

**IMPACT OF WATER ACCESS ON SUSTAINABLE RURAL LIVELIHOODS: A CASE
OF ELEMENTAITA DIVISION IN NAKURU COUNTY, KENYA**

BY

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**A RESEARCH REPORT SUBMITTED IN PARTIAL FULFILLMENT FOR THE RE-
QUIREMENTS OF THE DEGREE OF MASTER OF ARTS IN PROJECT
PLANNING AND MANAGEMENT OF THE UNIVERSITY OF NAIROBI**

2012

DECLARATION

This research report is my original work and has not been presented for a degree in any other University.

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DEDICATION

I dedicate this research report to my beloved wife Electine Kosgei and my children: Obed Kipchirchir, Marion Jebet and Faith Jerono for their encouragement and standing by side while working in the weekends and nights piecing this document together.

ACKNOWLEDGMENT

I wish to express my gratitude to all the persons who worked tirelessly to ensure that this research project is a success. I appreciate in a special way my supervisor Prof. T. Maitho for the technical support, guidance and advice while writing this report. My sincere thanks go to Mr. Mungai, the Resident Lecturer for Nakuru Extra Mural for his guidance, encouragement and support.

I acknowledge the support that I received from group six members; Tom, Zipporah, Susan, Monica and Florence during our classes and discussions. Thank you very much.

I wish to thank Dr. M. Mironga and P. Munene who proof read this document.

I wish to extend special gratitude to the authors of journals, books, research papers that I reviewed while coming up with this project that has added value to my knowledge.

TABLE OF CONTENTS

	Page
DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGMENT	iv
LIST OF TABLES	Error! Bookmark not defined.
LIST OF FIGURES	x
ABBREVIATIONS AND ACRONYMS	xii
ABSTRACT	xiv
CHAPTER ONE:INTRODUCTION	1
1.1Background to the Study	1
1.2 Statement of the problem	3
1.3 Purpose of the study	4
1.4 Objectives of the study	4
1.5 Research Questions	5
1.6 Significance of the study	5
1.7 Delimitation of the Study	6
1.8 Limitation of the Study	6
1.9 Basic Assumptions of the Study	6
1.10 Definition of Significant Terms	6
1.11 Organization of the Study	7
CHAPTER TWO: LITERATURE REVIEW	8
2.1 Introduction	8
2.2 Sustainable Rural Livelihoods	8
2.2.1 Sustainable Livelihood Framework.....	9

2.3 Physical Factors of Water Access factors and sustainable livelihoods	13
2.3.1 Water Availability and Sustainable Rural Livelihoods	14
2.3.2. Water Quality and Sustainable Rural Livelihoods	15
2.3.3 Water Affordability and Sustainable Rural Livelihoods	16
2.3.4 Distance and Time spend to water points and Sustainable Rural Livelihoods.....	17
2.4 Management of Water Projects and Sustainable Rural Livelihoods.....	18
2.5 Socio-Economic Factors of Water Access and Sustainable Rural Livelihoods.....	19
2.5.1 Water use	20
2.5.2 Water and Food Security	20
2.5.3 Assessing cost-effectiveness of water	21
2.5.4 Improved drinking water source.....	22
2.6 Theoretical Framework	22
2.6.1 Roots of Livelihoods Thinking.....	22
2.6.2 Chronology of Sustainable Livelihoods	22
2.6.3 Determinants of Livelihood.....	25
2.6.4 Components and Flows in a Livelihood.....	25
2.6.5 Rights based Approach.....	25
2.7 Conceptual Framework	26
2.8 Gaps in Literature Review.....	27
CHAPTER THREE:RESEARCH METHODOLOGY	28
3.1 Introduction	28
3.2 Research Design.....	28
3.3 Target Population	28
3.4 Sampling Procedure	29
3.4.1 Sample Size and Selection.....	29

3.5 Data Collection Instruments.....	30
3.5.1 Questionnaires	30
3.5.2 Focus Group Discussion.....	30
3.5.3 Interviews	31
3.6 Validity and Reliability of Instruments.....	31
3.6.1 Validity of Instruments.....	31
3.6.2 Reliability of Instruments	31
3.7 Data Collection Procedures.....	31
3.8 Data Analysis Techniques.....	32
3.9 Ethical Consideration	32
3.10 Operational Definition of Variables.....	33
CHAPTER FOUR:DATA ANALYSIS, PRESENTATION AND INTERPRETATION	35
4.1 introduction	35
4.2 Return Rate.....	35
4.3 Demographic Characteristics	35
4.3.1 Distribution of the Respondents by Gender	35
4.3.2 Distribution of Respondents by Age	36
4.3.3 Distribution of the Respondents by Educational Level.....	36
4.3.4 Distribution of respondents by Income Levels.....	37
4.3.5 Distribution of Respondents by Villages.....	37
4.4 Physical Factors of Water Access	38
4.4.1 Water Availability	38
4.4.2 Water Quality and Health of the Respondents	38
4.4.2.1 Respondents who suffer from diseases in relation to water source.....	38
4.4.3 Water Affordability	40

4.4.3.3 Causes of high cost of water	41
4.4.4 Distance and Time taken to Water Points	41
4.5 Management of Water Projects	43
4.5.1 Management of Water Projects	43
4.5.2 Composition of Management Committees of Water Projects	44
4.5.3 Decision Making of Women in Water Project	44
4.5.4 Operation and Maintenance of Water Project	45
4.5.5 Ownership of Water Projects.....	46
4.5.7 Challenges faced by Water Projects	46
4.6 Socio-Economic Factors of Water project	47
4.6.1 Water Uses.....	47
4.6.2 Water Scarcity and Children.....	48
4.6.3 Household Coping Strategies during water scarcity.....	48
CHAPTER FIVE:SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.....	49
5.1 Introduction	49
5.2 Summary of Findings	49
5.3 Discussion	51
5.4 Conclusions	52
5.5 Recommendations	53
5.6 Suggestion for Further Research.....	53
5.7 Contributions to the body of Knowledge	54
REFERENCES.....	56

APPENDICES.....	62
Appendix 1: LETTER OF TRANSMITTAL.....	62
Appendix 2: QUESTIONNAIRE FOR HOUSEHOLDS	63
Appendix 3: FOCUS GROUP DISCUSSION GUIDE	68
Appendix 4: KEY INFORMANT INTERVIEW	69
Appendix 5: SAMPLE SIZE DETERMINATION.....	70

LIST OF TABLES

	Page
Table 2.1: Chronology of Sustainable Development	23
Table 3.1: Operational Definition of Variables	33
Table 4.1 Return Rate of the Questionnaire.....	35
Table 4.2 Respondents by Gender	35
Table 4.3 Age of the Respondents.....	36
Table 4.4 Distribution of Respondents by Education Level	36
Table 4.5 Distribution of respondents by Income Levels	37
Table 4.6: Distribution of Respondents by Villages	37
Table 4.7 Access by Respondents to Water Source.....	38
Table 4.8 Distribution on whether they suffer for the water sourced	38
Table 4.9: Distribution of Respondents who reported health problems	39
Table 4.10: Distribution of the Respondents on quality of water	39
Table 4.11: Cost of water in 20 liter jerican	40
Table 4.12: Respondents Perception of the cost of water	41
Table 4.13: Cause of High cost of water.....	41
Table 4.14: Distances covered round trip to water points.....	42
Table 4.15: Time spend to fetch water in dry season.....	42
Table 4.16: Time spend to fetch water in wet season.....	43
Table 4.17: Distribution of respondents by presence of rain water harvesting.....	43
Table 4.18: Management of water project.....	43
Table 4.19: Composition of the management of water projects	44
Table 4.20: Decision making of women in water projects.....	45
Table 4.21: Drawers of water at households.....	45
Table 4.22: Personnel carrying out operations and maintenance of water projects	46
Table 4.23: Ownership of water projects.....	46
Table 4.24: Challenges faced by Water projects	47
Table 4.25: Water use by respondents	47
Table 4.26: Water scarcity and effects on children.....	48
Table 4.27: Coping strategies during water scarcity	49
Table 5.1: Summary of the study findings	50
Table 5.2: Contribution to the body of knowledge.....	54

LIST OF FIGURES

Page

Figure 1. Sustainable Livelihood Framework	9
Figure 2. Schematic diagram of the household water economy	21
Figure 3. Conceptual Framework	26

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
ADC	Agricultural Development Corporation
CARE	Cooperative for Assistance and Relief Everywhere
CBO	Community Based Organizations
DFID	Department for International Development
ECOSOC	Economic and Social Council
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
HDI	Human Development Index
HDR	Human Development Report
ICWE	International Conference on Water and Environment
IDRC	International Development Research Centre
IDS	Institute of Development Studies
IFAD	International Fund for Agricultural Development
KIHBS	Kenya Integrated Household and Budget Survey
KNDHS	Kenya National Demographic and Health Survey
KNDR	Kenya National Demographic Report
KNWRMS	Kenya National Water Resources Management Strategy
MCDI	Millennium Community Development Initiatives
MDGs	Millennium Development Goals
NGO	Non-Governmental Organization
OCHA	Office for the Coordination of Humanitarian Affairs
ODI	Overseas Development Institute
SIWI	Stockholm International Water Institute
SL	Sustainable Livelihoods
SLA	Sustainable Livelihoods Approach
UN	United Nations
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization

UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
WCED	World Commission on Environment and Development
WED	Water, Environment and Development
WFP	World Food Programme
WHO	World Health Organization
WPP	Water Partnership Programme
WSS	Water Supply and Sanitation

ABSTRACT

This study was carried out to assess water factors that impact sustainable rural livelihoods in Elementaita Division, Nakuru County. Owing to several factors the problem of water access remains a multi-million challenge for families in rural areas and this had to be explained in scientific research through assessing water issues that affect the livelihoods. Households remain far from water projects despite interventions that governments, NGOs and other agencies have put in place. The study had sought to address the following objectives; assess water access factors and its impact on sustainable rural livelihoods, evaluate management of water projects and determine how it impacts on sustainable livelihoods and to determine how socio-economic factors of water impact rural livelihoods in Elementaita Division. The study used sustainable livelihood framework in its analysis and establishing what areas of interventions would be considered for the study. This includes looking at assets, capital, livelihood strategies, institutional processes and vulnerability context. The design for the study was descriptive survey where questionnaires were generated on related areas of study and individuals were selected through probability sampling. Sampling for household was carried out through systematic sampling. The study targeted a sample 195 household heads, 1 water users association also a Key Informant Interview (KII) was carried out with District Water Officer (DWO) and District Public Health Officer (DPHO). Data collection was carried out using questionnaires, interviews, reviewed secondary data, and descriptive survey. The data was analysed using inferential statistics by use of descriptive statistics. The findings were presented in tables using frequency and percentages. From the findings water availability, quality and affordability determine the level of households assets in the community thereby impact negatively or positively. Over 98% of the respondents reported that children walk long distances or do not attend school in order to fetch water for the households, this impact negatively on their mental and physical development as well as their education. There is need to carry out awareness on the implication of using water of poor quality in the community as it may have adverse health effects on the lives of the community. Increasing awareness levels on rain water harvesting by the community need to be enhanced to improve on quality of water. Parents should also ensure that their children access education and not engage in child labour. The findings and recommendations will be shared by Ministry of Water and Ministry of Education, researchers, all stakeholders and the community of Elementaita Division and Nakuru County in general to enhance service delivery and address root causes of some of the challenges identified.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

According to United Nations Development Programme (UNDP), (2006) report, people need water and sanitation to sustain their health and maintain their dignity. The report further states that water beyond the household sustains ecological systems and provides input into the production systems that maintain livelihoods. This means that water permeates all aspects of human development and lack of its access at household level or for production results to peoples' choices and freedoms curtailed by ill health, poverty and vulnerability.

The same UNDP report further reveals that globally an estimated 1.1 billion people in developing countries have inadequate access to water and 2.6 billion people of out the 6 billion lack basic sanitation. The above estimates concur with findings by World Bank, (2010) report which showed that water is a scarce resource with multiple interwoven uses that range from drinking water, energy, irrigation among others. The report further states that, more than one-sixth of the Worlds' population does not have access to safe drinking water, with 80% living in rural areas thus access to water cannot not be guaranteed globally.

UNDP, (2010) report developed three dimensions of Human Development Index (HDI); health, education and income. Of these dimensions highlighted in the report access to water by people may improve or reduce its severity. Women and young girls carry a double burden of disadvantages, since they are the ones who sacrifice time and their education to collect water UNDP, (2006) report. The report further states that there is more water in the world for domestic purposes, for agriculture and for industry. The problem is that some people notably the poor are systematically excluded from access by their poverty, by their limited legal rights or by public policies that limit access to the infrastructure that provide water for life and for livelihoods.

According to the recent progress report by the Joint Monitoring Programme WHO/UNICEF, (2010), global improved drinking water coverage increased from 77% to 87%. However, the developing world including sub Saharan Africa continue to lag behind developed nations in their progress towards meetings the water related Millennium Development Goals

(MDGs) WHO/UNICEF, (2008), WHO/UNICEF, (2010). Based on WHO/UNICEF, (2008) report, one of the most important measure to spur economic growth, reduce poverty as well improve public health is universal access to and use of clean potable water and sanitation supplies. Pruss-Ustan, (2008) found out that nearly 10% of total burden of diseases worldwide can be attributed to unsafe water, sanitation and hygiene, and the associated disease claim 3.6 million lives annually. As Bartram, (2005) says that access to improved water and sanitation is important because it acts as the foundation for healthy communities, and results in significant health, economic and social gains.

UNDP, (2006) report states that deprivation in water and sanitation produces multiplier effects. These include some of the followings costs for human development. Some 1.8 million children die each year as a result of diarrhoea globally. Another critical aspect is the loss of 443 million school days each year from water related illness. The report further reveals that millions of women spend several hours a day collecting water and lifecycles of disadvantages affecting millions of people with illness and lost education opportunities in childhood leading to poverty in adulthood UNDP, (2006).

Sub Saharan Africa accounts for about one-third of the World population without access to improved drinking water suppliers UNDP, (2008). Another critical aspect is that losses are greatest in some of the poorest countries in Sub-Saharan Africa with about 5% loss of Gross Domestic Product (GDP) or some \$ 28.4 billion annually. The report further reveals that the amount lost exceeds total aid flows and debt relief in the region in 2003 UNDP, (2006).

According to Sutton, (2005) large percentage of non-functioning wells and unused is a stark markers of inadequate operation and maintenance and lack of sustainable services. Further the report states in a survey conducted by Sutton in 11 countries in Sub-Saharan Africa, the percentage of functioning water systems in rural areas ranged from 35-80%. In Tanzania for example, a survey carried out by Haysom, (2006) revealed that average functionality rates among public distribution points was 45%.

According to KNDR, (2005), recognizes that water is a basic need and an important catalyst for both economic and social development on the country. The report further states that access to water for human consumption; agriculture use is a major problem in rural areas. The report further states that access to piped water has not increased since 1989. Mehta and Ondari, (2004) study, confirms that in Kenya it is estimated that Community Based Organizations (CBOs) run about 30 percent of all rural water supply schemes. The CBOs manage systems like

infrastructural systems based on user tariffs and they spend about 6 million dollars in operational expenditure annually, this cannot be left alone without proper management of resources and putting measures in place to reduce corruption and mismanagement. According to Kenya National Human Development Report (KNHD), (2006) it estimates that about 53% of Kenyans walk less than 15 minutes to fetch water, the same reports asserts that 7.6% of households have piped water into their dwelling. Involvement of women in management of water projects enhances their decision making in planning, implementation and monitoring of projects as well institute ownership of water resources.

1.2 Statement of the problem

Owing to the myriad challenges associated with rural communities accessing water, the researcher developed the topic to ascertain the impact of water access on rural livelihoods. According to Bauman, (2005) an estimated 35% of rural water supplies in sub-Saharan Africa are non-functional an indication that peoples' livelihoods are being jeopardized. This reduces several households into seeking mitigating measures that would resort to high vulnerability.

According to KNWRMS, (2006), Kenya is classified as a water scarce country with 647 m³ per capita per annum. Kenya is categorized as a water scarce country because it falls short of 1,000 m³ per capita per annum benchmarked by UN. According to KIHBS, (2006) 57% of households in Kenya access safe drinking water sources, 82% in urban setup and 48.0% in rural areas. The current situation of water shortage in Elementaita Division is wanting, several projects that were initiated Agricultural Development Corporation in 1980s were vandalized by people were resettled in the farm. Eight boreholes that were functional during the ADC operation, remains non-functional with only one functional. About 10,000 kilometres pipeline remains in sorry state as the inhabitants sold most of the steel pipes as scrub metals. There is also a noted depletion of forest cover in water catchment areas.

Connections of water point to households in Africa remain low. This limits access of households to water. When households are not connected, they have limited options and therefore impact negatively on their livelihoods. This means that these households may collect water from untreated water sources or purchase water from middle persons/vendors who overcharge the prices. Through this water becomes expensive and most households spend millions of shillings to buy water which would have been less costly to them UNDP, (2006).

Onjala, (2002) confirms that a large number of households are still far from water points. He further says that the level of coverage goes down as low as 20% during dry season when seasonal water sources dry up making distances to water long and often exceeding 5 kilometers.

KNDHS, (2009) reveals that increasing access to improved drinking water is one of the millennium Development Goals (MDGs) that Kenya along with other nations worldwide has adopted United Nations General Assembly (2001). The KNDHS report further says that lack of access to water source may limit the quantity of suitable drinking water sources available for use at household.

Several water projects have failed not because of funding but because of systems, policies as well management related factors coupled with socio-economic issues that have de-motivated sustainability of water projects in Rural Kenya. There are several non-functional water projects across the country that is in dire need of evaluation to ascertain what may have caused their current state. These calls for conclusive and well researched study that will enable government, development agencies and well as other relevant and interested groups to analyse and synthesize information that will be aimed at addressing the root causes of these endemic challenges that affect the water sector. The importance of this study is aimed at furnishing with researchable data that will catapult economic stimulus as well continuity of water projects in communities and thereby increase functionality of water projects in Rural Kenya. This study therefore, seeks to assess the impact of water access on sustainable rural livelihoods.

1.3 Purpose of the study

The study aimed at assessing the impact of water access on rural livelihoods in Elementaita Division, Nakuru County, Kenya.

1.4 Objectives of the study

The objectives of the study were:

1. To assess physical factors and its impacts on sustainable rural livelihoods in Elementaita Division.
2. To evaluate management of water projects and determine how it impacts on sustainable livelihoods in Elementaita Division.
3. To determine how socio-economic factors of water impact on rural livelihoods in Elementaita Division.

1.5 Research Questions

The research questions were:

1. Does what extent does physical factors of water impact on sustainable livelihoods in Elementaita Division?
 - 1.1. To what extent does availability of water impact on sustainable rural livelihoods in Elementaita Division?
 - 1.2. Do what extent does water quality impact on sustainable rural livelihood in Elementaita Division?
 - 1.3. To determine how water affordability impact on sustainable rural livelihoods in Elementaita Division?
 - 1.4. How does distance from a water point and time taken to collect water impact on sustainable rural livelihoods in Elementaita Division?
2. Does management of water projects impact on sustainable rural livelihoods?
 - 2.1. What is the level of training of water technicians in Elementaita Division?
 - 2.2. To what extent does decision making of water users' impact on sustainable rural livelihoods in Elementaita Division?
 - 2.3. To what extend does gender in management of water impact on sustainable rural livelihoods in Elementaita Division?
 - 2.4. How does operations and maintenance of water projects impact on sustainable rural livelihoods in Elementaita Division?
3. Do socio-economic factors of water affect sustainable rural livelihoods?
 - 3.1. How does water scarcity impact on sustainable rural livelihoods in Elementaita Division?
 - 3.2. How does water use impact on sustainable rural livelihood in Elementaita Division?

1.6 Significance of the study

The findings of the study once shared will be useful for NGOs, government of Kenya and other researchers in the field of water. As Montgomery, (2007) said that the usefulness of information gathered ensured that there is gaining of a better understanding of economic, social and technical factors on sustainable livelihoods allows interventions to be tailored to fit the needs and conditions of sub Saharan Africa, at the regional, national and local levels.

The findings will also be useful to policy makers and institutions of learning and management to be able to manage water projects in sustainable manner.

1.7 Delimitation of the Study

The study was carried out in Elementaita Division of Nakuru County, Gilgil District. The study targeted water users group, key informants, water drawers and households. The study also utilized secondary data from relevant ministries in Water Management (Ministry of Water and Irrigation,

1.8 Limitation of the Study

The study envisaged a limitation that all household heads could not be sampled however, a sample size representing the villages in the division was done.

1.9 Basic Assumptions of the Study

This study assumed that the respondents, who were interviewed, provided reliable and accurate data which was used to arrive at conclusions and recommendations for the study. It was also assumed that the sample sizes were representative of the entire population.

1.10 Definition of Significant Terms

Assets Refers to resources and access to resources and potentialities that communities have to have a livelihood.

Impact Refers to the after-effects of an intervention.

Management of water projects refer to operations and maintenance of water projects, decision making by water drawers and users, inclusiveness of women in management of water projects as well as challenges facing water projects.

Physical factors refer to water availability, affordability, quality and distance and time taken to collect water by individuals or households in a particular context.

Socio-economic factors refer to coping strategies employed by communities during water scarcity as well as effects of water scarcity at household level.

Sustainable Livelihoods Refers to assets, capabilities and activities that communities engage in order to live a comfortable live.

1.11 Organization of the Study

Chapter one contains 11 sub sections namely: background to the study, statements of the problem, purpose of the study, objectives, research questions, significance of the study, delimitation of the study, limitation of the study, basic assumptions of the study, definition of significant terms and summary.

Chapter two has eight sections namely; introduction, sustainable rural livelihoods, into impact of water access on sustainable livelihood, conceptual framework, theoretical framework and operationalization.

Chapter three has the following sections; research design, target population, sampling procedure, methods of data collection, validity and reliability, operational definition of variables and ethical consideration.

Chapter four had the following sections, data analysis, presentation and interpretation.

Chapter five has summary of findings, discussion, conclusions and recommendations as well as contribution to the body of knowledge.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter has been segmented into eight sections namely; introduction, sustainable rural livelihoods, into impact of water access on sustainable livelihood, conceptual framework, theoretical framework and operationalization.

In a study of the impact of rural water supply and sanitation in Punjab Pakistan by Asian Development Bank (ADB), (2010), the study revealed that projects significantly improved household's access to water supply, reduced drudgery among the lowest socio-economic groups, improved high school attendance of girls in middle socio-economic group and increased leisure time for female members of households. Other documented findings in the water project were that 43% of Community Based Organizations (CBOs) managing the project were partly or fully functional. They had low functional maturity and this reflected weak capacity in managing Water Supply and Sanitation (WSS) systems. Majority of those CBOs lacked resources for capital replacement and routine maintenance. According to MCDI, (2010) report confirms that in Africa more than 340 million people lack access to safe drinking water. With climate change and water scarcity, the current situation will become even more desperate especially considering that already 45 countries worldwide, 35 of which are in Africa, are considered greatly water stressed, Kenya included.

2.2 Sustainable Rural Livelihoods

In a classic 1992 paper, Sustainable Rural Livelihoods: Practical concepts for the 21st Century, Robert Chambers and Gordon Conway proposed a definition of sustainable livelihood:

“A livelihood comprises of capabilities, assets (stores, resources, claims and access) and activities required for a means of living; a livelihood is sustainable which can cope with and recover from stress and shocks, maintains or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term”.

Sustainable livelihoods approaches has increasingly been developed and adopted by many development institutions as a means of analysis and of action by depicting processes through which individuals and households use all or part of it in their reach to make their living. Department for International Development (DFID’s) Sustainable Livelihoods, Cooperative for Assistance and Relief Everywhere (CARE’s) Household Livelihood Security and United Nations Development Programme (UNDP) Human Development are examples of agencies implementing through Sustainable Livelihood Approaches, Moriarty. P. et al (2004).

2.2.1 Sustainable Livelihood Framework

Scoones, (1998) elaborated three elements of Livelihoods Framework: Livelihood Resources, Livelihood Strategies and Institutional Processes and Organizational studies.

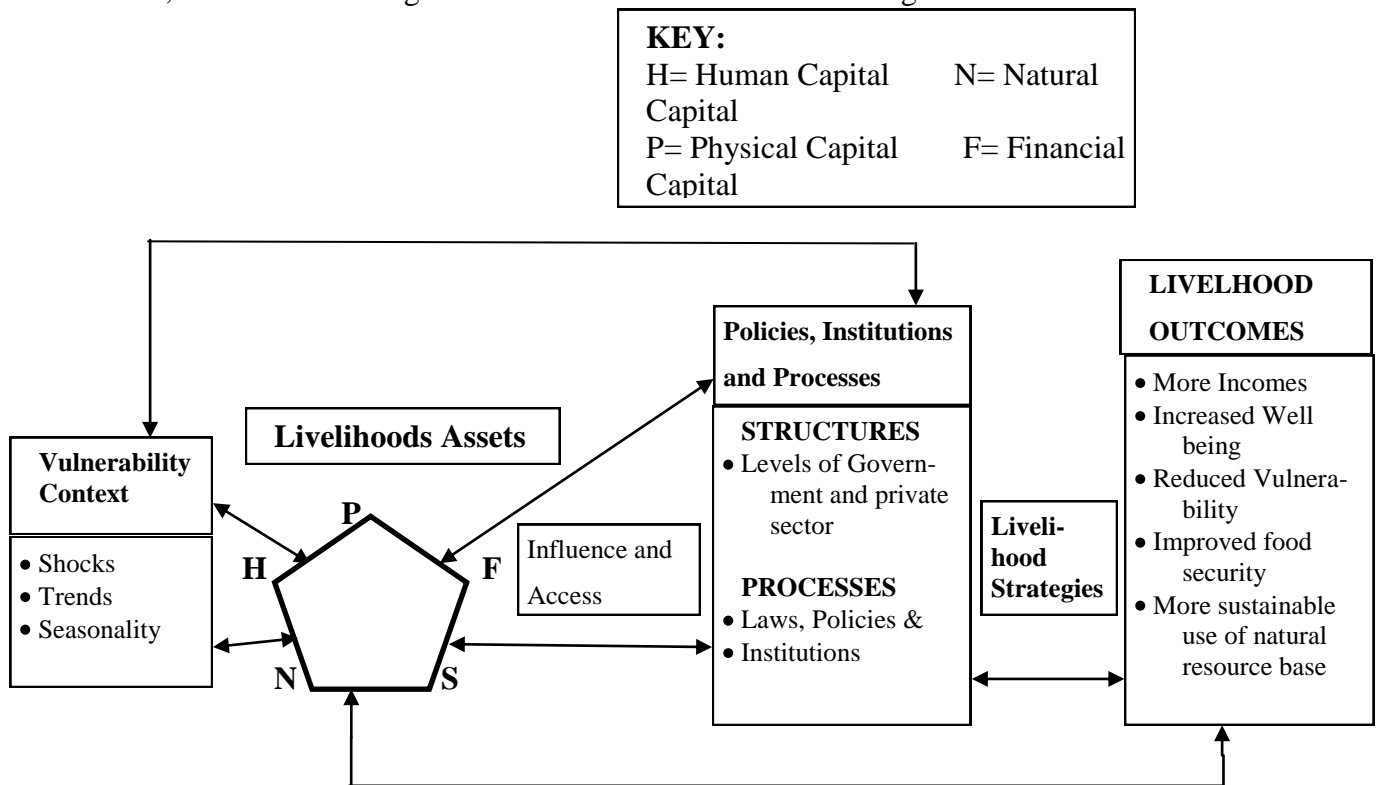


Figure 1: Sustainable Livelihood Framework

Source: Adopted from: *Sustainable Livelihood Guidance Sheet 2: DFID 1999*

2.2.1.1 Livelihood Resources

Scoones, (2009) defines livelihood resources as the basic material and social, tangible and intangible assets that people use for constructing their livelihoods. These livelihoods resources are conceptualized as different types of ‘capital’ to stress their role as a resource base.

These resources or assets are natural, economic or financial, human and social capital. Another capital asset that was added by DFID was physical capital.

Natural capital refers to the natural resource stocks like water, soil and air among others and environmental services such as hydrological cycle. These are important because livelihoods are derived from it. Economic or financial capital refers to capital base including infrastructure, production equipment and technologies that are critical in pursuit of any livelihood strategy. Human capital refers to skills, knowledge, ability to labour and good health and it is important for pursuit of different livelihood strategies. Social capital refer to social resources i.e. networks, social claims, relations, affiliations and associations upon which people draw when pursuing different strategies. Grey-Gardner, (2008) summarized the livelihood assets as follows: Natural: water availability, quantity and quality. Human: skills knowledge, ability and health. Physical: water supply infrastructure, equipment, maintenance materials (including tools). Financial: financial resources including savings, grants, pensions, loans. Social: quality of social networks and relationships.

Livelihood Outcomes

Livelihood incomes are diverse. Sustainable Livelihoods (SL) framework divide them into five categories; first, more income and more economically sustainable livelihoods second, increased well-being (non-material goods such as self-esteem, sense of control and inclusion, physical security, health, access to services, political enfranchisement, maintenance of cultural heritage). Third, reduced vulnerability to external trends, shocks and seasonality, fourth, improved food security-which is of fundamental importance and fifth, more sustainable use of the natural resource base Twigg, (2001).

2.2.1.2 Livelihood Strategies

DFID, (1999) reported that in order to have improved rural livelihoods; structures and processes need to be transformed. These include; initiating changes in local institutions, reforming institutions through change of culture, norms, that limit access to the livelihood resources and assets. Another critical dimension is reforming communities through training on existing policies that undermine their existence as well as pass more information to the community members to be able to articulate issues that affect them. Another strategy may be carrying out community capacity building on areas of access to be able to reach many people. This means that certain members of the community are given priority to be able make and partici-

pate in decision-making processes to be able to address issues affecting the concerned community.

2.2.1.3 Institutional Processes and Organizational Studies

In order to be able to understand institutional processes, DFID, (1999) came up with four areas of focus namely: policies- which refers to those issues that inform development and provide framework for actions of public sectors, institutions refers to markets, institutions that regulate access to assets while culture refers to societal norms and beliefs. Power relations refer to age and gender of the people involved in the organization.

Leach *et al*, (1999), further developed the concept of livelihoods to include formal and informal institutions and the distribution of power in understanding how people gain access to and control over assets and utilize them in pursuit of livelihoods.

2.2.2 Vulnerability Context

Carney, (1998) defines vulnerability context to include natural and human-led trends and shocks. Nicol, (2000) says that in the Sustainable Livelihood framework in water sector is critical in getting an understanding of vulnerability context within which rural people gain and secure access to water resources. He further says that access and water security are determinants of local level processes including norms and customs, local property rights regimes and local economic factors related to water issues.

Different context present different levels of risk in securing access to suppliers i.e a number of factors will affect the risk profile including context (urban or rural); topographical factors; the transparency of government, availability of local private sector companies and the channels of communication through which demands can be expressed, Nicol, (2000).

Vulnerability not only posed by physical factors but also the risk and vulnerability to livelihoods through unstable social, physical and political environments which see voting controlled through patron-client networks, and local processes of decentralization captured by elites. Social vulnerability may relate to fragmentation within communities and households caused by adverse social processes, age-sex composition of households and communities and the ability to overcome challenges posed by heterogeneity and extremism. Political vulnerability refers to arbitrary exercise of power by political authority and the link between political change and decision-making regarding resource access, Nicol, (2000). As Nicol further says that when water is available and improved greater demand arises and therefore may affect demand for labour is increased and therefore children spend more time collecting water. This may

affect their physical development as well as academic performance. However, less access may also affect negatively on children and women walking long distances in search for water for the household.

Vulnerability context impacts livelihood assets and vice versa. Policies and institutions as well as process have a two-way impact. It is important to note that when there are favourable government policies and processes there are reduced shocks and negative effects on people's livelihoods. Any deprivation of any of the livelihood assets/capital may have a negative impact on the vulnerabilities of households and communities, Twigg, (2001).

In rural areas in general, water plays a critical role. Access to a reliable supply of water allows people to expand their livelihoods, increase productivity and reduce the risks associated with the vulnerability. The factors that make up the vulnerability context are important because they have a direct impact upon people's assets and the livelihood options that are open to them. These categories include: trends, shocks and seasonality. Trends are long term and usually large scale. These include population trends, resource trends, economic trends, trends in governance and politics, and technological trends. Shocks include human health shocks, natural shocks, and economic shocks. They can destroy assets directly. They can also force people to dispose of assets as part of coping strategies. Resilience to external shocks and stresses is important factor in livelihood sustainability. Seasonality is expressed through seasonal shifts in prices, production, food availability, employment opportunities and health. These are one of the greatest and most enduring of hardship for poor people, Twigg, (2001).

Transforming Structures and Processes

These are institutions, organizations, policies and legislation which shape livelihoods. They operate at all levels, from the household to the international arena, and in all spheres, from public to private. They determine access to the five types of capital, livelihoods strategies and decision makers, terms of exchange between the different types of capital, and economic and other returns from livelihood strategies, Twigg, (2001).

Sustainable Livelihoods and water

Using SL framework, the impact of water interventions can be traced through a chain of linkages in which time, distance, management, energy released by less illness and reduced time spent on buying medical treatment, are used in additional activities that contribute to increased well-being, Dercon and Krishnan, (2000).

The role that water plays in livelihoods in rural areas in developing countries is manifold; health, agriculture, domestic collection, flood/drought, livestock, renewable natural resources, ceremonial etc. with land, it can be argued that water is the most significant input into a sustainable livelihood in Africa, Gowing, (2003). The above inputs are further segregated into; availability, quality, management and time and distance used to collect the resource.

2.3 Physical Factors of Water Access factors and sustainable livelihoods

According to Human Development Report (HDR) (2006), the UN Committee on Economic, Social and Cultural declared that water is a human right that each one is entitled to sufficient, safe, acceptable, physically accessible and affordable for personal and domestic use. These five core issues represent the foundations of water security. Yet they are widely violated. The report further says that poor households are less likely to get their water from a variety of improved sources. In Dar- es Salaam-Tanzania or Ouagadougou-Burkina Faso fewer than 30% of households are connected.

According to World Bank, (2009) rural areas perform consistently worse than urban areas on water access. 38% to 52 % have easy access to safe water as compared with 59% to 83% in urban areas. UNFPA, (2003) report that in Sub Saharan Africa, there are 10 countries including; Angola, Chad, Democratic Republic of Congo, Eritrea, Ethiopia, Guinea, Madagascar, Rwanda, Sierra Leone and Kenya are the most vulnerable in terms of access to safe water as well as hunger. The report further reveals that between a third and half of the populations have access to safe water and over a third of the population are undernourished.

UNDP, (2006) report that water access fell short by five percent since 1990 due to shortage of adequate funding to repair or replace rapidly aging infrastructure. However, this coupled with other issues of management and post project implementation through tariffs may improve the operations and maintenance of water systems to meet the needs of communities. About 49% of rural communities had access to water falling short of the target of 85% as stipulated by the millennium development goals targets.

According to SIWI, (2004) report some of the benefits associated with improved water access include but not limited to; improved human health, improved education, improved food security and food production. These cannot be achieved easily if good water management practices are not put in place to ensure that the benefits of water last longer. This means that busi-

ness plans are developed to ensure that communities manage and utilize water in an effective and efficient way.

There is need to link other factors together to ascertain the level of impact that water access has on sustainable rural livelihoods. This can involve looking at how water availability, distance to collect water, affordability and management of water projects and their corresponding challenges affect rural livelihoods. This will involve having a look at the interdependence and interlink of the factors.

2.3.1 Water Availability and Sustainable Rural Livelihoods

In order to get an understanding of water availability, the study relies heavily on the work of Carlevaro and Gonzalez, (2011) that identified sources of water and categorized in three main types; rainwater, surface water (river, streams, lakes and ground water. Out of these three sources, groundwater is assumed to be of good quality however, this is an assumption that is not always correct.

The selection of a water source will depend on quality, quantity, of the water, costs of development, operation, funds available, and distance from the community it serves DFID, (2011). All these factors may affect negatively or positively on the livelihoods of households while posing vulnerabilities and risks if some issues are compromised.

OCHA, (2010) reveals that in a provisional 2010 Sphere project standards for water use it was projected that the average per capita water consumption be at least 15 litres per person perday that equals to 5475 litres annually. Availability of water sources remain a daunting tasks for communities and families.

Availability of water poses several challenges to households and communities. In areas where water is not available, women and children travel tens of kilometres to fetch water. This is seen through queues in water points during dry seasons. In concluding remarks by DFID, (2002) report, the availability of a good quality water source close to home has numerous benefits especially in terms of human wealth, with subsequent linkages to all other dimensions of livelihoods. Though such gains in human wealth have an intrinsic value in terms of quality of life as a developmental end and a means of economic productivity.

2.3.1.1 Sources of water

Rain Water Harvesting and Sustainable Rural Livelihoods

It is an ancient technology that has a proven record of providing water next to the house for domestic use and on a larger scale for economic use by increasing the productivity of arable lands and watering livestock, Smet, (2005). Families that do not have the technology to utilize the water may not be able to harvest the water. This is because it needs guidance on the design, construction and maintenance of rainwater catchments systems that may cost more than the facility could afford, Petersen and Gould, (1999). Sometimes the rainwater may carry pollutants that it picks from the atmosphere and therefore need technical skills to be able to discard the first flush of water from the catchments surface, Pacey and Cullis, (1986).

A family with stable financial capital with an eager attitude towards rainwater harvesting may set up structures that are going to improve on the livelihoods and reduces stresses associated with lack of water for the household or for livestock or agriculture.

Ground water sources and Sustainable Rural Livelihoods

Groundwater constitutes 97% of global freshwater and is an important source of drinking water in many regions of the world, Howard et al, (2006). Several families may practice the following types of groundwater for their livelihoods depending on how affordable they are to them. Groundwater sources include; deep wells, shallow wells or boreholes. As much as that this water is suitable most families and communities may not be able to utilize this type of water due to the technical, economic or supply constrains associated with them, DFID, (2011).

Surface Water Sources and Sustainable Rural Livelihoods

Surface water sources include; large rivers, ponds, lakes and small upland streams. By its very nature, surface water is likely to have a highly variable quality in terms of chemical and microbiological content. This needs treatment of the water to be able to reduce or dilute the chemicals that may become an expensive venture. There are other challenges associated with surface water where operation and maintenance of treatment plants may become impossible to run bearing in mind the economic conditions of the people in rural areas, DFID, (2011).

2.3.2. Water Quality and Sustainable Rural Livelihoods

Access to safe drinking water is one of the Millennium Development Goals (MDGs) agreed upon by the World's leaders in the United Nations Millennium Summit in 2000. The MDG drinking water target is to halve by 2015 the proportion of people without sustainable ac-

cess to safe drinking water, WHO, (2011). The report further states that access to safe drinking water is an element of sustainable development and is central to the goal of poverty reduction. Lack of quality water means a lot to families, communities and children. According to WHO, (2002)-report lack of access to safe water, basic sanitation and good hygiene practices is the third most significant risk factor for poor health in developing countries with high mortality rate. WHO, (2004) further reports that diarrhoeal diseases for instance is widely recognized as the principal result of inadequate water, sanitation and hygiene. The report further reveals that 1.8 million people die every year from diarrhoeal disease, 90% of whom are children below the age of 5. Most people in Sub Saharan Africa spent at least a third of their income on treatment of water related diseases like malaria and diarrhoea, SIWI, (2004). SIWI report further states that, women in Sub Saharan Africa spend up to 6 hours a day on water collection chores. The time spend could be utilized for other productive duties such as child care, harvesting, or any other income generating activity that the household would utilize for improving its livelihood and living standards.

According to UN-Water, (2007) attribute water scarcity often creates a question of water quality, this result from environmental pollution and using un-protected water points. The report further asserts that water and health are intimately interlinked. Water conveys pathogens to people and provide the habitat for vector and intermediate hosts of pathogens. Shortage of water and inadequate sanitation may limit the ability of families to cope with some threats that may lead to infection and illnesses. Disease associated with water affect the poor with greater margins as compared to rich nations with a burden of ill health that creates a vicious cycle of poverty and sickness, UN-Water, (2007). Such families and communities may not be able to carry out their tasks effectively due to several hours or even days supporting sick people or relatives. This limits their socio-economic productivity.

Vulnerable communities are disproportionately affected by poor water quality. These communities include those that live near water ways of compromised quality. In order to mitigate on the risks of diseases suffered by communities, families and communities can mobilize towards improved drinking water facilities UN-Water, (2007).

2.3.3 Water Affordability and Sustainable Rural Livelihoods

UWAZI report, (2007) says that inequitable investment and poor maintenance result in affordable water. Supply of water from water points and through water, pipelines to kiosk is

unreliable due to artificially created water shortages by cartels. These cartels create a temporary shortage by either blocking on the water pipelines or destroying intakes to create a water problem. As a result, those who can least afford to pay, pay high prices and persistently have the worst access to safe water.

2.3.4 Distance and Time spend to water points and Sustainable Rural Livelihoods

Inadequate water infrastructure can create multiplier risks in rural areas. Several hours are wasted when women and children spend more time to fetch water for domestic use in walking for long distances to water points. Another critical aspect to this challenge is the time used to queue on water points that may take over 4 hours. This coupled with low inflow of water due to unimproved water source. Most water sources are dilapidated state. The HDR (2006) argues that Kenya will need to increase the number of people with access to water by 11.6 million. This target is daunting but may be attainable.

OCHA, (2010) reported that as at 2010, 1.1 billion people lived more than one kilometre from their nearest safe water source. This number would be even worse with projections that more than 5 billion people of the world's population would be without access to water and sanitation by 2030. UNFPA, (2002) report estimated that women in many developing countries walk for an average of about 6 kilometres each day to collect water. The report further states that water collection for domestic purposes is generally the responsibility of women and children. Therefore, availability of clean water to households reduces the women's workloads and hours spent in fetching water.

Based on UN, (2000) report showed that water collection times for villages in Kenya average just over 4 hours per day in dry season and 2 hours per day in wet season. The data also indicate times in the range of 4 to 6 hours per day in Botswana, Burkina Faso and Ivory Coast.

Women are exposed constantly to the risk of contraction of water-related diseases largely because of their role in collecting water, washing clothes, cleaning and cooking and in particular in rural areas performing day-to-day agricultural task. Carrying heavy water jars over long distances puts women's health at risk, particularly during pregnancy. Bearing heavy loads can result in premature birth, a prolapsed uterus, or back injuries, UNFPA, (2003).

UNDP, (2006) report states that for young girls, the lack of basic water and sanitation services translates into lost opportunities for education and associated opportunities for empowerment. The report further states, that the time burden for collecting and carrying water is

one explanation for the very large gender gaps in school attendance in many countries. The report further identifies that Tanzania schools attendance levels 12% higher in homes 15 minutes or less from a water source that in homes an hour or more away. Young girls, particularly after puberty are also less likely to attend classes if the school does not have suitable hygiene facilities.

2.4 Management of Water Projects and Sustainable Rural Livelihoods

UNDP-World Bank, (2008) report in its Water and Sanitation decade reports, estimates that achieving lasting benefits from water supply interventions involves much more than building facilities. It must be focused on the importance of involving the community in all aspects of service delivery, use of appropriate technologies, and the role of governments as service promoter rather than provider. The report further revealed that governments have an assumption that communities somehow ‘manage’ their facilities but do not help build capacities nor have any commitment to do so. This leaves communities to design their own traditional approaches towards maintaining water systems. There is need to define the roles of community members in project planning, implementation, cost recovery, operations and maintenance (O &M) and asset ownership that are poorly defined and communicated.

Haysom, (2006) reported that management of water projects encompasses among other critical elements, participation that is viewed as a tool for improving the efficiency of a project. It is also seen as a fundamental right that beneficiaries should have a say about interventions that affect their lives. Participation can take different forms including the initial expression of the demand for water, the selection of technology and its site, the provision of labour and local materials, a cash contribution to the project costs, the selection of the management type and even water tariff.

Management of water projects remains critical for its operationalization as well as continuity of the project. Most projects that are managed well outlive their functions. Haysom, (2006) proposes in his study on Tanzania water projects that there could be separation of roles as purchaser, service provider, regulator and asset holder to be able to meaningfully manage the water and be able to reach man people in rural communities.

According to E-Sadek, (2011) identified three levels of decisions and improvements that can be taken in management of water. The lowest level that this study will address is the user’s level. This level includes; increasing users’ awareness, applying water pricing and water saving

technology would lead to improve in local water efficiency. With water shortages and grim future if the current trend continue, there would be a growing understanding that sustainable water management requires water governance, including integrated water resource management. Integrated water resource management coordinates the development and management of water, land and related resources. It seeks to maximize social and economic welfare in an equitable manner, to sustain ecosystems and bring together the technical, social and political spheres, WED, (1992).

Decentralization of management of projects

This is the second principle of management that was made from the International Conference on Water and Environment (ICWE) Dublin 1992 that stated that water development and management should be based on a participatory approach involving users, planners and policy makers at all levels. It further states that participatory approach should raise awareness on the importance of water among policy makers and the public, WPP, (2009).

2.5 Socio-Economic Factors of Water Access and Sustainable Rural Livelihoods

Overseas Development Institute (ODI), (2003) says that where women undertake most agricultural labour, productive impacts are significant. For households and economies relying on the sale of labour, the cost of losing a day's labour can be exceptionally high at particular times of the year. The opportunity cost of water collection can have social, economic dimensions. For example, when the burden of collecting water falls disproportionately on children, the result may be lost education, health and safety of children among other multiplier effects. Women and children collecting water at night may also injure themselves or even engage into circumstances that may erode their emotional wellbeing.

People suffering from water-related diseases occupy more than half of the world's hospital beds, Lenton *et al*, (2005). Economically, improving water and sanitation services worldwide would have great benefit. It is estimated that each dollar invested in improving water and sanitation could yield \$3-34 depending on the region, and \$ 7.3 billion in health-related costs could be avoided each year, Lenton *et al*, (2005).

The issue of water pricing is a critical concern in the management of water projects. Under-pricing of water, which is practiced in most countries of Africa and Middle East, allows low-value users such as agriculture (which accounts for 88% of end users overall) to consume large quantities of water and use it wastefully. The result is depletion, degradation and physical

and economic losses. Under-pricing also results in unreliable service, unwillingness to pay, and decline in capacity to provide services, (IDRC, 1996). The IDRC report further stated that apart from water pricing other factors such as complex social, cultural, political and economic factors impact availability, allocation and use of water.

2.5.1 Water use

White *et al*, (1972) segregated water into the following uses: consumption, hygiene and amenities. Water for consumption refers to water content in beverages and food. Hygiene refers to the minimum water to wash one's body, clothes, utensils, food, clean the home, and for sanitation. Amenities refer to other uses which include bathing, watering gardens, washing cars. Through these categories, water utilized or consumed may vary from each item discussed that may cause a vulnerability to the household assets.

2.5.2 Water and Food Security

DFID, (2002) reveals that food and water security are related and that food security is an outcome of a set of vulnerabilities, dependent on how people gain access to production and exchange of opportunities. This is impacted by the broad expenditure, in time, labour or money, invested by households in gaining access to water.

There are also important gender and age specific issues involved in the division of labour for water collection. In rural Africa, where most agricultural labour is undertaken by women, productive impacts can be significant. For households and economies relying on the sale of labour, the cost of losing a day's labour can be exceptionally high at particular times of the year ODI, (2002). A key question in water collection, therefore, concerns the opportunity cost of this time- within and between households, across seasons and between good and bad years. As illustrated in Figure.2.

The opportunity cost of water collection can be of social and economic dimensions. The burden of collecting water falls disproportionately on children; the result may be lost education. Other areas that may be affected include health, nutritional and safety dimensions, DFID, (2002).

In a study conducted by Roy *et al*, (2005) in the community of N'atipkong and Ngendui in Kenya, women reported spending an average of 3.5 hours each day collecting water during dry season and double that in wet seasons because of hillsides and slippery hills. The report further reveals that children also collect water particularly during weekends and take longer be-

cause they play at the water points and collect less water of about 10 litres instead of 20 litres, DFID, (2002).

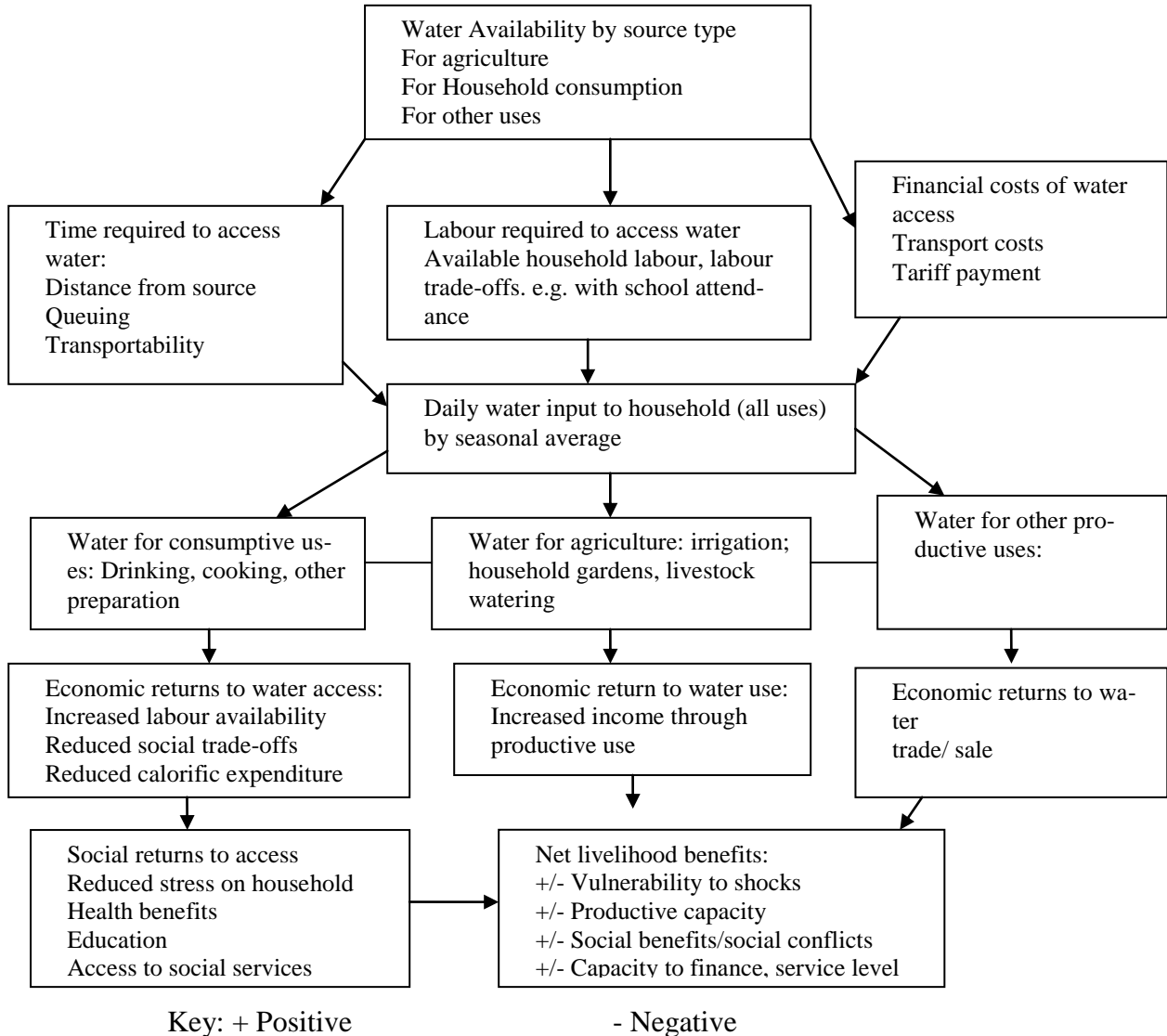


Figure 2: Schematic diagram of the household water economy.

Source ODI, 2002.

2.5.3 Assessing cost-effectiveness of water

In order to ascertain the cost effectiveness of water projects in rural areas a critical look at the economic assessment focused on time saving, health benefits that come from time freed by fewer episodes of ill-health; this means that time can be used for additional livelihood activities. The saved time may also be available for preventing premature deaths. This would also be used to mean that the number of days that a person is ill in a year is treated as days totally unavailable for any meaningful livelihood activities, DFID, (2011).

2.5.4 Improved drinking water source

Improved drinking water source refers to one that is protected from contamination WHO/UNICEF, (2008). If water is collected from a safe source, unsafe handling or storage of water can contaminate water, making household water treatment an important means of ensuring safety, WHO/UNICEF, (2008). It is critical to note that peoples' basic standards can be satisfied if the round trip to the water source is 30 minutes or less, WHO/UNICEF, (2004). When families are able to collect water within the said requirements, time that is more meaningful would be used to carry out other development initiatives in the household and thereby improve on the livelihoods and eventually on the living standards of the family and community.

2.6 Theoretical Framework

The section has been discussed as follows:

2.6.1 Roots of Livelihoods Thinking

There were several cross-disciplinary research efforts that were made by researchers in earlier days which focused on household studies, villages, farming systems that have come to impact development studies and livelihoods thinking in modern society, Lipton and Moore, (1972). The issue of sustainable development came into force in 1990's into the development discourse. These were as a result of strategies aimed at reducing poverty, people centred approaches, and sustainability in the political arena and development theory and practice that resulted in the widespread adoption and adaptation of livelihood definitions, models, and frameworks, Scoones, (2009).

Chambers and Conway, (1992) most often trace the explosion of livelihood research and literature to a working paper that emerged from the Institute of Development Studies in 1992, which sought to theoretically locate sustainable livelihoods within the actor-oriented approaches to development, the framework of environmental and social sustainability and the rhetoric of poverty reduction. The two researchers sought to diversify the definition to incorporate the narrowly conceptualizations of poverty as production, employment and poverty line thinking to include ideas of capability, assets and sustainability, WCED, (1987, Sen, (1987), Swift, (1989).

2.6.2 Chronology of Sustainable Livelihoods

A summary of the development of sustainable development is presented in the table 2.1 below. It includes events, publications and organizational changes reported over reported period. There

other issues addressed here are details related to evolution of the Sustainable Livelihoods Approach research, policy and practice from 1987 to 2008.

Table 2.1: Chronology of Sustainable Development

Year	Activities
1987	The World Commission on Environment and Development publishes the ‘Brundtland Commission report’
1988	IIED publishes ‘The Greening of Aid: Sustainable Livelihoods in Practice’
1990	UNDP publishes the first Human Development Report
1992	UN holds Conference on Environment and Development; IDS publishes ‘Sustainable Rural Livelihoods’ by Chambers and Conway
1993	Oxfam employs the SL approach
1994	CARE adopts household livelihoods security as a framework for relief and development
1995	UN World Summit for Social Development; UNDP adopts Employment and Sustainable Livelihoods as one of top five priorities; IISD publishes ‘Adaptive Strategies and Sustainable Livelihoods’ by Singh and Kalala; SID launches Sustainable Livelihoods and People’s Everyday Economics project 1996 ‘Adaptable Livelihoods’ by Davies is published; DFID invites
1996	‘Adaptable Livelihoods’ by Davies is published; DFID invites Sustainable Livelihoods projects; ‘Participatory Research for Sustainable Livelihoods’ by Rennie and Singh is published
1997	New Labour publishes White Paper on International Development ‘Eliminating World Poverty: A Challenge for the 21st Century
1998	DFID’s Natural Resources Department opens a consultation on sustainable livelihoods and establishes a Rural Livelihoods Advisory Group Natural Resources Advisers annual conference takes Sustainable Livelihoods as its theme and later publishes contributory papers: <i>Sustainable Rural Livelihoods: What Contribution Can We Make?</i> (Carney (ed.), 1998) SID publishes <i>The Sustainable Livelihoods Approach, General Report of the Sustainable Livelihoods Project 1995–1997</i> (Amalric, 1998) UNDP publishes <i>Policy Analysis and Formulation for Sustainable Livelihoods</i> (Roe, 1998) DFID establishes the SL Virtual Resource Centre and the SL Theme Group IDS publishes ‘Sustainable rural livelihoods: a framework for analysis’ (Scoones, 1998) The FAO/UNDP Informal Working Group on Participatory Approaches and Methods to Support Sustainable Livelihoods and Food Security meets for the first time
1999	DFID creates the Sustainable Livelihoods Support Office and appoints Jane Clark as its Head DFID publishes the first <i>Sustainable Livelihoods Guidance Sheets</i> . These have been regularly updated and are available at www.nssd.net/references/SustLiveli/DFIDapproach.htm#Guidance DFID also publishes <i>Sustainable Livelihoods and Poverty Elimination</i> (DFID, 1999) and <i>Livelihoods Approaches Compared</i> (Carney et al., 1999)

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- Presenters at the Natural Resources Advisers Conference report progress in implementing SL approaches and DFID later publishes these in *Sustainable Livelihoods: Lessons from Early Experience* (Ashley and Carney, 1999)
- ODI publishes „Sustainable Livelihoods in Practice: early application of concepts in rural areas (Farrington et al., 1999)
- DFID establishes the Sustainable Livelihoods Resource Group of researchers/consultants Amartya Sen's book *Development As Freedom* is published
- 2000 DFID commissions and funds Livelihoods Connect, a website serving as a learning platform for SLA
 FAO organizes an Inter-agency Forum on Operationalizing Sustainable Livelihoods Approaches, involving DFID, FAO, WFP, UNDP, and IFAD
 DFID publishes *Sustainable Livelihoods – Current thinking and practice* (DFID, 2000a); *Sustainable Livelihoods – Building on Strengths* (DFID, 2000b); *Achieving Sustainability: Poverty Elimination and the Environment* (DFID, 2000c); and more *SL Guidance Sheets*
 The Sustainable Livelihoods Resource Group establishes a subgroup on PIP (Policy, Institutions and Processes)
 IDS publishes „Analysing Policy for Sustainable Livelihoods (Shankland, 2000), the final report from its ESCOR programme
 Oxfam publishes *Environments and Livelihoods: Strategies for Sustainability* (Neeffjes, 2000)
Mixing it: Rural livelihoods and diversity in developing countries (Ellis, 2000) is published
 The UK government publishes its second White Paper, *Eliminating World Poverty: Making Globalization Work for the Poor* (DFID, 2000d)
- 2001 Millennium Development Goals established.
 New Labour wins election
 DFID commissions research on further development of the SLA framework; practical policy options to support sustainable livelihoods
Sustainable Livelihoods: Building on the Wealth of the Poor (Helmores and Singh, 2001) is published DFID organizes
- 2002 World Summit on Sustainable Development (Earth Summit 2002) takes place in Johannesburg, South Africa.
 Publication of *Livelihoods Approaches Compared: A Multi Livelihoods Approaches Compared: A Multi Agency Review of Current Practice* by Karim Hussein
- 2003 Publication of *Sustainable Livelihoods: A Case Study of the Evolution of DFID Policy* by William Solesbury
- 2008 Workshop held on SL framework: Ten years of researching the poor. Oxford University, 24 January 2008
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Source: Adopted from Sustainable Livelihoods by Morse et al. (2009) and Solesbury (2003).

Over the years sustainable livelihoods concept became an international focus for both empirical and theoretical work.

2.6.3 Determinants of Livelihood

There are numerous determinants of livelihood strategy. Many livelihoods are predetermined by accident of birth. These are referred as ascriptive for example in India children may be born on a caste with an assigned role as potters, shepherds or washer people. Many livelihoods are less singular or predetermined. Some people improvise livelihoods with degrees of desperation, what they do being largely determined by social, economic and ecological environment in which they find themselves. A person may also choose livelihoods especially through access to education or migration, Chambers *et al*, (1991).

2.6.4 Components and Flows in a Livelihood

Chambers and Conway, (1991) came up with four components of Sustainable Livelihoods namely; tangible assets (stores and resources), intangible assets (claims and access), and people and livelihood capabilities. Stores are tangible assets that include food stocks, stores of value such as gold, jewellery and woven textiles and cash savings in banks of thrift and credit schemes. Resources include land, water, trees, livestock, farm equipment and domestic utensils, Chambers *et al*, (1991).

2.6.5 Rights based Approach

The right of access to fresh water

In 2002, following the World Summit on Sustainable Development in South Africa, a United Nations committee siding with those who objected to the privatization of water supplies declared that; “Water should be treated as a social and cultural good and not primarily as an economic commodity”. Later, ECOSOC, the United Nations Committee on Economic, Cultural and Social Rights agreed on a general comment on water as a human right: “Water is fundamental to life and health. The human right to water is indispensable for leading a healthy life in human dignity. It is a pre-requisite to the realization of all other human rights.” UNESCO, (2004).

In theory, the sustainable livelihoods frameworks and thinking offer a systematic, holistic, inter-sectoral, actor-oriented approach for understanding the lives of poor and marginalized people and creating links to macro level policy for poverty reduction. In practice from what researchers have carried SL approaches have proved useful for research, programmatic interventions and policies that have focused on poverty reduction, food security, tourism development, fisheries development and water sectors among others, Benneth, (2010).

2.7 Conceptual Framework

The study has identified independent variables which include; physical factors of water access that include- water availability, water affordability, water quality, distance and time taken to collect water. Another variable is management of water projects that is segregated into; training of technicians, level of decision making of water users and management and gender representation and challenges operations and maintenance of water projects. Another independent variable is socio-economic factors that includes; level of community relationships and water use.

The study also looked at the dependent variable-sustainable rural livelihoods. The variables studied included; improved health, increased rate of enrolment/education, food security, increased income level.

On moderating variable it included water laws and policies while intervening variable was attitude of water drawers.

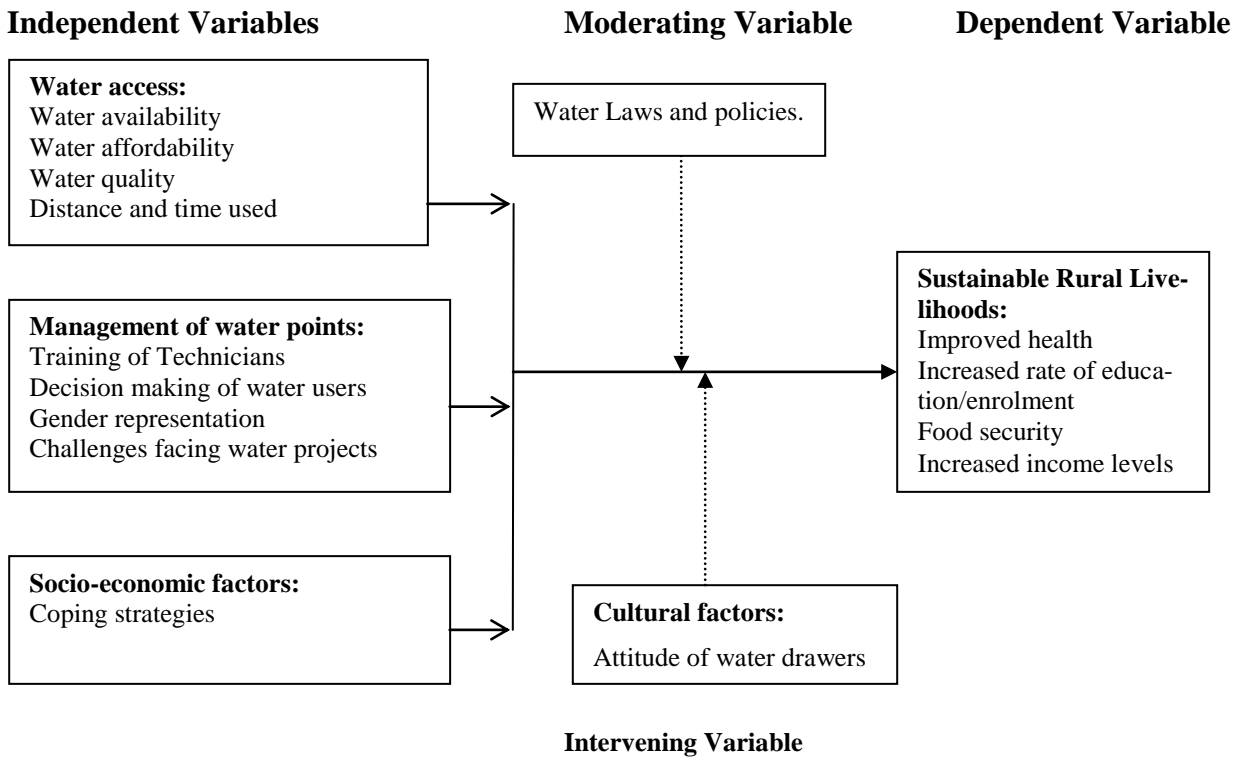


Figure 3: Conceptual Framework

2.8 Gaps in Literature Review

Most research undertaken and reported in sustainable access to safe drinking water has focused on the relationship between water and disease. Not much has been written about the costs to health that may affect individual involved in collecting water, DFID, (2010). Through this study which was undertaken in Elementaita Division data on the variables discussed will be interpreted and information shared.

There is need to carry out an assessment how water project are being affected by water access related factors. This coupled with research and secondary data may help in adding knowledge base on related water projects and their challenges in communities.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodologies which were used in the study. The chapter consists of research design, target population, sampling procedure, methods of data collection, validity and reliability of instruments, operational definition of variables and ethical consideration.

3.2 Research Design

A descriptive survey was used in the study on assessing the impacts of water access, management, and socio-economic factors on sustainable livelihoods in rural areas. Mugenda and Mugenda, (2003) contend that the purpose of a descriptive research is to describe behaviours and characteristics. For the purposes of obtaining adequate and relevant information in a short time, the study used survey to collect the data. Best and Khan, (2009) agreed with other scholars who argued that descriptive surveys describes and interprets phenomena and are concerned with conditions or relationships that exists, opinions that are held, processes that are going on, and effects that are evident or trend that are developing. Therefore, the study used the design in order to analyse the phenomena of physical factors, management, and socio-economic factors of water access in relation to sustainable rural livelihoods. Isaac and Michael, (1995) say that in order to describe facts and characteristic of a given population or an area of interest, factually and accurately, the best model or design is descriptive research design. The study also used qualitative methodology through use of focus group discussion. Cooper and Schindler (2001) agreed that focus groups are panels, facilitated by a moderator who meets with the audience for a specified period of time to exchange perspectives, knowledge and opinions on a topic. The focus groups were able to explore new or unexpected information that was not anticipated and the researcher can also observe reactions to a research question in an open forum.

3.3 Target Population

The target population was picked from household heads within Elementaita Division of Gilgil District. Elementaita Division has 45 villages and has four sub locations. Each of the sub

locations were clustered and based on their population the villages were selected. Kong'asis sub location was represented by 5 villages, Kiambogo sub location 6 villages and Miti-Mingi sub location by 2 villages. In each of the sub locations, simple random sampling was carried out in picking the number of villages which was as follows, Kong'asis sub location- Olesirwa, Block D, Kapkures, Kong'asis and Kampi Turkana villages. In Kiambogo sub location, Kahuhu, Kiambogo, Gituamba, Tee, Tangi Tano and Kahoroko Villages were selected. Finally in Miti-Mingi sub location, Kiptangwany and Munanda villages were selected. One water group was randomly selected among 10 Water Users Associations. Key informant Interviews were carried out with District Water Officer-Gilgil District and Public Health Officer- Elementaita Division. The area has 4546 households and 195 household heads were interviewed.

3.4 Sampling Procedure

In this section, sample size and selection was discussed.

3.4.1 Sample Size and Selection

According to Mugenda and Mugenda, (1999) where there is time and resources, a researcher may take a bigger sample. This means that there would be a higher level of confidence.

They further add that if the target population is less than 10,000 the sample size would be calculated as follows:

$$n = \frac{Z^2 pq}{d^2} = \frac{(1.96)^2 (0.5) (0.5)}{(0.07)^2} = 196$$

where;

n= the desired sample size

z= the standard normal deviate at the required confidence level of 95%.

p= the proportion in the target population estimated to have characteristics being measured

q= 1-p

d= the level of statistical significance set (confidence interval) of 7%.

This sample size is close to the sample size proposed by Yamane, (1967) of 194 for a population of 4546 with precision levels of $\pm 7\%$ in appendix 7. Therefore a sample of 196 would be selected for the study. This was carried out through cluster sampling of sub locations and randomly selected villages. Systematic sampling was carried out for all the households in each of the villages.

Probability sampling was used collect data. Castillo, (2009) said that probability sampling is a sampling technique where the samples are gathered in a process that gives all the individuals in a population equal chances of being selected. Probability sampling allows subjects in a population to be randomly selected, so that each one of the stands an equal chance of being included in the study. The study also selected 1 water uses group for focus group discussion of the ten existing water groups.

3.5 Data Collection Instruments

The following are the data collection instruments that were used to carry out the data collection.

3.5.1 Questionnaires

Data was collected from households in Elementaita Division. Primary data was collected using structured questionnaires with both open and closed questions. The questionnaire was administered to the respondents by the researcher with the help of four research assistants. The data collection used a questionnaire because of it is a typical method through which descriptive data can be collected, Gay, (1981).

3.5.2 Focus Group Discussion

Focus group discussion is another method that was used to collect data from selected groups. This is because the groups have information that was important in addressing management challenges faced by water users and drawers. Focus group discussions have been found helpful in assessing needs, developing plans, testing new ideas or improving existing programmes, Krueger, (1988); Babbie, (1992). Focus group guides were developed to be used in the focus group discussion. A group of 6 (2 female and 4 male) committee members were interviewed.

3.5.3 Interviews

Key Informant Interviews were carried out with Government of Kenya Ministries of Water and Irrigation and Public Health. This gave the report a technical look at issues affecting communities.

3.6 Validity and Reliability of Instruments

In this section validity and reliability of instruments were discussed in detail.

3.6.1 Validity of Instruments

Validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are, Joppe, (2000). In order to ascertain the extent of the research instruments, the researcher conducted a pre-test of 10 respondents from the sample to test the instrument. Mehrens, *et al.*, (1987) refers face validity to whether the test looks valid “on the face of it.” For content validity was used to check on word and phrases used in the questionnaire. Pre-test of the questionnaire was carried out to ensure that the content in the questionnaire remains unbiased.

3.6.2 Reliability of Instruments

Refers to the extent to which results are consistent over time and an accurate representation of the total population under the study, Joppe, (2000). Kirk and Miller, (1986) came up with three types of reliability which relate to quantitative research as: (1)the degree to which a measurement, given repeatedly, remains the same, (2) the stability of a measurement over time; and (3) the similarity of measurement within a given period of time. Worthen et al (1993) defines reliability as a measure of how stable, dependable, trustworthy, and consistent a test is in measuring the same thing each time. During this study the researcher used 10 questionnaires to determine the effectiveness of the research instrument.

3.7 Data Collection Procedures

Before carrying out the research, proper documentation and printing of copies were done early enough. This ensured that the assignment went on as planned. The materials included; a letter of introduction will be given to the leaders of the villages sampled, letter of permission to carry out the research and questionnaires and other materials. A pilot test was carried out to check on validity and reliability of the instruments. Once this process was done, the tools were

modified to fit the context and preparation for the exercise to commence. Leaders were mobilized based on the dates for the data collection so that they informed the groups and communities. Letters were sent to the selected groups informing them of the time they were to be interviewed. Permit for carrying out data collection was requested at the Ministry of Higher Education, Department of Post Graduate which was approved. The data collection schedule included the household survey and key informant interviews. After the data collection the data was verified to check whether all the sections were dully filled as well as ascertain the number of questionnaires submitted. This was done to ensure quality data collected. Later the data was keyed in Statistical Programme for Social Scientist (SPSS).

3.8 Data Analysis Techniques

Anderson and Poole, (2001) says that the researcher must be able to interpret the data reliably, once data has been collected. The data collected was analysed using descriptive statistics such as percentages, means scores, mode, and standard deviation. Both qualitative and quantitative data will be analysed and interpreted using descriptive statistics in order to address the research objectives. Data was keyed in Statistical Programme for Social Scientist (SPSS). Results will be presented in tables using percentages and frequencies to facilitate comparisons. Excel worksheet will be used for data analysis.

3.9 Ethical Consideration

Utmost caution was exercised while administering questionnaires and conducting interviews to avoid any mistrust between the respondents and the researcher. Permission was sought from the respondents and they were assured of confidentiality.

3.10 Operational Definition of Variables

Table 3.1: Operational Definition of Variables

Objectives of the study	Variables	Indicators	Data Collection Tools	Measurement Scale	Data Analysis Tools	Type of Data Analysis
To assess physical factors of water access and its impacts on sustainable livelihoods in Elementaita Division.	Independent Variable Water availability. Water quality. Water affordability. Distance covered and time taken to collect water	Percentage of households with all round access to water.	Questionnaire	Ordinal	Percentages and frequencies	Descriptive
		Percentage of households reporting walking less than one kilometre to water points and using less than 15 minutes to fetch water.	Focus Group discussion	Ratio		
		Percentage of households reporting affordable water for domestic use.	Key Informant interviews			
		Percentage of households reporting good health and reduced water related diseases due to access to quality source of water. Improved livelihoods.				
To evaluate management of water projects and determine how it impacts on sustainable livelihoods in Elementaita division.	Independent Variables Training of water technicians Decision making of the water users. Gender representation in water management Mismanagement of water projects Inconsistent collection of	Percentage of members with management skills.	Questionnaires, Focus Group discussion	Ratio	Percentages and frequencies	Descriptive and inferential
		Percentage of water users reporting to actively participate in making decisions	Secondary data			
		Increased number of women in the management committees				
		Proportion of committee members reporting cordial working relation-				

	revenue from water sales	ships				
	Proper documentation	Proportion of community members/households reporting improved revenue collection and value for money for the services they receive.				
	Conflicts between management committees and community	Reduced inter group and community conflict.				
To determine how socio-economic factors impact on rural livelihoods in Elementaita Division.	Independent variable: Economic returns to water access Social returns to water access. Water use	Increased income through productive use of water. Increased labour availability Reduce social trade offs Reduced stress on household Reported health and education benefits Increased access to social services.	Questionnaire Focus group discussion Key informant interviews.	Ratio	Percentages and frequencies	Descriptive
	Dependent Variables Improved health Increased rate of enrolment/education Food security Increased income levels	Proportion of households reporting improved health. Percentage of children enrolled in school and level of retention. Proportion of households reporting as food secure all years round. Proportion of households reporting increased income levels.	Questionnaire	Ratio	Percentages and frequencies	Descriptive

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 introduction

This chapter presents data analysis, presentation and interpretation of the study.

4.2 Return Rate

A total of 196 household heads within Elementaita Division were sampled. Questionnaires were administered to them. However, out of the targeted respondents, only 195 were able to participate in the exercise representing 99.5% as shown in Table 4.1 below.

Table 4.1 Return Rate of the Questionnaire

Description	Frequency	Percentage
Returned	195	99.5
Not Returned	1	0.5
Total	196	100.000

From the above presentation of results the number of questionnaires not returned was insignificant and therefore the questionnaires received were suitable for the study.

4.3 Demographic Characteristics

This section dealt with the demographic characteristics of the respondents. This was meant to provide the basis of understanding the composition of the respondents and to determine their ages, gender, education, location and main source of income.

4.3.1 Distribution of the Respondents by Gender

Majority of the respondents (54.9%) were males while (45.1%) were females as shown in Table 4.2

Table 4.2 Questionnaire Return Rate

Description	Frequency	Percentage
Male	107	54.9
Female	88	45.1
Total	195	100

However, this did not affect the quality of the data collected since extend of water access in communities by male and female is almost the same. Based on the Chi Square approximation at 5% alpha of the proportion of male and female respondents in the collected data, the observed difference (9.7%) in the proportion of the two gender is not significantly different from half (0.5) due to the calculated probability value (P-value) of 0.17.

4.3.2 Distribution of Respondents by Age

The study was interested in the age of the sampled household heads.

Table 4.3 shows the summary of the results.

Table 4.3 Age of the Respondents

Description	Frequency	Percentage
Below 25 yrs	30	15.4
25-35 yrs	89	45.6
36-45 yrs	45	23.1
Over 45 yrs	31	15.9
Total	195	100

Table 4.3 shows that majority of the respondents, as represented by 45.6% were aged between 25-35 years. This was followed by respondents who were aged 36-45 years while 15.4% and 15.9% of the respondents were in the age bracket of below 25 years and over 45 years respectively.

4.3.3 Distribution of the Respondents by Educational Level

Majority of the respondents (40.0%) were respondents with secondary level education this was followed closely by respondents (35.9%) with primary level of education as shown in Table 4.4

Table 4.4 Distribution of Respondents by Education Level

Description	Frequency	Percentage
Primary	70	35.9
Secondary	78	40.0
Diploma	25	12.8
Graduate	2	1.0
Not Schooled	20	10.3
Total	195	100

However, respondents with diploma and graduate level of education were 12.8% and 1.0% respectively. Of importance also were respondents who had not schooled at all standing at 10.3%

4.3.4 Distribution of respondents by Income Levels

Table 4.5 shows how the respondents were categorized as per their income levels. This included income from farm produce, livestock and salaries.

Table 4.5 Distribution of respondents by Income levels

Description	Frequency	Percentage
Less than Kshs 5000	108	55.4
Between Kshs 5001-10000	71	36.4
More than Kshs 10001	16	8.2
Total	195	100

Majority of the respondents sampled (55.4%) had monthly income levels below Kshs 5000 while 36.4% and 8.2% were respondents earning between Kshs 5001-10000 and more than Kshs 10001 respectively.

4.3.5 Distribution of Respondents by Villages

The distribution of respondents per village of residence as shown in Table 4.6

Table 4.6 Distribution of Respondents by Villages

Village	Frequency	Percentage
Tee	20	10.3
Kampi Turkana	10	5.1
Gituamba	10	5.1
Kiambogo	15	7.7
Kahuho	19	9.7
Kiptangwany	18	9.2
Olesirwa	4	2.1
Kapkures	6	3.1
Block D	17	8.7
Tangi Tano	17	8.7
Kahuroko	7	3.6
Munanda	18	9.2
Kong'asis	34	17.4
Total	195	100

This study was conducted to household heads and the villages were sampled based on their population sizes in the division. Majority of the respondents came from Kong'asis village (17.4%) followed by Tee (10.3%), Kahuho (9.7%), Kiptangwany (9.2%), Munanda (9.2%), Tangi Tano (8.7%), Block D (8.7%), Kiambogo (7.7%), Kampi Turkana (5.1%), Gituamba (5.1%), Kahuroko (3.6%), Kapkures (3.1%) and Olesirwa (2.0%).

4.4 Physical Factors of Water Access

The section has been divided into four areas of analysis namely, water availability, water quality, water affordability and distance and time taken to fetch water.

4.4.1 Water Availability

This section discusses available water sources in Elementaita Division

4.4.1.1 Types of Water Source accessed by the Respondents

Table 4.7 shows how water source was accessed by the respondents

Table 4.7 Access by Respondents to Water Source

Description	Frequency	Percentage
River	13	6.7
Pond	9	4.6
Borehole	65	33.3
Piped into dwelling	5	2.6
Public tap	58	29.7
Unprotected pan	11	5.6
Rainwater	34	17.4
Total	195	100

From the above presentation, majority of the respondents 33.3% accessed borehole for water while this was followed closely by public tap (29.7%), Rainwater (17.4%), River (6.7%), Unprotected pan 5.6%), pond (4.6%) and piped into dwelling (2.6%).

4.4.2 Water Quality and Health of the Respondents

The sub section discusses on the impact of water quality on health of the respondents with regard to water sources, its effects and its quality.

In order to ascertain the level of water quality of the water and its effects on the health of the respondents, questions were asked as in Table 4.8 (Whether they are affected by the water) and Table 4.9 (if they were affected, what were results).

4.4.2.1 Respondents who suffer from diseases in relation to water source

Respondents were asked questions on whether the water from the sources cited in Table 4.7 affected them and their response were presented in Table 4.8

Table 4.8 Distribution on whether they suffer from the water sourced

Description	Frequency	Percentage
YES	113	57.9
NO	82	42.1
Total	195	100

From the respondents interviewed, majority (57.9%) reported being affected by the water whereas 42.1% of the respondents reported not to have suffered from the water. This was to the respondents practicing rain water harvesting, public tap and piped into dwelling.

From the results above, further discussion was looked into establishing of the 57% percent of the respondents what they were suffering from as presented in Table 4.9.

Table 4.9 Distribution of respondents who reported health problems

Description	Frequency	Percentage
Fell sick (diarrhoea, dysentery, amoebiasis)	90	79.6
Discoloured teeth	23	20.4
Total	113	100

From the above analysis, majority of the respondents 79.6% reported suffering from diarrhoea, dysentery and amoebiasis after using the water while 20% of the respondents have their family members or themselves discoloured teeth.

Further questions were asked on the quality of the water they were using at household level and the results are presented in Table 4.10.

Table 4.10 Distribution of the respondents on quality of water

Description	Frequency	Percentage
Potable and safe	14	7.2
Moderately safe	69	35.4
Fair Quality	79	35.9
Poor Quality	42	21.5
Total	195	100

From the above presentation, majority of the respondents 35.9% reported the water to be moderately safe and 35.4% reported the water to be of fair quality. However, 21.5% of the respond-

ents cited the water to be of poor quality for human beings to consume while 7.2% of the respondents reported the water to be potable.

The effects of the water cited in Table 4.7, especially with the borehole may in the long run affect the health status of the respondents.

4.4.3 Water Affordability

Water affordability was categorized into cost per 20litre jerician, respondents' view of the rate charged and its causes.

4.4.3.1 Cost of water in 20 litre Jerican

Respondents were asked on how much it costs a 20 litre jerician in their villages and the findings were presented in Table 4.11

Table 4.11 Cost of water in 20 litre jerician

Description	Frequency	Percentage
Kshs 2	33	17.4
Kshs 3	44	23.2
Kshs 4	13	6.8
Kshs 5	26	13.7
Kshs 10	63	33.2
Kshs20	11	5.8
Total	190	100

From the presentation, majority of the respondents 33.2% were buying the water at Kshs 10 which was followed closely by respondents purchasing water at Kshs 3 at 23.2%, Kshs 2 at 17.4%, Kshs 5 at 13.7%, Kshs 4 at 6.8% and Kshs 20 at 5.8%.

4.4.3.2 Respondents perception of the cost of water charged

The respondents were asked to rate the cost of the water they were purchasing and the findings were presented in Table 4.12.

Table 4.12 Respondents perception of the cost of water

Description	Frequency	Percentage
Very Expensive	49	25.1
Expensive	122	62.6
Normal	18	9.2
Not expensive	6	3.1
Total	195	100

From the presentation, majority of the respondents 62.6% reported that the cost of water was expensive while 25.1% of the respondents reported the water to be very expensive. 9.2% and 3.1% of the respondents reported the cost of water to be normal and not expensive respectively.

4.4.3.3 Causes of high cost of water

Further there was need to ascertain the reasons behind the high water cost in the area and a question was developed as presented in Table 4.13.

Table 4.13 Cause of High Cost of Water

Description	Frequency	Percentage
Presence of middle men/persons	58	33.1
Expensive Operation	117	66.9
Total	175	100

From the presentation above, majority of the respondents 66.9% reported that the high costs were due to expensive operations for water projects like boreholes and water piped into dwelling. However, 33.1% of the respondents reported that presence of middle men/persons or cartels made water to be expensive.

4.4.4 Distance and Time taken to Water Points

The study was also interested still on looking at water access to find the relation between distance and time taken to water points as presented in distance round trip, time taken to collect water in dry and wet seasons.

4.4.4.1 Distance to water points

The study looked at the distances covered to fetch water by respondents and presented in Table 4.14.

Table 4.14 Distances covered round trip to water points

Description	Frequency	Percentage
Less than 2 Km	52	26.7
Between 2-5Km	91	46.7
Between 5-10 Km	41	21.0
More than 10 km	11	5.6
Total	195	100

From the above presentation, majority of the respondents, 46.7% covered between 2-5 kilometres to fetch water, this was followed closely with 26.7% fetching water in less than 2 kilometres, 21.0% fetching water between 5-10 kilometres and 5.6% fetching water in more than 10 kilometres.

4.4.4.2 Time spend to fetch during dry season

The respondents were also asked to state the time they spend to fetch water in dry season as presented in Table 4.15.

Table 4.15 Time spend to fetch water in Dry Season

Description	Frequency	Percentage
Less than 30 mins	34	17.4
Between 30-60 mins	53	27.2
More than 60 mins	108	55.4
Total	195	100

From the presentation above, majority of the respondents 55.4% spend more than 1 hour to fetch water while 27.2% and 17.4% spend between 30-60 minutes and less than 30 minutes to fetch water.

4.4.4.3 Time used to fetch during Wet Season

The respondents were asked to state the time spend to fetch water during wet season as presented in Table 4.16.

Table 4.16 Time spend to fetch water during Wet Season

Description	Frequency	Percentage
Less than 30 mins	124	63.6
Between 30-60 mins	56	28.7
More than 60 mins	15	7.7
Total	195	100

From the presentation, majority of the respondents 63.6% spend less than 30 minutes to fetch water while 28.7% and 7.7% spend between 30-60 minutes and more than 60 minutes to fetch water respectively.

Another question on Rain water harvesting was asked to the respondents as presented in Table 4.17.

Table 4.17 Distribution of Respondents by presence of rainwater harvesting

Description	Frequency	Percentage
YES	125	64.1
NO	70	35.9
Total	195	100

From the above presentation, majority of respondents 64.1% practice rain water harvesting while 35% of the respondents do not.

4.5 Management of Water Projects

The second objective of the study was to determine how management of water projects impact in sustainable rural livelihoods. Here who manages, gender composition of management committees and decision making of women, operation and maintenance, ownership and challenges faced by water projects are presented.

4.5.1 Management of Water Projects

Respondents were asked questions relating to the management of water projects in order to ascertain who manages water projects in the study area as presented in Table 4.18.

Table 4.18 Management of water Projects

Description	Frequency	Percentage
Water committees	164	84.1
NGOs	3	1.5
Government	8	4.1
Church	1	0.5
Village committees	19	9.7
Total	195	100

From the presentation above, majority of the respondents 84.1% reported that water committees were managing water projects while those managed by village committees comprised of 9.7% while government, NGOs and church managed 4.1%, 1.5% and 0.5% respectively.

4.5.2 Composition of Management Committees of Water Projects

Respondents were asked questions relating to the composition of the management of water projects as presented in Table 4.19.

Table 4.19 Composition of the Management of water Projects

Description	Frequency	Percentage
Both Men and Women	98	51.6
Men only	50	26.4
More men and few women	40	21.1
More women and few men	2	1.1
Total	190	100

From the presentation above, majority of the respondents 51.6% said that in the management there were both men and women, while 26.4% reported that there were only men in the committees. However, 21.0% reported that there were more men and few women in the committees and 1.0% reported that there were more women and few men in the committees.

4.5.3 Decision Making of Women in Water Project

Further there was need to ascertain the perception about women's inclusion in decision making as presented in Table 4.20.

Table 4.20 Decision making of women in water project

Description	Frequency	Percentage
Not important	57	29.2
Somewhat important	38	19.5
Important	83	42.6
Very important	17	8.7
Total	195	100

From the presentation above majority of the respondents 42.6% and 8.7% reported that decisions of women in water projects are important and very important respectively. However, 29.2% and 19.5% of the respondents reported that inclusion of women in decision making is not important and somewhat important respectively. This may impact negatively on the plans that women have bearing in mind that women and children bear the responsibility of collecting water for most households as presented in Table 4.21.

Table 4.21 Drawers of water at households

Description	Frequency	Percentage
Women	36	18.5
Women and Girls	113	57.9
Girls only	1	0.5
Boys	3	1.5
Boys and Girls	21	10.5
Youth	15	7.72
Men	6	3.1
Total	195	100

From the presentation above, majority of the respondents 57.9% reported that women and girls fetch water for most households; this was followed closely by women only 18.5%, boys and girls 10.5%, youth 7.7%, men 3.1%, boys 1.5% and girls 0.5%.

4.5.4 Operation and Maintenance of Water Project

This section present issues on operation and maintenance of water projects in the study area. Questions were posed to the respondents on who operates and maintains water projects in the community and was presented in Table 4.22.

Table 4.22 Personnel carrying out operations and maintenance of Water Projects

Description	Frequency	Percentage
Trained Technicians	17	8.7
Untrained Technicians	70	55.8
Untrained water committees	100	12.6
Trained Water Committees	8	5.3
Total	195	100

From the above presentation, majority of the respondents 55.8% reported that operations are done by untrained technicians while untrained water committees, trained technicians and trained water committees accounted for 12.6% 8.7% and 5.3% respectively.

4.5.5 Ownership of Water Projects

The respondents were also asked on the ownership of water project in the community as shown in Table 4.23.

Table 4.23 Personnel carrying out operations and maintenance of Water Projects

Description	Frequency	Percentage
Community members	106	54.4
Water Committee	76	39.0
Government	11	5.6
Private	1	0.5
Youth	1	0.5
Total	195	100

From the above presentation, majority of the respondents 54.4% reported that water projects are owned by the community members while those owned by water committees, government, private and youth accounted for 39.0%, 5.6%, 0.5% and 0.5% respectively.

4.5.7 Challenges faced by Water Projects

The respondents were asked to highlight the challenges faced by water projects in their villages as presented in Table 4.24. Of the 195 respondents interviewed, 185 respondents representing 94.9% agreed that there were challenges facing water projects in the community while 5.1% disagreed.

Table 4.24 Challenges faced by water projects

Description	Frequency	Percentage
Mismanagement	74	40.0
Corruption	69	37.3
Dilapidated infrastructure	22	11.9
Pricing	18	9.7
Cronyism	1	0.5
Water Regulation	1	0.5
Total	185	100

From the presentation above, majority of the respondents 40.0% reported that mismanagement on part of the committees is rampant in most water projects; another 37.3% reported that corruption while dilapidated infrastructure, pricing, cronyism and water regulation accounted for 11.9%, 9.7%, 0.5% and 0.5% respectively.

4.6 Socio-Economic Factors of Water project

The third objective of the study was to determine how socio-economic factors of water projects impact in sustainable rural livelihoods. Here discussions are presented based on water scarcity and its effects on the education of the child and mitigation measures by families to counter water scarcity.

4.6.1 Water Uses

Table 4.25 shows how the respondents utilize their water in household

Table 4.25 Water Use by Respondents

Description	Frequency	Percentage
Washing clothes, hygiene	57	29.2
Cleaning	45	23.1
Drinking	92	47.2
Kitchen gardens	1	0.5
Total	195	100

Majority of the respondents, 47.2% rely the water from the water sources for drinking while 29.2%, 23.1% and 0.5% rely for washing clothes and hygiene, cleaning and kitchen gardens respectively.

4.6.2 Water Scarcity and Children

Here the respondents were asked questions relating to the effects of water scarcity on children lives as presented in Table 4.26. Of the 195 respondents interviewed, 170 representing 87.2% agreed that children lives are affected by water scarcity whereas 12.8% disagreed.

Table 4.26 Water Scarcity and Effects on Children

Description	Frequency	Percentage
Don't attend school	56	32.9
Walk long distances to fetch water	112	65.9
Employed to carry water	2	1.2
Total	170	100

From the presentation, majority of the respondents 65.9% reported that children walk long distances to fetch water, 32.9% reported that children do not attend school at all as their parents leave them at home to look for this commodity or the children leave school to look for the water with their parents. 1.2% of the respondents reported that children are employed to carry water.

4.6.3 Household Coping Strategies during water scarcity

Here the respondents were asked questions relating to the effects of water scarcity on household as presented in Table 4.27.

Table 4.27 Coping Strategies during Water Scarcity

Description	Frequency	Percentage
Sale of chicken and eggs	52	26.7
Sale of farm produce (beans, maize, potatoes)	87	44.6
Sale of small livestock (goats, sheep)	33	16.9
Sale of large livestock Cows, bulls)	1	0.5
Sale of household items (tables, beds, kitchen items)	22	11.3
Total	170	100

From the presentation, majority of respondents 44.6% reported sale of farm produce (beans, maize, potatoes) to purchase water, this was followed by sale of chicken and eggs, sale of small livestock (goats and sheep), sale of household items (tables, beds, kitchen items) and sale of large livestock (cow and bulls) at 26.7%, 16.9%, 11.3% and 0.5% respectively.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings, discussion, conclusions and recommendations.

5.2 Summary of Findings

Table 5.1 shows the summary of findings of the study.

Table 5.1 Summary of the study Findings

Objectives	Summary of Findings
1. Demographic characteristics	Most of the respondents interviewed 55.4% had a monthly income levels of below Kshs 5000 and 8.2% with over Kshs 10,001.
2. To what extent does availability of water of water impact on sustainable rural livelihoods	Majority of the respondents, 33.3% relied on water from boreholes while 29.7% on public tap. 17.4% of the respondents rely on rain water harvesting while 5.6% rely on unprotected pan.
3. Do what extent do water quality impact on sustainable rural livelihoods	On water quality, majority of the respondents 57.9% felt that the water they were using was affecting them. Of the above respondents, 79.6% reported to have had diarrhoea, dysentery and amoebiasis resulting from the water.
4. To determine how water affordability impact on sustainable rural livelihoods	On water affordability, majority of the respondents 33.2% were purchasing water at Kshs 10 for 20 litre jericin. 5.8% of the respondents purchase 20 litre Jericin with Kshs 20. Majority of the respondents, 66.9% perceive that the high cost of water in the community is due to high cost of operations while 33.1% perceive presence of middle men/persons has increased the cost for water.
5. How does distance from a water point and time tak-	On distance to water points, majority of the respondents, 46.7% travel between 2-5 kilometres to fetch water.

<p>en to collect water impact on sustainable rural livelihoods</p>	<p>Majority of the respondents 55.4%, spend over one hour in search for water during dry season.</p>
<p>6. What is the level of training of water technicians impact on rural livelihoods</p>	<p>From the ministry of Water and irrigation, few of the groups have been trained.</p>
<p>7. To what extent does decision making of water users impact on sustainable rural livelihoods</p>	<p>On drawers of water, majority of the respondents 57.9% reported women and girls. On composition of water projects, majority of the respondents</p>
<p>8. To what extent does gender in management of water impact on sustainable rural livelihoods in Elementaita Division?</p>	<p>51.6% of the respondents reported that water groups are composed of men and women while 26.4% said that men only were in the committees. From the respondents, women do not play a critical role in the management of water as 29.2% said that their views were not important while 19.5% said that it was somewhat important.</p>
<p>9. How does operations and maintenance of water projects impact on sustainable rural livelihoods in Elementaita Division?</p>	<p>On operation and maintenance, majority of the respondents 55.8% cited untrained technicians to be manning water projects. On challenges facing water projects, majority of the respondents 40.0% cited mismanagement as the main cause followed closely by corruption at 37.3%.</p>
<p>10. How does water scarcity impact on sustainable rural livelihoods in Elementaita Division?</p>	<p>Majority of the respondents 57.9% said that women and girls are the main water drawers while boys and girls accounted for 10.5%. On coping strategies employed by households, majority of the respondents 44.6% reported to have sole farm produce (beans, maize, and potatoes) in order to purchase water while 26.7% sold children and eggs. Majority of children walk long distances as they represent 65.9% of the respondents' feedback while 32.9% do not attend</p>

	school but engage in water activities during seasons of water scarcity.
11. How does water use impact on sustainable rural livelihood in Elementaita Division?	On main use of water, most of the respondents 47.2% relied on the available water for drinking whereas 29.2% on washing and hygiene.

5.3 Discussion

With the income that the community members earn from agriculture and other sources of income, it may become difficult to meet family needs. An example would be a family of 4 persons require 60 litres per person per day which translates to 1800 litres purchasing water at Kshs 5 will require Kshs 9000 each month to meet water costs which may not happen because the family has other requirements. This makes the family to resort to other cheap water which may compromise water quality as well health of the household, thereby, increasing their chances of vulnerability.

Available water to the communities remains unsafe forcing families to incur extra expense to not only pay for water bills but also pay health charges. This coupled with several families living below Kshs 5000 monthly may make them susceptible to other forms of behaviour that may negate morality and modernization. A low target of households harvesting rain water still is a challenge as most communities have not appreciated harvesting run offs for agriculture. Most of the water in unprotected pans are shared with domestic animals and wild animals. Piped water into dwelling was at 2.6% compared to 7.6% for the country Kenya National Human Development Report KNHD), (2006). This is far much below and resources need to be harnessed to improve on the findings

Water quality has an impact on rural livelihoods. Water sources impede on the health status of households thereby limits their opportunities in meeting their daily opportunities and income when they fall sick after consuming water of poor quality. Of great concern is the percentage of community members suffering from diseases that can be prevented by using safe water. Bartam, 2005 and Pruss-Ustan (2008) agrees with this fact. UNDP, (2006) report also concurs with the findings that diarrhoea remains the killer diseases and is associated with unsafe water.

Water are sold at an exorbitant prices this is because of high operations costs as most of the people charged with the responsibilities of water projects are untrained. Another aspect is that most of the water projects are mismanaged and therefore this is pushed to the consumers of water. Presence of middle men/persons or cartels also poses a challenge on the pricing of water thereby impeding on the purchasing power of families and individuals.

On women and girls walking long distances to fetch water, the study found out that women carry water in their backs and therefore may need to make more trips to access the commodity. An example would be a woman needs about 100 litres for the household; this may force her to make five trips each day translating to five hours spent. This compares favourably with what UN, (2000) found out.

On management of water projects, Operations and Maintenance (O&M) remains with people who have not been trained, increasing the chances of communities to be secluded through marginalization and increase in water prices. Community participation needs to be improved to check on accountability of the assigned persons to take care of the community interest without affecting their lives. This finding concurs with UNDP-World Bank, (2008).

In order to cope with water scarcity, households may sell their assets to offset pending water bills. This may limit their assets within the household level and render them vulnerable. With reference to Table 4.5 on income levels, majority of the respondents earning less than Kshs 5000 per month may not afford the water and therefore resort into water of poor quality.

5.4 Conclusions

The purpose of this study was to assess the impact of water access, water management and socio-economic factors on sustainable Rural Livelihoods in Elementaita Division. The following conclusions were made from the results of the study.

The quality of water has an impact on the income and health status of children, families and community members. Individuals spend their meagre resources when they fall sick to treat themselves owing to a preventable cause of poor water quality in the community.

Distances to water sources are far thereby many household spend several hours looking for the precious commodity. These hours spend would be used to carry out other chores and activities that would increase on the income levels of the families.

5.5 Recommendations

The following recommendations were made in order to reduce effects of water access on sustainable rural livelihoods.

1. There is need to train water committees on proper management of water in the community. The community members also need to be sensitized on the need to put their water project committees to task over cases of corruption and cartels. This could be done through government efforts of strengthening water Users Associations through implementation of the Water Act 2001.
2. There is need to sensitize communities not to interfere with the education of their children during dry seasons as majority were engaged out of school. This could be done in consultation with Ministry of Gender, Children and Social Development. Of great concern is child labour that the Ministry need to fight to the very end.
3. Government of Kenya, through ministry of Water and Irrigation to increase levels of awareness of Rain Water Harvesting to Improve of the Quality of water at household level.
4. Ministry of Water and Irrigation and other partners to put measures in place to train community members and committees on effective operations and maintenance of water projects this will reduce challenges faced by communities.

5.6 Suggestion for Further Research

The following areas are suggested for further study:

1. To determine the impact of water scarcity of household purchasing power.
2. To determine the impact of training of water committees on operation and maintenance.

5.7 Contributions to the body of Knowledge

Table 5.2 indicates the contributions made by this study to the body of knowledge.

Table 5.2 Contributions to the Body of Knowledge

Objectives	Contribution to the body of Knowledge
1. To assess physical factors of water access and its impacts on sustainable livelihoods in Elementaita Division.	<p>Water quality may limit the health of an individual when the water quality has not been measured to see if it has negative effects on human beings and their livestock. Majority of community members rely on available water without putting emphasis on their health. It poses a risk of individuals who become ill and therefore bedridden and may not meet the family responsibilities of providing for their children. Children may also suffer from disease caused by untreated water and therefore may miss their classes and this may lead to poor performance in school.</p> <p>Water availability within a close distance or piped into dwelling reducing time spent to fetch for water which would be utilized to carry out other tasks in the household level.</p> <p>Families are spending their meagre resources to purchase water, thereby pushing them to a vulnerable situation.</p> <p>Records from health facilities in Elementaita Division revealed serious health effects on water quality of community members due to drinking water of poor quality.</p>
2. To evaluate management of water projects and determine how it impacts on sustainable livelihoods in Elementaita Division.	<p>Majority of the committees managing water in the community have included women in the management of water, however, more inclusion of women in the committees is required bearing in mind that they are the ones who bear the brunt of fetching water.</p> <p>Operations and maintenance of water projects was found to be lacking based on the interviews with the respondents. Most of the communities spend much of the resources to access water due to corruption and mismanagement of water projects. The number of</p>

untrained personnel manning water projects risks more vulnerable families into poverty as they need to dig deeper into their pockets to access health and water.

3. To determine how socio-economic factors of water impact on rural livelihoods in Elementaita Division.
- Most of the respondents interviewed showed high level of coping with water scarcity by selling off their assets to access water. This may pose a risk of selling all their assets in search for quality water.
- Children also spend most of their school going time to fetch water thereby impeding on their performance in school.
-

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APPENDICES

Appendix 1: LETTER OF TRANSMITTAL

Jonah K. Cherutich

P.O. Box 420

Gilgil, 20116

No.....

Dear Sir/Madam,

I am a student at the University of Nairobi and I am carrying out a research study as requirement for the award of Master of Arts Degree in Project planning and Management.

I am conducting a survey with the sole purpose of gathering information on **“Impacts of water access, management and socio-economic factors on Sustainable Livelihoods in Rural Areas. A case of Elementaita Division.**

You have been selected to assist in providing the required information as your views and ideas are considered important to this study.

I am therefore kindly requesting you to fill this questionnaire. The information and data required is needed solely for academic purposes and will be treated with a very high degree of confidentiality.

Your cooperation will be highly appreciated

Thank you.

Yours faithfully

JONAH KHAMATHEW CHERUTICH

Reg. L50/66175/2010

Appendix 2: QUESTIONNAIRE FOR HOUSEHOLDS

Demographic Characteristics

1. Please indicate your gender
 - a. Male
 - b. Female
2. Kindly indicate your age?
 - a. Below 25 years
 - b. 25-35 years
 - c. 36-45 years
 - d. Over 45 years
3. What is your highest level of education
 - a. Primary
 - b. Secondary
 - c. Diploma
 - d. Graduate
 - e. Not schooled
12. What is your average income monthly?
 - a. Less than Kshs 5000
 - b. Between 5001-10000
 - c. More than 10,001

Water availability

13. What is your main source in the community?
 - a. River
 - b. Pond
 - c. Borehole
 - d. Piped into dwelling
 - e. Public tap
 - f. Unprotected pan
 - g. Rainwater
14. Are you affected by the water stated above?
 - a. Yes
 - b. NO
15. If YES above, how are you affected?
 - a. Fall sick (diarrhoea, dysentery, amoebiasis)[
 - b. They have discoloured teeth
16. Do you practice Rain Water Harvesting?
 - a. Yes
 - b. NO

17. If YES above, why do you practice it?.....
.....

18. If NO in Question 7 give reasons.....
.....

Water Quality

19. How do you rate the quality of the water you use?

- a. Portable and safe []
- b. Moderately safe []
- c. Fair quality []
- d. Poor Quality []

20. What is the main use of the water in your household

- a. Washing (clothes, hygiene []
- b. Cleaning []
- c. Drinking []
- d. Irrigation []
- e. Kitchen garden []

21. Who collects water?

- a. Women []
- b. Women and girls []
- c. Girls []
- d. Boys []
- e. Boys and Girls []
- f. Youth []
- g. Men []

Time and Distance

22. What mode of transport to collect water?

- a. Carry with one's back []
- b. Donkey(s) []
- c. Cart []
- d. Bicycle []
- e. Wheel barrow []
- f. Vehicle []
- g. Other [] specify

23. How long is the distance round trip?

- a. < 2 km []
- b. 2 < 5 km []
- c. 5-10 km []
- d. > 10 km []

24. How long do you take to collect water dry seasons?

- a. Less than 30 minutes []
- b. Between 30-60 minutes []
- c. More than 60 minutes []

25. How long do you to collect water in wet season?

- a. Less than 30 minutes []
- b. Between 30-60 minutes []
- c. More than 60 minutes []

Water affordability

26. How much does it cost a 20 litre container?

- a. Kshs 2 []
- b. Kshs 3 []
- c. Kshs 4 []
- d. Kshs 5 []
- e. Kshs 10 []
- f. Kshs 20 []
- g. > Kshs 20 []

27. How do you rate affordability of water sources in your community?

- a. Very expensive []
- b. Expensive []
- c. Normal []
- d. Not expensive []

28. What is making the water expensive?

- a. Middle men []
- b. Expensive operation []

Water management

29. Who manages the water?

- a. Water committee []
- b. NGOs []
- c. Government []
- d. Church []
- e. Village committee []

30. Who constitutes the management of the water?

- a. Both men and women []
- b. Men only []
- c. More men and few women []
- d. More women and few men []
- e. Youth []

31. Who are the main decision makers of water projects in the community?

- a. Government officials []
- b. Local administration []
- c. Community members []
- d. Water committees []

- e. Youth []
- f. Private []

32. How do you rate decision making of women in water projects?

- a. Not important []
- b. Somewhat important []
- c. Important []
- d. Very Important []

33. Who operates the water projects in your community?

- a. Trained technicians []
- b. Untrained technicians []
- c. Untrained water committee []
- d. Trained water committees []

34. How do the management of water projects maintain existing water pipelines and other sources?

- a. Seek for financial support []
- b. Involve community []
- c. Hire casuals []
- d. Leave it to waste []

35. Who owns the water project/source?

- a. Community members []
- b. Committee []
- c. Government []
- d. Private []
- e. Youth []
- f. Private []

36. Are water projects faced by problems

- a. Yes []
- b. NO []

37. What are some of the challenges facing water projects? Select more than one.

- a. Mismanagement []
- b. Corruption []
- c. Dilapidated infrastructure []

- d. Pricing []
- e. Cronyism []
- f. Water regulation []

Coping strategies

38. What are some of the coping strategies during water scarcity?

- a. Sale of assets []
- b. Exchanging water for other assets []
- c. Reducing meals []
- d. Reducing bathing []

Social dimensions of water access

39. Are children affected by water scarcity?

- a. Yes []
- b. NO []

40. How are they affected?

- a. They don't attend school []
- b. The walk long distances to fetch water []
- c. They are employed to carry water []

41. Do household assets determine level of water access in households?

- a. Yes []
- b. NO []

42. If YES in Q 33, what are some of the assets that are sold?

- a. Chicken and eggs []
- b. Farm produce (maize, beans, potatoes, e.tc) []
- c. Small livestock (goats, sheep) []
- d. Large livestock (cows, bulls) []
- e. Household items (tables, beds,kitchen items) []

.....

Thank You

Appendix 3: FOCUS GROUP DISCUSSION GUIDE

1. What are the main sources of water in your area?
2. In your own words, how is the quality of water for drinking in your area?
3. Do your members practice rainwater harvesting? And why?
4. Who are the main water drawers in your group?
5. How are children affected by water scarcity?
6. How are the rates for water in your group? Do the members of the community afford the rate that you charge?
7. Have you been trained on Water policies and regulations?
8. D your group have a laid down business plan?
9. What are some of the challenges faced by women and girls while fetching water?
10. How do you maintain the water lines?
11. How are women involved in water projects?
12. What are some of the challenges faced by your water project?
13. Are there cultural practices that make the community not fetch water from water groups?
14. Are you conversant with water laws and regulations?
15. Is your group registered and licensed with Water Resource Management Authority (WARMA)

Thank You

Appendix 4: KEY INFORMANT INTERVIEW

1. What are the main sources of water in Elementaita Division
2. In your own words, how is the quality of water for drinking in the division
3. How is the concept of rain water harvesting conceived by Elementaita community?
4. Who are the main water drawers in Elementaita division
5. How are children affected by water scarcity?
6. How do you rate water pricing in Elementaita Division?
7. Who manages water in the Division?
8. How are women involved in water projects in Elementaita Division?
9. How is the capacity of WUAs in the area?
10. Is school attendance affected by water scarcity? And How?
11. What are some of the challenges faced by water projects in the Division?
12. In drought seasons, what some of the coping strategies for the community?

Thank You

Appendix 5: SAMPLE SIZE DETERMINATION

Sample size for $\pm 3\%$, $\pm 5\%$, $\pm 7\%$ and $\pm 10\%$. Precision levels where confidence level is 95% and P=5.				
Size of	Sample Size (n) for Precision (e) of:			
Population	$\pm 3\%$	$\pm 5\%$	$\pm 7\%$	$\pm 10\%$
500	a	222	145	83
600	a	240	152	86
700	a	255	158	86
800	a	267	163	89
900	a	277	166	90
1000	a	286	169	91
2000	714	333	185	95
3000	811	353	191	97
4000	870	364	194	98
5000	909	370	196	98
6000	938	375	197	98
7000	959	378	198	99
8000	976	381	199	99
9000	989	383	200	99
10000	1000	285	200	99
15000	1034	290	201	99
20000	1053	392	204	100
25000	1064	394	204	100
50000	1087	397	204	100
10000	1099	398	204	100
>100000	1111	400	204	100

a= Assumption of normal population is poor (Yamane, 1967). The entire population should be sampled.