season sets in. Comparatively, respondents with boreholes accounted for (19.2%). Those who got their water from the water pans and springs accounted for (14.2%) and (5%) respectively. The minority of the respondents however relied on dam water. The minority were majorly individuals from within the urban sections of Baringo County. They accounted for (3.3%) of the respondents who were interviewed. According to the respondents, these water points are located as far as 10 kilometres to 30 Kilometres away from their homesteads.

Table 4.2 detailed these findings

Table 4.2: Source of water for use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Boreholes	23	19.2	19.2	19.2
	Water pans	17	14.2	14.2	33.3
	Rivers	34	28.3	28.3	61.7
	Springs	6	5.0	5.0	66.7
	Lakes	36	30.0	30.0	96.7
	Dams	4	3.3	3.3	100.0
	Total	120	100.0	100.0	

Source: Field Data 2018



Map 4.1: Baringo Water Sources

Source: Ministry of Water, Kabarnet

4.4 Does your water source satisfy your daily requirements?

Majority of the respondents, (94.2%) disclosed that the demand for water surpassed the supply volumes that they received. Moreover, a minority (5.8%) noted that they have sufficient supply for their needs. Most respondents noted that they get less than 20 litres of water per day per person. Some say they can only get 5 litres per day for their use per person. This according to the (UNDP 2006), is below the standardized 46 litres per day per person requirement in Kenya.

4.5 Causes of water scarcity in Baringo County

The unpredictable weather patterns that have made rainfall very hard to come by have been noted to be the biggest cause of water scarcity in the county (41.7%). Meanwhile, (20%) of the respondents opined that animal-human conflicts are fuelling water scarcity in the county. These animals are both wild and domestic. Some respondents said that they are forced to kill these wild animals to reduce competition over water, these wild animals invade their homes in search of water. Increased demand of water due to population increase for economic activities was established at (19.2%). According to some respondents, The Perkerra Irrigation Scheme uses most of the water resources to maintain production, this in return causes water scarcity to the community around. Meanwhile, (13.3%) of the respondents attributed the scarcity as “man-made” especially in the urban centres for the water vendors to rake in exorbitant revenues. (5.8%) noted that the scarcity can be attributed to pollution issues in the environment, such as sedimentation which alters the flow of water to down streams. The output on the figure 4.2 describes the patterns.

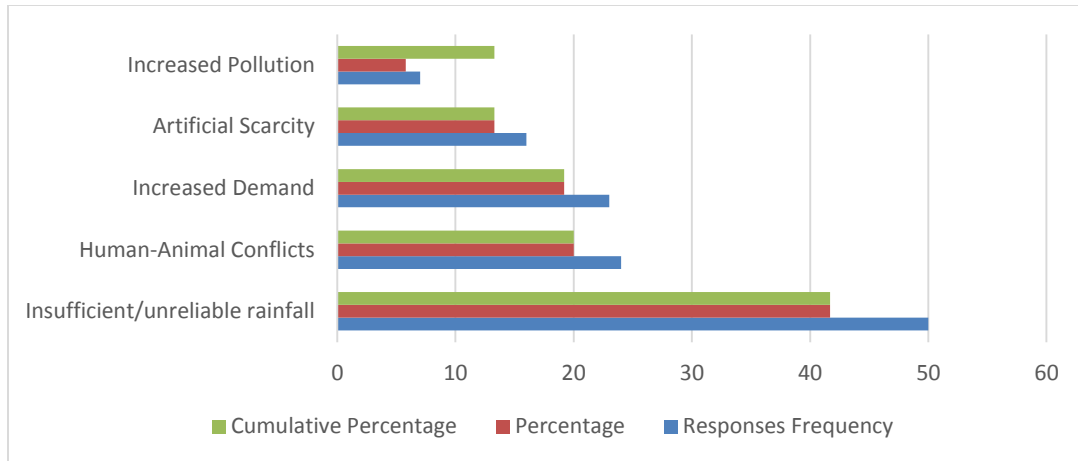


Figure 4.2: Percentage of respondents on causes of water scarcity in Baringo County

Source: Field Data 2018

4.6 Is scarcity of water a perpetual problem in Baringo?

Many respondents interviewed made it clear that the water scarcity in Baringo county is a perpetual problem and not a temporal issue. (44.3%) of the respondents “strongly agreed” to that assertion even as the minority of the respondents (6.7%) disclosed that they did not agree that the problem is perpetual. (5.8%) of the interviewees however remained non-committed to the issue.

4.7 Severity of the water scarcity problem

To understand the extent to which water scarcity in Baringo is perceived by the residents, majority of them (45.8%) strongly agreed that the problem is severe. This is in comparison to the (39.2%) who “agreed” to the same notion. Meanwhile, the minority of the respondents, (0.8%) strongly disagreed that the problem of water scarcity in Baringo is a very severe problem. Being a severe problem, most of the respondents also asserted that their biggest problem now is the lack of water resources in the county. In this regard,

majority of the sampled population subjected to the interviews sessions disclosed that the scarcity of water in the county is the biggest problem in the county. The majority who agreed were (57.5%). The minority, (3.3%), disagreed that water scarcity may not be the biggest problem in the county currently.

4.8 Conflicts and water scarcity

(98%) of the respondents interviewed admitted that water has been a source of conflict in the area (22%) however think otherwise.

4.8.1 Factors fuelling conflicts in the area

Generally, the region has witnessed a lot of conflicts instigated by unequal distribution of resources (60.8%). (10%) think that the conflict in the region is fuelled by political issues even as (11.7%) point fingers at cattle rustling as the biggest contributor to the conflict witnessed in the region. 9% think that conflict in Baringo County is due to Land Ownership disagreements while 8% think it's due to ethnicity.

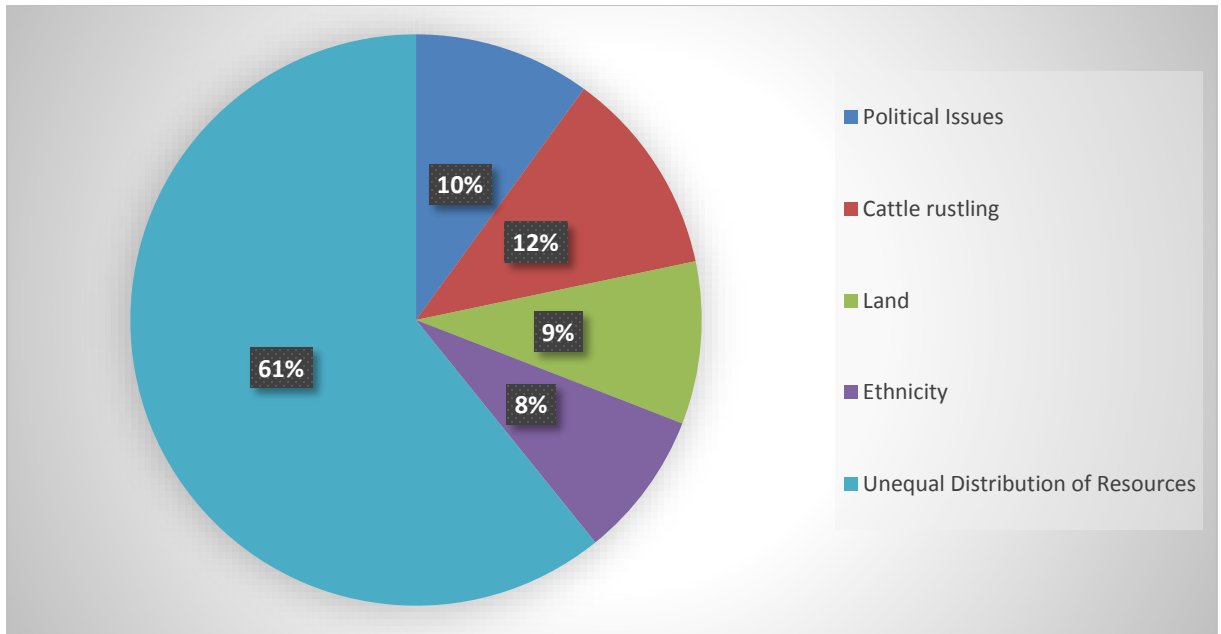


Figure 4.3: Percentage of respondents on factors fuelling conflicts in Baringo County

Source: Field Data 2018

4.8.2 How has water scarcity fuelled conflicts in Baringo county?

Out of the 120 respondents in the study, a majority of 108 emphatically agreed that water can be blamed for the conflict in the region while the rest 12, thought otherwise. The way water scarcity has enhanced conflicts in the region reveals that pastoralists have set against the non-pastoralists while fighting for water (36.7%). Some respondents (15.8%) noted that the scarcity leads to interaction between communities that have remained historically hostile to one another therefore threatening the regional stability. Meanwhile, (47.5%) admitted that the scarcity brings to the fore issues of politics and resource allocation thus threatening the peace of the region. Table 4.3 gives the details:

Table 4.3: How water scarcity has fuelled conflicts in Baringo County

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	scarcity of water has set the pastoralists against the non-pastoralists	44	36.7	36.7	36.7
	Increased demand for water leads to interaction between “hostile communities”	19	15.8	15.8	52.5
	Water scarcity leads to political tensions between communities	57	47.5	47.5	100.0
	Total	120	100.0	100.0	

Source: Field Data 2018

4.8.3 Water scarcity and conflict resolution

Since majority of the respondents noted that water is a major epicentre of conflicts in the region, it is only logical that the conflicts are largely soluble if the problem of water is solved. The majority concurs with this at (25%) and (29%). Meanwhile, others (21%) disagreed to this assertion even as (16.7%) remained non-committed to the question.

4.9 Challenges of Water scarcity on livelihoods of the residents Baringo County

Considerably, water scarcity in Baringo poses a lot of challenges for the local population. This is according to (86.7%) of the respondents. (13.3%) of the respondents think otherwise. This therefore means that majority of those respondents who were subjected to this interview concur that the residents in Baringo County are indeed faced with various challenges that are as a result of the water scarcity in the county of Baringo. This lends a lot of credence to this research study as it admits that indeed, as postulated in the study, there are problems associated with water scarcity within Baringo County.

Based on scarcity of water, several issues have risen in Baringo County. Majority of the respondents noted that insecurity is a major problem arising from scarcity of water (50.8%). According to some respondents, Communities attack each other at water resource points to fulfil their water needs, some people attack homesteads to steal stored water, thus raising insecurity. This is comparable to the (27.5%) who noted that the major problem caused by water scarcity is health issues. Some respondents think that poor sanitations result to water polluted in most water points causing health issues. Meanwhile, (13.3%) quoted the high costs of life as a result of water scarcity even as (8.3%) notes that education has been affected due to water scarcity. Some respondents said that schools close so that students can join their parents in search for water for both home use and domestic animals. Figure 4.4 gives the findings;

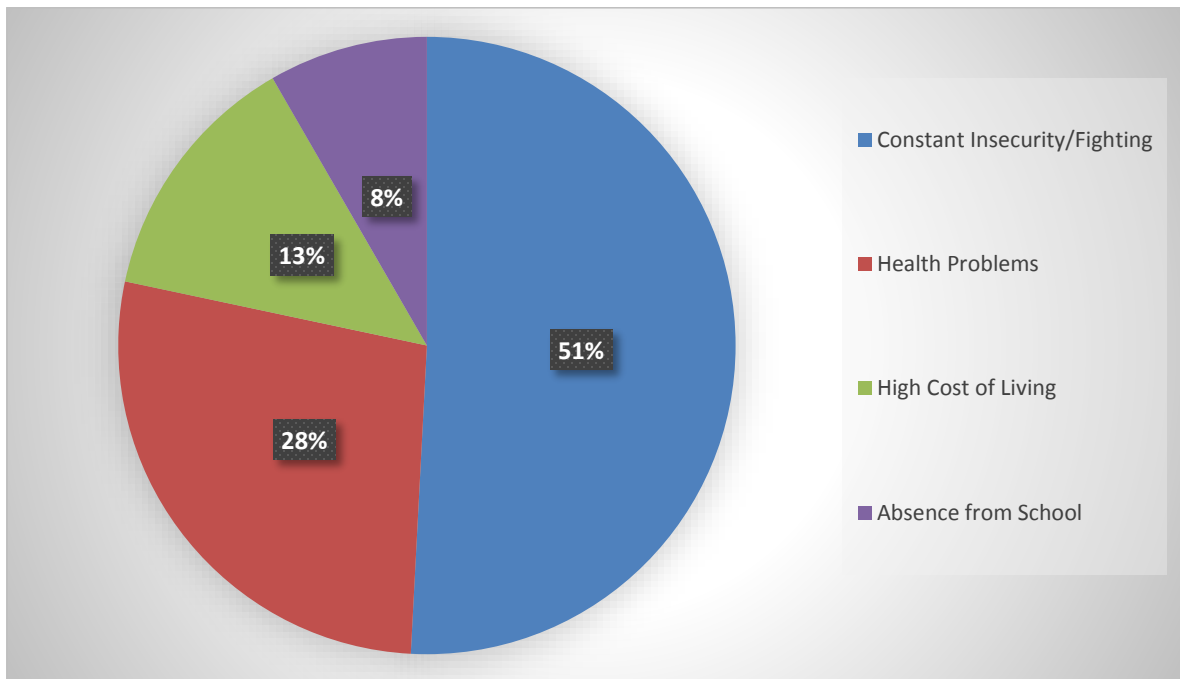


Figure 4.4: Percentage of respondents on the challenges residents of Baringo county face due to water scarcity
Source: Field Data 2018

4.10 Effects of water scarcity on the livelihoods of Baringo County Residents

Table 4.4 further gives the detail into how the livelihoods of the Baringo residents have been affected by lack of sufficient water. Majority noted that the greatest threat due to lack of water was that a lot of resources are spent on water and thus increasing the cost of life for the respondent (39.2%). Most respondents affirmed that they have to go to long distances to look for water, thus this means use of a lot of resources such as money in search of water. (28.3%) however noted that children education has been largely affected by the scarcity. Schools in Baringo county close down so that children would help their parents search for water. (20.8%) point out to conflicts over resources as an effect on livelihoods, human-animal conflict has been noted by some respondents as an issue since animals break into homes to look for water and end up killed or killing people. Some respondents also affirmed that communities flare against each other to protect water resources available for them. Such conflicts have impacted a lot in the engagement of economic activities. Meanwhile, 14% of the respondents noted that competition for the available water resources has resulted to lack of trust among the communities. Communities live in fear of each other.

Table 4.4: Effects of water scarcity on the livelihoods of Baringo County Residents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	The education of children has been affected	34	28.3	28.3	28.3
	Resources are spent on trying to find water thus increasing cost of life	47	39.2	39.2	67.5
	Conflicts amongst the residents leads to engagement in economic activities	25	20.8	20.8	88.3
	Lack of trust amongst communities	14	11.7	11.7	100.0
	Total	120	100.0	100.0	

Source: Field Data 2018

4.11 Livelihoods and water scarcity in Baringo County

scarcity of water in the county has had immense influence on the economic life of the residents of the county. (48.3%) and (32.5%) either “agreed” or “strongly agreed” that this is indeed true. Moreover, the minority of the interviewees disclosed that this is not true (3.3%). (10%) of the respondents remained neutral.

4.12 County productivity and water scarcity

In terms of productivity in all facets of the economy, there was a general feeling amongst the respondents that water absence in the region has lowered the productivity of the county tremendously. This was affirmed by (48.3%) who strongly believed that the assertion is true. Moreover, only (3.3%) noted that this statement may not be entirely true even as

(9.2%) remained non-committal to the question. Notably, majority of the respondents, (45.8%) admitted to this statement even as the minority disagreed with the statement that productivity in all spheres of the economy has been greatly impaired due to water scarcity in the county.

4.13 Local government and distribution of water resources in Baringo County

Majority of the respondents disclosed that the local devolved government has been engaged in distributing resources to mitigate the effects of water scarcity in the county. (67%) of the interviewees admitted to this even as (53%) noted that the devolved government was not keen on solving the problem.

4.14 Strategies employed by the local government to distribute resources for encountering water scarcity

Construction of water reservoirs has been the most preferred strategy of enhancing water provision in the county according to majority of the respondents (37.5%). According to (28.3%), the devolved government has been sinking boreholes to enhance water distribution in the county. Respondents assert that these boreholes are not enough since the distance travelled to look for these water resources is quite far. (22.5%) of the interviewees noted that piped water is being used by the devolved government to improve water accessibility even as the minority of the respondents, (3.3%) disclosed that the county government is encouraging water harvesting to the locals. Some locals think that having harvested water has reduced community flares against each other. 8.3% of the respondents agree that the local government deliver water to their homesteads. Some interviewees noted

that the water delivered is occasionally, thus cannot meet their water daily demand. This is indicated in the summary output table 4.5.

Table 4.5: Strategies employed by the local government to distribute resources for encountering water scarcity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sinking more boreholes	34	28.3	28.3	28.3
	Building water reservoirs	45	37.5	37.5	65.8
	Piping homesteads	27	22.5	22.5	88.3
	Delivering water to various homesteads	10	8.3	8.3	96.7
	Encouraging the harvesting and storage of water	4	3.3	3.3	100.0
	Total	120	100.0	100.0	

Source: Field Data 2018

4.15 Success rates of the local government in distributing water resources

The respondents, asked to appraise the local government on their efforts to enhance accessibility to water resources in Baringo County noted that the efforts have been moderately effective. This was noted by (49.2%) of the respondents. Meanwhile, (36.7%) disclosed that the efforts have been successful to a very low extent even as (13.3%) admitted that to a great extent, these efforts have been very successful. The minority, (0.8%) disclosed that these efforts have been “to a very great extent” relevant in handling the cases of water scarcity in Baringo county.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter outlines the summary, conclusions and recommendations for the research study. This study set to achieve the objectives of the study. The chapter also provides areas of further research to provide guidance to future researchers on strategic decision making. Based on the objectives a questionnaire guide was developed and used to gather the data which was analyzed and hence the findings of the research are summarized and conclusions drawn in this chapter.

5.1.1 Summary of Findings

5.1.2 Causes of water scarcity in Baringo County

Evidently, the research study admits that there are cases of water scarcity in Baringo County. The findings of the study resonate with the assertion of Adams, & Anderson (2008) that climate change in the globe today is gradually rendering certain regions arid. Few scholars are in agreement on the main cause of aridity in the region but one salient fact comes out in much discourse on the climatic conditions of the region – human activities. Baringo consists majorly of the pastoralist communities. With large heads of cattle, the vegetation in the area is strained to the core. In fact, Anderson (2009) notes that the fact that the vegetative protection cover of the area is very low exposes the county to unfavourable climatic conditions. In this essence, this study affirms that poor precipitation rates are one of the most notable reasons why there is scarcity of water in the county.

Baringo also lies within the expansive Rift valley which characteristically receives low levels of precipitation in a year. This, according to Barron (2004), considerably affects the climatic pattern of the county considering that it somewhat lies on the leeward side of major Kenyan highlands like Kericho. As discussed by Biamah (2005), this has been a major contributor to the relatively lower levels of precipitation in the county. The geographical location of the county has been compounded by the very many human factors such as Pastoralism, Agriculture and Settlement and physical factors in the region such as global warming, poor precipitation etc.

But other than poor precipitation, research has established that despite the fact that the population of the area has grown exponentially, the resource base remains almost at a constant. In fact, if anything, the resources in the county are considered to be fast depleting courtesy of the overgrazing and unsustainable economic practices like charcoal burning (Barron, 2004). There has been a progressive degradation of the county natural resource thus leading to cases of water conflict in the county. This is evident from the findings where 50.8% of the respondents noted that constant fighting/insecurity is a major problem arising from scarcity of water.

In his analysis of the emergence of water scarcity in the urban centres, Barron, Rockström & Gichuki (1999) note that on many occasions, artificial scarcity has been propagated by dubious business magnates as a way of enhancing their revenue portfolios. While this has not been extensively researched, majority of the respondents in the urban areas noted that on some occasions, insufficient water has been due to the conduct of the stakeholders in

the ministry as a way of creating artificial scarcity in the county. Essentially, this research notes that the scarcity of water in the county of Baringo is a conglomeration of very many factors. Climatic factors, as well as human factors are at interplay to influence the weather patterns of the county thus limiting the precipitation received in the county (Gicheru et al, 2004).

Despite occasional heavy rains in the region, there is substantial evidence that the problem of scarcity of water in the region is perpetual. In fact, as the respondents disclose in the study, there has not been any season when they can confidently assert that they have sufficient water for their use. This is because of the fact that they lack strategies to harvest sufficient water during the rainy season. Many research publications admit that there are no proper mechanisms through which water can be harvested during the rainy season and kept for use during the dry season. Evidently, this is an assertion that human factors have equally played a very notable role in compounding the problem of water scarcity in the region.

5.1.3 Water scarcity related conflicts

A critical study of the region reveals a volatile region where insecurity reigns (Hickley et al, 2004). In fact, this year, Baringo has experienced unknown attacks courtesy of the insecurity in the region. While a simplistic analogy has been given to the effect that cattle rustling and politics inflames insecurity in the region, one fundamental issue that has been confirmed by a majority of reports in the area is that there is immense competition of resources in the area amongst the communities in the area. Majority of the resident of the

county are pastoralists seeking to have adequate pasture for their cattle and water for their cattle. Water scarcity in the region has complicated the situation in the region. In the Red Cross report released in 2016, it was noted that water scarcity has led to a near full blown conflict in the region (Mango et al, 2014). Majority of the communities in the region are rivals who are suspicious of each other, while searching for water points for their cattle, these communities occasionally bump into each other leaving with catastrophic results.

Water is a very critical resource in the pastoral communities. In fact, a study of the epicentre of these conflicts in the county reveals that the points under dispute are sections with sufficient water and grass (Koppen et al 2008). This study emphatically notes that there is a very strong correlation between water scarcities in the region and the insecurity witnessed in the region. But while this study notes that competition for resources is at the centre of the security issues in the county, it also affirms that politics have played a very central role in the mounting tensions in the county.

5.1.4 Effects of water scarcity on the livelihood the county residents

Absence of water has very debilitating effects on the society. In this regard, the livelihood of the residents of Baringo has been largely impaired. One of the factors to be considered when selecting a good location for an economic activity, especially industries is the availability of water. scarcity of water lowers the probability of any area or region attraction any form of investment and thus a relatively slower economic progress is experienced. Baringo has witnessed a rather stunted growth in terms of its economy despite the presence of other resources like land. Residents of the country are considered very poor compared to other regions in Kenya where water is not very scarce (Mogaka, 2006).

Productivity in the county is very low. This has been affirmed by most of the respondents who were interviewed in the study. Not very many of the residents are willing to engage in any meaningful economic activity like subsistence farming which is a critical driver of the macro economy of Kenya. The reasoning behind this decision is because of the fact that majority of the economic activities that can be undertaken by the residents of the county to empower themselves economically rely on the availability of water to progress. The conclusions in this study is similar to the assertions of Kipkorir (2002) which notes that regions that are arid generally avoid even the simplest economic activities to sustain themselves as water is needed in these economic activities. These communities tend to focus much on livestock which unfortunately, are wiped away at the onset of drought season.

Residents of the county consider water as a basic commodity, just like other communities in the country. While considered a very basic commodity for human survival, its cost is too high making it out of reach of majority of individuals. The implications of this are that individuals who would want to spend on goods that improve their lifestyle would want to invest heavily on water which is considered a very basic community. An inhabitant of Baringo would rather purchase water than engage in other sustaining economic activities. Perhaps this is the reason why the productivity of the region is considered lower. Majority of the residents are focused on purchasing a commodity considered “basic” but they purchase it at a very high price and thus an opportunity cost to engage in other meaningful economic activities is lost.

- **Service delivery**

Various services have been hampered by the perpetual lack of water in the county. As noted in the study, the education sector has been the most affected. In the Red Cross report, children find it hard to attend schools in the very dry season. As discussed by Kijne, Barker & Molden (2003), the priority of every resident of the country shifts to finding water whenever the scarcity hits critical points. In the recent drought, it was noted that children in the school going age skived school since they were focused on finding food or feeding themselves.

- **Health**

Healthcare sector, just like the education sector experiences a lot of pressures owing to the scarcity of water. Service delivery is generally strained in cases where there is extreme scarcity of water. Water is needed to run even the most basic of services within the educational and healthcare institutions. In this regard, it is expected that any slump in supply of water will further impair the operations of the entities.

5.1.5 County government and water resource distribution

Not very many respondents agree that the local government is actually on the ground and working round the clock to ensure that accessibility to water is ensured within the county. A slightly higher number of the respondents however discount this observation and discloses that the local government has been engaged in several conceited efforts to distribute water resources in the county as follows:

- **Boreholes, Building Water reservoirs and Piping homesteads**

One of the most notable strategies being employed by the county government is the drilling of the boreholes. Several water points have been established especially in the urban centres. Drilling of boreholes has been noted as one of the most sustainable modalities of ensuring that populations within the arid and semi-arid areas get their water. In the government economic survey of 2012, it was established that Baringo drilled several boreholes to ensure that the pastoralist communities get water for their cattle, as well as constructing water reservoirs and even homes within the urban areas are piped with clean drinking water. Institutions such as hospitals are equally reliant on drilled water.

- **Water delivery and harvesting**

In extreme cases, the local government has been engaged in delivering water to drought-stricken areas in the county. While this is not a sustainable effort, it has been lauded as an effective modality of providing short time mitigation services to areas where water is completely absent. This has been largely influenced by several humanitarian organizations that operate within the county.

5.2 Conclusions

The first objective was to assess the causes of water scarcity in Baringo County. From the findings it was noted that the major cause of water scarcity is the unpredictable weather patterns that make rainfall hard to come by. Residents of Baringo county also affirmed that water scarcity was brought about by Artificial scarcity, where water vendors want to rake exorbitant revenues whereas, human-animal conflict was also noted to be a cause of water

scarcity since human beings and animals compete on the limited water resources. Pollution such as sedimentation was noted by some respondents to cause pollution on some water resources thus causing a decrease in the available water leading to scarcity of water.

The second objective was to explain the extent to which scarcity of water in Baringo County might have led to conflict, Generally, according to Baringo County residents, the region has witnessed a lot of conflicts instigated by unequal distribution of resources. The third objective was to evaluate some of the challenges facing the livelihoods of the residents of Baringo county, thus, majority noted that the greatest threat due to lack of water was that a lot of resources are spent on water and thus increasing the cost of life. Most respondents affirmed that they have to go to long distances to look for water, thus this means use of a lot of resources such as money in search of water. The residents also noted that children education has been largely affected by the scarcity. Schools in Baringo county close down so that children would help their parents search for water. Human-animal conflict has been noted by some respondents as an issue since animals break into homes to look for water and end up killed or killing people. Some respondents also affirmed that communities flare against each other to protect water resources available for them. Such conflicts have impacted a lot in the engagement of economic activities. Some of the respondents noted that competition for the available water resources has resulted to lack of trust among the communities. Communities live in fear of each other. The fourth objective was to assess the input of the local county government in promoting the distribution of water resources within Baringo County. Construction of water reservoirs has been the most preferred strategy of enhancing water provision in the county according to majority of the respondents thus the devolved government has been sinking boreholes to enhance water

distribution in the county. The interviewees also noted that piped water is being used by the devolved government to improve water accessibility as well as encouraging water harvesting to the locals. Some locals think that having harvested water will reduce community flares against each other. The local government of Baringo County also delivers water to their homesteads, though occasionally.

5.3 Recommendations

1. There is need to change the lifestyle of the inhabitants so that sustainable production practices should be implemented. Instead of the large herds of cattle that end up stressing the available resources, civic education should be promoted to ensure that the wanton environmental degradation in the area is discouraged and sustainable agriculture promoted to enhance productivity as well. The local government has an enormous responsibility to steer the communities in the county towards effective and sustainable use of the available resources to enhance their productivity. This will alter the Baringo County climate and increase precipitation of the area as well as reduce feuds over water resource.
2. Baringo County children drop out of school so as to help parents in search of water. The study recommends the local government to build boreholes near schools.
3. The study also recommends that water reservoirs should be built near wild animal habitats, this would discourage the human-animal conflict over the available water resources.

5.3.1 Recommendation for further studies

This study gives a very general outline on the problem of water in Baringo County and the associated conflicts that have been brought forth by the scarcity of water in the region. There is a sense that this study lacks a comparative approach comparing the extent to which water scarcity in Baringo County has led to conflicts in the different constituencies in the County. For further research, this study recommends that a specific study is done within the constituencies within Baringo County to establish the extent to which conflicts have been fuelled by water scarcity. To develop an effective policy plan, there is need to develop a specific comprehension of the extent of water scarcity within the constituencies making up Baringo county. This calls for a comprehensive study targeting the specific constituencies. This study did a general study of Baringo county disregarding the details of the occurrences within the constituency therefore for further study, there is need to be a little specific in terms of the causes of water scarcity in the region and the correlation between water scarcity and conflicts in the region.

REFERENCES

- Aaron T. Wolf, 'Conflict and cooperation along international waterways', in *Water Policy*, Vol. 1, No. 2, 1998, pp. 251–265.
- Adams, W. M., & Anderson, D. M. (2008). Irrigation before development: indigenous and induced change in agricultural water management in East Africa. *African Affairs*, 87(349), 519-535
- Afghanistan Human Development Report 2011: Case Study Water and Conflict in Ali Abad, Kundoz
- Alexander Carius, Geoffrey D. Dabelko and Aaron T. Wolf: The United Nations and Environmental Security: Water, Conflict, and Cooperation
- Anderson, D. M. (2009). Agriculture and irrigation technology at Lake Baringo in the nineteenth century. *Azania: Journal of the British Institute in Eastern Africa*, 24(1), 84-97.
- Andrea Kraljevic WWF Analysis 2012 Water Conflict Myth or Reality
- Annabelle Houdret: Local Water Conflicts and the Role of Development Cooperation
- Ayre, G., & Callway, R. (2013). *Governance for sustainable development: a foundation for the future*. Earthscan.
- Babbie, E. R. (2011). *Survey research methods*. Cengage Learning.
- Barron, J. (2004). *Dry spell mitigation to upgrade semi-arid rainfed agriculture: Water harvesting and soil nutrient management for smallholder maize cultivation in Machakos, Kenya* (Doctoral dissertation, Institutional for system ekologi).
- Barron, J., Rockström, J., & Gichuki, F. (1999). Rain water management for dry spell mitigation in semi-arid Kenya. *East African Agricultural and Forestry Journal*, 65(1-2), 57-69.

- Basnet (2010)-Impacts of water scarcity on women's life
- Beisheim, M., & Liese, A. (Eds.). (2014). *Transnational partnerships: effectively providing for sustainable development?* Springer.
- Bernard, H. R. (2011). *Research methods in anthropology: Qualitative and quantitative approaches*. Rowman Altamira.
- Biamah, E. K. (2005). *Coping with drought: options for soil and water management in semi-arid Kenya*. Wageningen University and Research Centre
- Biggs, E. M., Bruce, E., Boruff, B., Duncan, J. M., Horsley, J., Pauli, N., .. & Haworth, B. (2015). Sustainable development and the water–energy–food nexus: A perspective on livelihoods. *Environmental Science & Policy*, 54, 389-397.
- Blewitt, J. (2014). *Understanding sustainable development*. Routledge.
- Burns, R. B. (2009). *Introduction to research methods*. Addison Wesley Longman.
- Cavana, R. Y., Delahaye, B. L., & Sekaran, U. (2001). *Applied business research: Qualitative and quantitative methods*. John Wiley & Sons Australia.
- Christopher. W. Tatlock (2006). Water Stress in Sub-Saharan Africa
- Committee on Economic, Social and Cultural Rights (2002): Right to Water, General Comment No. 15, 20 January 2003, E/C.12/2002/11(Geneva: CESCR).
- Creswell, J. W., & Clark, V. L. P. (2007). Designing and conducting mixed methods research
- Daria Nepomilueva: Water scarcity indexes (2017)
- Duić, N., Guzović, Z., Kafarov, V., Klemeš, J. J., van Mathiessen, B., & Yan, J. (2013). Sustainable development of energy, water and environment systems. *Applied Energy*, 101, 3-5.
- East Pokot Inter Agency Response Analysis Field Mission – July 2014

Falkenmark Indicator or Water Stress Indicator (Rijsberman FR. Water scarcity:Factor

fiction? Agricultural Water Management. 2006 Feb; Volume 80, Issue 1-3: 5-22.)

Francis N. Gichuki: Water scarcity and Conflicts: A Case Study of the Upper Ewaso Ng'iro
North Basin

Francis Kariuki (2015). Conflict Resolution by Elders in Africa: Successes, Challenges and
Opportunities

Gicheru, P., Gachene, C., Mbuvi, J., & Mare, E. (2004). Effects of soil management practices
and tillage systems on surface soil water conservation and crust formation on a sandy
loam in semi-arid Kenya. *Soil and Tillage Research*, 75(2), 173-184.

Gleick, P. (1996) Basic water requirements for human activities: meeting basic needs, *Water
International*, 21, pp. 83-92

Gomez-Lobo, A. & Contreras, D. (2000) Subsidy Policies for the Utility Industries: A
Comparison of the Chilean and Colombian Schemes (Santiago: University of Chile).

Goodwin-Niering Center for Conservation Biology and Environmental Studies Connecticut
College Announces the 2009 Elizabeth Babbott Conant Interdisciplinary Conference on
the Environment. Spring 2009 In *Flow-Line*

Griggs, D., Stafford-Smith, M., Gaffney, O., Rockström, J., Öhman, M. C., Shyamsundar, P.,
& Noble, I. (2013). Policy: Sustainable development goals for people and
planet. *Nature*, 495(7441), 305-307.

Hassan Partow: Environmental Impact of Wars and Conflicts

Harsanyi, J. C., & Selten, R. (1988). A general theory of equilibrium selection in games. *MIT
Press Books*, 1.

Helle Munk Ravnborg August 2004: *Water and Conflict – lessons learned and options available on conflict prevention and resolution in water governance*

Hickley, P., Muchiri, M., Boar, R., Britton, R., Adams, C., Gichuru, N., & Harper, D. (2004). Habitat degradation and subsequent fishery collapse in Lakes Naivasha and Baringo, Kenya.

Karanja Gichuki and Fissiha Tefera (1990). Soil and Water Conservation in Kenya: Bibliography with Annotations (Nairobi, Kenya: University of Nairobi, Department of Agricultural Engineering; and Stockholm, Sweden Agency for Research Cooperation with Developing Countries (SAREC)

Keesstra, S. D., Quinton, J. N., van der Putten, W. H., Bardgett, R. D., & Fresco, L. O. (2016). The significance of soils and soil science towards realization of the United Nations Sustainable Development Goals. *Soil*, 2(2), 111.

Kenya Legal Resources: Water Management

Kijne, J. W., Barker, R., & Molden, D. J. (Eds.). (2003). *Water productivity in agriculture: limits and opportunities for improvement* (Vol. 1). Cabi.

Kilkis, S. (2016). Sustainable development of energy, water and environment systems index for Southeast European cities. *JOURNAL OF CLEANER PRODUCTION*, 130, 222-234.

Kipketer, J.K (2014, January): Drought risk and vulnerability assessment; a case study of Baringo County

Kipkorir, E. C. (2002). Analysis of rainfall climate on the Njemps flats, Baringo District, Kenya. *Journal of arid environments*, 50(3), 445-458

- Koppen, B. C., Giordano, M., & Butterworth, J. (Eds.). (2008). *Community-based water law and water resource management reform in developing countries* (Vol. 5). CABI.
- Lanari, N., Liniger, H., & Kiteme, B. P. (2016). Commercial horticulture in Kenya: Adapting to water scarcity.
- Malcolm Langford (2005): The United Nations Concept of Water as a Human Right: A New Paradigm for Old Problems?
- Mango, L. M., Melesse, A. M., McClain, M. E., Gann, D., & Setegn, S. G. (2014). Land use and climate change impacts on the hydrology of the upper Mara River Basin, Kenya: results of a modelling study to support better resource management. *Hydrology and Earth System Sciences*, 15(7), 2245.
- M. Tignino – Water, international peace, and security
- Mogaka, H. (2006). *Climate variability and water resources degradation in Kenya: improving water resources development and management* (Vol. 69). World Bank Publications.
- Mugenda, O. M. (2009). *Research methods: Quantitative and qualitative approaches*. African Centre for Technology Studies.
- Nam, U. V. (2015). Transforming our world: the 2030 Agenda for Sustainable Development.
- Nash Colundalur (2010): New Internationalist? The world unspun: *A deadly drought 1st September 2010*
- Neuman, L. W. (2002). Social research methods: Qualitative and quantitative approaches.
- Pal Tamas: Water Resource scarcity and Conflict: Review Of Applicable Indicators And Systems Of Reference
- Pearce, D., Barbier, E., & Markandya, A. (2013). *Sustainable development: economics and environment in the Third World*. Routledge.

- Peter H.Gleick and Mathew Heberger: (Water and Conflict) Events, Trends and Analysis
2011-2012
- Phelps, D. (2007). Water and Conflict: Historical Perspective. *Journal of Water Resources Planning and Management* 133(5): 382-385
- Postel,S.L.(2000) Entering an era of water scarcity: the challenges ahead. *Ecological applications*,10(4),941-948
- Rabin, M. (1993). Incorporating fairness into game theory and economics. *The American economic review*, 1281-1302.
- Ramzi Majal. Environmental & Human factors affecting physical water scarcity & Economic water scarcity.10, Sep 2010
- Rockström, J., & Falkenmark, M. (2015). Increase water harvesting in Africa. *Nature*, 519(7543), 283.
- Samuel O. Owuor & Dick W.J.Foeken: Water reforms and Interventions in urban Kenya
- Shangguan, Z. P., Shao, M. A., Lei, T. W., & Fan, T. L. (2002). Runoff water management technologies for dryland agriculture on the Loess. *The International Journal of Sustainable Development & World Ecology*, 9(4), 341-350.
- Shalabh,(2004)Indian Institute of Technology Kanpur, Systematic Sampling Chapter 11
- Sombroek, W. G., Braun, H. M. H., & Van der Pouw, B. J. A. (2002). *Exploratory soil map and agro-climatic zone map of Kenya, 1980. Scale 1: 1,000,000*. Kenya Soil Survey.
- Theresa Polk (2011). Digging Deeper: Water, Women and Conflict
- Thomasson, Fredrik (2004) Water and Local conflict: a brief review of the academic literature and other sources. Swedish Waterhouse Stockholm, Sweden.

- Tiffen, M., Mortimore, M., & Gichuki, F. (2004). More people less erosion: environmental recovery in Kenya.
- Tortajada, C., Joshi, Y., & Biswas, A. K. (2013). *The Singapore water story: sustainable development in an urban city state*. Routledge
- United Nations Development Programme (UNDP), Human Development Report 2006: Beyond scarcity: Power, poverty and the global water crisis,
- UN Water, 2007, World Water day: Coping with water scarcity - Challenge of the twenty-first century
- UN Water: Gender, Water & Sanitation; *Water for Life* (2005-2015)
- Van Vuuren, D. P van Vilet, J., & Stehfest, E. (2009). Future bio-energy potential under various natural constraints. *Energy Policy*, 37(11), 4220-4230
- Wheeler, S. M., & Beatley, T. (2014). *Sustainable Urban Development Reader*. Routledge.
- Zhang, N., Li, Y. P., Huang, W. W., & Liu, J. (2014). An Inexact Two-Stage Water Quality Management Model for Supporting Sustainable Development in a Rural System. *Journal of Environmental Informatics*, 24(1).

APPENDIX I: QUESTIONNAIRE

INSTRUCTIONS

- i. Answer all the questions by making a small legible tick (✓) in the appropriate boxes.*
- ii. Do not write your name in this questionnaire. Responses shall be treated with utmost confidence.*
- iii. All the responses in this questionnaire are strictly for academic purposes only*

SECTION A: PERSONAL INFORMATION

i. Gender of the respondent

Male Female

ii. Age of the respondent

18 - 25 26 - 30 31 - 35 above 35

iii. Constituency of residence

Eldama Ravine Tiaty Baringo Central Baringo North
Mogotio

iv. Source of water for domestic use

Borehole Water pans River Spring Lake Dams
Other....

v. Does your water source satisfy your daily requirements?

Yes No

SECTION B: CAUSES OF WATER SCARCITY

i. Do you experience cases of water scarcity from your water source?

Yes No

ii. What could be the cause of this scarcity in your opinion?

Insufficient/unreliable rainfall Artificial scarcity
 Conflict with animals Increased pollution
 Increased demand Other.....

Indicate your level of agreement to the statements below relating to water scarcity in Baringo County. Use a scale of 1-5, where 1- strongly disagree, 2- disagree, 3- neutral, 4- agree, 5- strongly agree

	Strong	disagr	neutra	agree	Strong
Water scarcity in Baringo county is a perpetual problem that has greatly affected the lifestyle of the inhabitants in the county					
The scarcity experienced in the county is not a perennial problem but a temporal problem that does not come very often					
The county government and other stakeholders have admitted that the scarcity of water experienced in Baringo county is severe and requires intensive remedial programs					
Water scarcity is the biggest problem/issue that Baringo county is dealing with currently					

In your own opinion, indicate the extent to which water scarcity has affected the lives of the residents of Baringo county

- | | | | |
|------------------------|--------------------------|-------------------|--------------------------|
| To a very low extent | <input type="checkbox"/> | to a low extent | <input type="checkbox"/> |
| To a moderate extent | <input type="checkbox"/> | to a great extent | <input type="checkbox"/> |
| To a very great extent | <input type="checkbox"/> | | |

SECTION C: WATER RELATED CONFLICTS

i. Does Baringo County experience conflicts between the communities residing within it?

Yes No

ii. What are some of the factors fuelling these conflicts in your opinions?

- | | | | |
|------------------------------|--------------------------|--------------------|--------------------------|
| Political issues/differences | <input type="checkbox"/> | Ethnicity | <input type="checkbox"/> |
| Cattle rustling | <input type="checkbox"/> | Resources | <input type="checkbox"/> |
| Land | <input type="checkbox"/> | population presure | <input type="checkbox"/> |

Other.....

iii. Do you admit that water as a resource has played a central role in these conflicts?

Yes no

iv. How exactly has water scarcity in the county led to conflicts within the county?

scarcity of water has set the pastoralists against the non-pastoralists

Increased demand for water leads to interaction between “hostile communities”

Water scarcity leads to political tensions between communities

Other.....

Indicate your level of agreement to the statements below relating to the causes of water related conflicts in Baringo County. Use a scale of 1-5, where 1- strongly disagree, 2- disagree, 3- neutral, 4- agree, 5- strongly agree

	Strong	disagr	neutra	agree	Strong
The conflicts in the county can be effectively addressed if the problem of water scarcity is addressed					
Water related conflicts in Baringo county are flamed further by the problem of distrust amongst the communities in the county					
Not all conflicts within Baringo county are related to water scarcity					
Local politics have played a critical in promoting water related conflicts in Baringo county					

In your own opinion, indicate the extent to which water scarcity has fuelled conflicts amongst the residents of Baringo county?

To a very low extent	<input type="checkbox"/>	to a low extent	<input type="checkbox"/>
To a moderate extent	<input type="checkbox"/>	to a great extent	<input type="checkbox"/>
To a very great extent	<input type="checkbox"/>		

SECTION C: CHALLENGES OF BARINGO COUNTY DUE TO WATER SCARCITY

i. Does water scarcity in Baringo pose a serious threat to the inhabitants of the county?

Yes No

ii. What challenges are the residents of the county facing due to the scarcity of water in the county

Constant insecurity/fighting

Health problems

High cost of living

Absence from school

Others.....

iii. How has the water scarcity in Baringo affected the livelihoods of the residents?

The education of children has been affected

A lot of resources are spent on trying to find water thus increasing cost of life

There are a lot of conflicts amongst the residents leading to engagement in

economic activities

Lack of trust amongst communities

Indicate your level of agreement to the statements below relating to the challenges that Baringo county residents face due to scarcity of water. Use a scale of 1-5, where 1- strongly disagree, 2- disagree, 3- neutral, 4- agree, 5- strongly agree

	Strong	disagr	neutra	agree	Strong
The economic life of Baringo residents has taken a great blow due to the scarcity of water in the region					
Service provision in the county has been largely affected by lack of sufficient water. These include healthcare services and education services as well					
Productivity of the county has been significantly lowered due to water scarcity					
The problem of water has affected almost all spheres of life in Baringo county					

SECTION D: ROLE OF COUNTY GOVERNMENT IN WATER DISTRIBUTION

i. Has the local government put measures in place to mitigate the effects of water scarcity in Baringo County?

Yes no

ii. How has the devolved government undertaken this task?

Sinking more boreholes

Building water reservoirs

Piping homesteads

Delivering water to various homesteads

Encouraging the harvesting and storage of water

iii. In your own opinion, to what extent has the local government succeeded in distributing water resources in the county?

To a very low extent

to a low extent

To a moderate extent

to a great extent

To a very great extent

Indicate your level of agreement to the statements below relating to the role of the local county government in ensuring distribution of water resources between the communities. Use a scale of 1-5, where 1- strongly disagree, 2- disagree, 3- neutral, 4- agree, 5- strongly agree

	Strong	disagr	neutra	agree	Strong
The county government should provide the resources needed to enhance the distribution of water amongst the various communities in the county					
County government has a responsibility of partnering with other not for profit organizations to develop solutions for water scarcity in the county					
County government should offer civic education on how to harness the resources available to increase water harvesting in the county					
There is need for civic education on effective resource management in the county as a way of promoting the use of water resources in the county					