

**FACTORS INFLUENCING SUSTAINABILITY OF
COMMUNITY WATER PROJECTS IN KENYA: A CASE OF
WATER PROJECTS IN MULALA DIVISION, MAKUENI
COUNTY**

BY

GODFREY OKOTH OCHELLE


**UNIVERSITY OF NAIROBI
KIKUYU LIBRARY
P. O. Box 92 - 00902,
KIKUYU**

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

2012

DECLARATION

This project report is my own work and has not been submitted for degree award in any university.

Signature: 

Date: 26/11/2012

Godfrey Okoth Ochelle

L50/78443/2009

The research project report has been submitted for examination with my approval as the university supervisor

Signature: 

Date: 25/11/2012

Dr. Lydia N. Wambugu

Lecturer, Department of Extra Mural,

University of Nairobi

DEDICATION

I would like to dedicate this project to my wife Catherine Nyagoha and daughters Valiance Pedaiah and Vine Splendor for their understanding and support during the many days I was away from them due to the project work.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to all the people who have in one way or the other contributed towards my master studies and specifically towards the development of this project report. I am greatly pleased to acknowledge the timely and technical support I received from my supervisor Dr. Lydia N. Wambugu who ably guided me towards the development of the report.

I acknowledge the efforts of all the lecturers who taught me during course work and motivated me towards becoming a better intellectual. I acknowledge my fellow students who inspired me in different ways. Special appreciation also goes to my friend and fellow student Ezan whom we studied with closely during our course work. God bless you all.

TABLE OF CONTENT

DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENT	v
ACRONYMS AND ABBREVIATIONS.....	viii
LIST OF TABLES.....	ix
LIST OF FIGURES.....	x
ABSTRACT	xi
CHAPTER ONE	1
INTRODUCTION	1
1.1 Background of the Study	1
1.2 Statement of the Problem	4
1.3 Purpose of the Study	6
1.4 Objectives of the Study	6
1.5 Research Questions	7
1.6 Significance of the Study.....	7
1.7 Delimitation of the Study	8
1.8 Limitations of the Study	8
1.9 Assumptions of the Study.....	8
1.10 Definitions of Significant Terms	9
CHAPTER TWO.....	10
LITERATURE REVIEW.....	10
2.1 Introduction.....	10
2.2 Water Resources	10

2.3	Sustainability of Water Projects.....	10
2.4	Community Participation in Water Projects.....	12
2.5	Financing Water Projects	16
2.6	Project Management Practices.....	19
2.7	Government Policies on Water Projects.....	21
2.8	Community Training	24
2.9	Theoretical Framework	25
2.10	Conceptual Framework	32
2.11	Summary of literature reviewed	33
CHAPTER THREE		35
RESEARCH METHODOLOGY		35
3.1	Introduction	35
3.2	Research Design	35
3.3	Target Population.....	35
3.4	Sample Size and Sampling Procedures.....	36
3.5	Research Instruments	37
3.5.1	Piloting the Research Instruments	38
3.5.2	Validity of the Research Instruments.....	38
3.5.3	Reliability of Research Instruments.....	39
3.6	Data Collection Procedure.....	39
3.7	Data Analysis Techniques	40
3.8	Ethical Considerations	40
3.9	Operationalization of variables.....	40
CHAPTER FOUR		43
DATA ANALYSIS, PRESENTATION AND INTERPRETATION		43
4.1	Introduction.....	43
4.2	Response Rate.....	43

4.3 Demographic characteristics of respondents	43
4.4 Community perception on sustainability of specific water projects.....	45
4.5 Influence of community participation on sustainability of water projects.....	47
4.6 Influence of project financing on sustainability of community water projects	55
4.7 Influence of community training on sustainability of community water projects.....	59
4.8 Influence of project management practices on sustainability of community water projects	62
CHAPTER FIVE	64
SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS.....	64
5.1 Introduction.....	64
5.2 Summary of findings of the study.....	64
5.3 Discussion of the findings of the study	66
5.4 Conclusions of the study	72
5.5 Recommendations of the study.....	73
5.6 Suggestions for further research	75
REFERENCES	76
APPENDICES.....	83
Appendix 1: Letter of Transmittal of Data Collection Instruments	83
Appendix 2: Questionnaire for members of water committees.....	84
Appendix 3: Key Informant Interview guide	90
Appendix 4: List of Water Projects with Water Management Committees	93

ACRONYMS AND ABBREVIATIONS

ASALS	Arid and Semi arid Lands
DFID	Department for International Development
JMP	Joint Monitoring Programme Enhancement Project
MDGs	Millennium Development Goals
MFI	Microfinance Institutions
NGOs	Non-government Organizations
OECD	Organization for Economic Co-operation and Development
PMBOK	Project Management Book of Knowledge
SPSS	Statistical Package for Social Science
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNICEF	United Nations Children's Fund
WCED	World Commission on Environment and Development
WAWI	West Africa Water Initiative
WHO	World Health Organization
WPEP	Water Supply and Sanitation Performance

LIST OF TABLES

Table 3.2: Sampling and Sample Size.....	37
Table 3.3: Summary of Operational Definition of Variables	41
Table 4.1: Gender of Respondents.....	43
Table 4.2: Age of respondents	44
Table 4.3: Highest level of education of the respondent	44
Table 4.4: Sustainability of Borehole Water Projects	45
Table 4.5: Sustainability of Shallow Well Water Projects	45
Table 4.6: Sustainability of Sand Dam Water Projects	46
Table 4.7: Sustainability of Pipeline Water Projects.....	46
Table 4.8: Sustainability of Water Tank Projects	47
Table 4.10: Level of community participation in conception and design	48
Table 4.11: Community participation in implementation of water projects.....	49
Table 4.12: Level of community participation in implementation	49
Table 4.13: Community contribution on decisions made during conception, design and implementation.....	50
Table 4.14: Community contribution in cash or kind during implementation and maintenance	51
Table 4.15: Registration of water projects by government	52
Table 4.17: Failed or non-functional water projects	53
Table 4.18: Main sources of financing for implementation of water projects.....	55
Table 4.19: Community members' knowledge of the cost of water projects	56
Table 4.20: Source of financing for maintenance of water projects	57
Table 4.21: Community capacity to meet cost of operation and maintenance of water projects	57
Table 4.22: How community members raise finance for operation and maintenance.....	58
Table 4.23: Training of water committee members on operation and maintenance.....	59
Table 4.24: Number of trainings attended by the water committee members.....	59
Table 4.25: Trainers with technical background on water resources.....	60
Table 4.26: Rating of effectiveness of trainings on operation and maintenance.....	60
Table 4.27: Involvement of the trained members of water committees in operation and maintenance	61
Table 4.28: Reason why trained members are not involved in operation and maintenance	62

LIST OF FIGURES

Figure 1: Conceptual Framework	32
--------------------------------------	----

ABSTRACT

The purpose of this study is to investigate the factors that influence sustainability of community water projects in semi arid areas in Kenya with a focus in Mulala division. The government of Kenya and non-governmental organizations have promoted interventions or projects aimed at improving water situations in the semi arid areas though with some low level of sustainability. This study has four objectives, namely, to examine the extent to which community participation influences sustainability of community water projects in semi arid areas; to determine the extent to which project financing influences sustainability of community water projects in semi arid areas; to assess the extent to which project management practices influences sustainability of community water projects in semi arid areas and to explore the extent to which community training influence sustainability of community water projects in semi arid areas. The study employed descriptive survey design with a sample of sixty respondents consisting of executive members of water management committees and two management staff of two non-governmental organizations. Data collected was edited, coded and analyzed using SPSS. The study was guided by two theories namely resource dependency theory and ecological modernization theory. The findings of the study indicated that community participation, project financing, project management practices and community training do influence sustainability of community water projects. It was also found out that the accountability and transparency among the committee members who manage the water resources is also a key factor which influences sustainability. If there is a perceived lack of transparency and accountability, community members tend to withdraw their support for the water projects. The study recommends that community participation in the whole project cycle should be enhanced, there should be high level of transparency and accountability in the management of water projects, donors should have adequate budgets for any water projects designed for implementation and organizations should strongly support monitoring and evaluation of their water projects beside ensuring that community responsible for management and operation of water projects are well trained in operation and maintenance.

UNIVERSITY OF NAIROBI
KIKUYU LIBRARY
P. O. Box 92 - 00902,
KIKUYU

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Water is a finite natural resource necessary for the sustenance of life and ecological systems and a key resource for social and economic development. Water scarcity is a phenomenon that adversely affects Arid and semi arid lands (ASALS) in the world. According to Brooks (1996), the ASALS are the most affected as the world faces severe and growing challenges to sustain water quality and to meet the rapidly growing demand for water resources, particularly among rural communities in Africa.

Access to water is a basic human right that is threatened by increasing water consumption patterns for domestic, commercial and agricultural use. According to Manyan, Offat and Kamuzungu (2009), critical determinants for access to water include distance to the water point, polluted water sources, perennial droughts, depleted ground water sources, and poorly formulated water and sanitation policies. According to Adams (1994), 51% of the people in Sub Saharan Africa lack access to safe supply of water whilst 14 countries were already experiencing water stress and another 11 countries were expected to join them by 2025. According to the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) Joint Monitoring Programme (JMP) for Water Supply and Sanitation report of 2004 at least 44% of the population in sub-Saharan Africa (some 320 million people) does not have access to clean reliable water supplies. The Department for International Development (DFID) (2001) indicates that majority of those without access (approximately 85%) live in rural areas where the consequent poverty and ill health disproportionately affect women and children. In response to the challenges facing various countries, the international community set the Millennium Development Goals

(MDGs) which commit the United Nations (UN) membership to reduce by half the proportion of people who are unable to reach or afford safe drinking water by the year 2015 (United Nations, 2000).

Poverty reduction and sustainable development are now given highest priority. This has seen various development agencies; governments and non-government agencies initiate several water projects in marginalized areas especially in arid and semi arid lands (ASALS). According to Republic of Kenya National Policy on Disaster Management (2004), Kenya is among countries in sub-Saharan Africa that face challenges of water scarcity and access. ASALS in Kenya form 80% of the country's land mass and is occupied by 25% of the country's population (Government of Kenya, 2004). The ASALS in Kenya includes the vast areas of northern and eastern regions of Kenya. The Government of Kenya national policy for the sustainable development of arid and semi arid lands of Kenya (2004) recognizes that ASALS have a potential to spur economic growth of the country if the scarce resources are utilized maximally. However, these areas are regularly worst hit by droughts, famine and hunger due to harsh climatic conditions. The government of Kenya and other international and local based development agencies have therefore initiated projects to mitigate against these disasters in Kenya.

One of the main interventions that have always been considered is ensuring availability and accessibility of water for the inhabitants. Mulala division which is located in Nzau district in Makeni County in the larger Ukambani region in Eastern part of Kenya is one of the regions that have been targeted for community water projects by the Kenyan government and non-governmental organizations. These initiatives have been supported by the broad government policy interventions with the intentions of ensuring proper management of water resources in the country.

Initiating projects to ease accessibility to water in the ASALs is seen as a noble cause. However, without proper planning and integrated approach that ensures sustainability of the water sources and its accessibility, such projects may not have lasting impacts.

Groundwater provides the only realistic water supply option for meeting dispersed rural demand as alternative water resources can be unreliable and expensive to develop (Foster, 2000; MacDonald, 2005). However many projects spend large amounts of money installing water sources without trying to understand the groundwater resources on which these sources depend. As a result, many supplies are unsuccessful or perform poorly (Robins 2006). Arid areas where groundwater recharges are limited and erratic. According to Gleitsmann (2007) in a qualitative assessment of the participatory water management strategies implemented at the community level in rural Mali through a water supply project — The West Africa Water Initiative (WAWI)- community-based rural water supply was found to be a positive step in responding to the needs of rural Malians. However, the assessment noted that the installation of such water projects with limited consultative participatory approaches and limited extension services do not necessarily proffer sustainable rural water supply. Furthermore, since the United Nations Conference on Environment and Development (UNCED) of 1992, the international community has made considerable effort to raise awareness about water resources concerns and management. Non-governmental organizations, farmers, local authorities, the scientific and technological community, business and industry, trade unions, indigenous people, children and youth and women, have become an integral part of the sustainable development and management of water resources at the international, national and local levels. Many non-governmental organizations have been more successful in building community awareness and local capacity than in providing technical support for water

assessments, water supply and sanitation. Attempts to encourage the transfer of operation and maintenance to water-user associations have had mixed results, since the generally low economic returns on irrigated agriculture and uncertain land tenure provide little incentive for farmers to make long-term capital investments.

It is therefore imperative that a deeper understanding of the dynamics of access to water and management of water projects in the rural environment are explored with the view to ensure sustainability. To achieve this, this study will examine the sources of water in Mulala division in Makeni County, the level of community participation in water projects, the nature of community and organizational systems in management of water projects, the practice of project planning, monitoring and evaluation and the sources of funding or financing for water projects.

1.2 Statement of the Problem

According to the Republic of Kenya National Policy on Disaster Management (2004) almost 70 % of Kenya's land mass is affected by drought. This covers most parts of Rift Valley, North Eastern, Eastern provinces and coast province thereby classified as arid and semi-arid areas. 75% of Kenya's population earns its living from agriculture which in turn depends on rainfall. Extreme weather and climate events influence the entire economy, which depends mostly on agricultural products like cash crops, food crops and animals.

Mulala is one of the areas which fall within the Eastern region that faces perennial drought and limited water resources. The region receives mean annual rainfall of 500-600mm. This situation has led to challenges in accessing clean and reliable water in arid and semi arid areas. This has necessitated government and non-governmental agencies to

develop interventions to support communities in these areas to establish water projects. However, there is lack of sustainability of most of the water projects initiated by government and non-governmental organizations as demonstrated by annual serious water shortages in these dry areas during droughts. There is therefore a need to understand why there are numerous water projects being implemented while water shortages persist.

Studies conducted by scholars such as Binder (2008) , Narayan (1995), Wakeman (1995), Wijk-Sijbesma (1995), Paul (1987), Yacoob and Walker (1991) , McCommon, Warner and Yohalem (1990), Nikkhah and Redzuan (2009), Dungumaro and Madulu (2003), Livingstone and McPherson (1993), Rono and Aboud (2003), Yuerlita, Febriamansyahv and Saptomo (2004) , Brett, Margaret and Tapmo (2007), Ijjasz E. (2006) and Sahlin (1998) agree on the definition, indicators and measures of sustainability as commitments to meet service expectations and needs of communities in the long-term. Sustainability is viewed as the management of resources in a manner that ensures benefits for both current and future generations. The studies also indicate the importance of community participation, appropriate and sufficient project financing and proper project organization management practices for successful development projects such as those in the water sector. The findings of the studies indicate that proactive involvement of beneficiaries influences development and management of projects and that effective community participation is concerned with willingness and capacity of the target community and beneficiaries to take charge and determine the nature of the project. The studies further show that community participation is low in developing countries. With regard to project financing, the studies indicate that poor maintenance of water facilities is usually attributed to insufficient funding leading to failure of most water projects. In developing

countries, there is poor regulatory framework to ensure proper utilization of funds, lack of accountability and transparency mechanisms.

However, there is gap in terms of studies already done locally to investigate the factors influencing the sustainability of water projects in semi arid areas in Kenya. This indicates a local knowledge gap on water project sustainability issues. Therefore, this study intended to investigate the factors that could influence sustainability of water projects in semi arid areas in Kenya, with a focus on Mulala Division in Makueni County.

1.3 Purpose of the Study

The purpose of the study was to establish the factors that influence sustainability of community water projects in semi arid areas in Kenya.

1.4 Objectives of the Study

The study was guided by the following four objectives:

1. To examine the extent to which community participation influences sustainability of community water projects in semi arid areas
2. To determine the extent to which project financing influences sustainability of community water projects in semi arid areas
3. To assess the extent to which project management practices influences sustainability of community water projects in semi arid areas
4. To explore the extent to which community training influence sustainability of community water projects in semi arid areas

1.5 Research Questions

The study was guided by the following four research questions:

1. To what extent does community participation influence sustainability of community water projects in semi arid areas?
2. To what extent does project financing influence sustainability of community water projects in semi arid areas?
3. To what extent do project management practices influence sustainability of community water projects in semi arid areas?
4. To what extent does community training influence sustainability of community water projects in semi arid areas?

1.6 Significance of the Study

The findings of the study were expected to bring out the factors that influence sustainability of community development projects. This will help the community development practitioners in designing their projects to do so in a manner that will necessitate sustainability of such projects. Communities and other stakeholders in development projects will have an understanding of the value of community participation, good project management practices and effective project funding. The findings of the study were also expected to add to the existing body of knowledge especially in the field of community development and management of water resources as well as enhancing the efforts towards the overall sustainable development. The literature will be useful to scholars as a reference material when carrying out further research of issues of sustainability of community development projects. It was expected that the recommendations of the study will inform the government on the need for policy development or review that will ensure a conducive environment for implementing

sustainable water projects. This will lead to improved service delivery by concerned government departments.

1.7 Delimitation of the Study

The study focused on factors that influence sustainability of community water projects. The study was carried out in Mulala division in Makueni County with focus on water projects established by government and Non-Governmental Organizations (NGOs). The geographical location was chosen due to the aridity and water scarcity in the region that attracts government and non-governmental organizations interventions with water projects as a result of the famine and drought being experienced in the region annually.

1.8 Limitations of the Study

The study was expected to face limitations such as financial constraints as the researcher was required to engage three research assistants to collect data, inaccessibility of some respondents due to the vastness of the region and the harsh weather condition and poor terrain of the target area. All of these limitations were mitigated against by involving the residents who understood the region to volunteer and assist in data collection.

1.9 Assumptions of the Study

It was assumed that the respondents would be willing to give the needed data and that accurate and complete data would be provided by the respondents.

1.10 Definitions of Significant Terms

The following are definitions of the key terms that were used in the study:

Community Participation: Refers to the involvement of community members throughout the project life cycle and in decision making processes and activities during needs assessment, project design and implementation.

Community Training: Enhancement of knowledge and skills of project and community members.

Government Policies: These are the laws and procedures formulated by government to govern the design and implementation of water projects.

Project financing: Refers to the actual financial support provided by donors, government and other local agencies to the community water projects.

Project management practices: Refers to the methodologies and approaches employed by donors, government and other development partners in initiation, designing, implementation, monitoring, evaluation and closure or transition of projects.

Sustainability: This refers to the capacity to maintain balance of water resources to ensure its availability over a long period of time.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents an analysis of existing literature on the factors influencing sustainability of community water projects in semi arid areas. It includes findings of related studies undertaken by other researchers.

2.2 Water Resources

According to the United Nations Economic and Social Council (2001), financial commitments to water supply and sanitation have to a large extent remained unfulfilled. Even though some developing countries such as Kenya have increased public spending in the sector, the gap between the levels of investment needed to achieve full water coverage and the levels of investment actually made is considerable. The Council further estimates that governments in developing countries spend some US\$ 10-25 billion annually on water supply and sanitation, with a major portion being spent on higher-level services in urban centres.

2.3 Sustainability of Water Projects

Binder (2008) defines a sustainable water system as one that can meet performance requirements over the long run. Such systems have characteristics of a commitment to meet service expectations, the capacity to satisfy public health and safety requirement on a long-term basis, minimal assistance needed in the long-run, financing of regular operation and maintenance by the users; and continued flow of benefits over a long period.

According to Diane Russell (undated) sustainability is a measure of how the growth, maintenance, or degradation of a resource or set of resources affects a population's ability to sustain itself. Indicators are used to measure these effects. A resource can be natural or human, and includes knowledge, technical, financial and other social systems. It is as a result of processes, investments, technologies and systems as they affect resources available to a population over time. Such processes include policy reform, investments made by donors, governments or other groups and technologies. The extent of local participation in and ownership of a process, investment decision, technology development and system is seen to be crucial to sustainability.

According to Narayan (1995), Wakeman (1995) and Wijk-Sijbesma (1995) key indicators of sustainability have the following seven components. First, reliability of the systems which implies that in community based systems, there has to be availability of spare parts and local skills to operate and maintain facilities to ensure that the system remains functional. Secondly, the sources of water have to be reliable and this may be guaranteed by ground and surface water maintenance. Furthermore, local institutional capacity with an autonomous institutional structure is an important component of sustainability. Management of the projects should have the flexibility to implement any necessary remedial measures. Cost sharing for operation and management should be considered as users in the community need to contribute resources to make the project sustainable. Resources required for operation and management should not go beyond the capacity of the community to provide.

Interagency collaboration between communities, governments, Non-governmental Organizations, the private sector, research institutions is required both in planning and implementation of community water based projects. There has also to be an effective use

of water services throughout the economic life of the community. There should be the ability of the community or households to handle seasonal fluctuations in water availability. Replicability of a project which involves the ability to duplicate the process and benefits in a new location after their effectiveness has been demonstrated in a given area implies that the experience gained from it has a multiplier impact.

According to the UN Economic and Social Council, Commission on Sustainable Development (2006), in promoting and facilitating sustainable water development and management, it is paramount to promote social stability and adaptability to environmental change, raise awareness, and to build human and institutional capacity, provide access to safe water supply and adequate sanitation for poor people, protect the quality of surface and groundwater and aquatic ecosystems, strengthen international institutional arrangements, and strengthen the enabling role of governments to enact and enforce water legislation and strengthen local water management and service capacities.

IFAD (2009) also considers the essential dimensions in sustainability of projects as institutional sustainability; household and community resilience to anticipate and adapt to change through clear decision-making processes, collaboration, and management of resources internal and external to the community, environmental sustainability to maintain a stable resource base, avoid overexploitation of renewable resources and preserve biodiversity; and structural change and dimensions of poverty to be addressed through the empowerment of poor and marginalized rural households.

2.4 Community Participation in Water Projects

According to Paul (1987), community participation implies a proactive process in which the beneficiaries influence the development and management of development projects rather than merely receiving a share of project benefits. Sara and Katz (1998) notes that

community participation creates an enabling environment for sustainability by allowing users, as a group to select the level of services for which they are willing to pay, to guide key investment and management decisions, and also to make choices and commit resources in support of these choices.

Yacoob and Walker (1991) observe that perceptions on community participation have changed dramatically over the years. In the past community participation was largely confined to labor and other contributions by communities during project construction. This has changed and community participation also involves capabilities and willingness of communities to take charge, influence and determine the nature of project during its life cycle to ensure long lasting impacts.

Narayan, 1995; Yacoob and Walker, 1991; McCommon, Warner and Yohalem, 1990; and Wright, 1997 summarize indicators of community participation and management as community participation in Decision-making, Control, Community contribution, Representation, Responsibility, Authority and Informed choice. It is necessary for all aspects related to project development and implementation to be based on community preferences. Communities must have the necessary information to understand options, and on available alternatives and associated costs, to help them in making rational and socially optimal decisions. Furthermore, communities need to willingly contribute to the development and operation of the project and not to be coerced. Those responsible for managing community water projects should represent the diversity within the community, and be elected democratically. Communities need to assume responsibility for the project through realizing that its survival or collapse depends on their investment, for example, in terms of time, physical and financial capital. The community has also to have the authority to make decisions relating to the project on behalf of the users. The community

should be able to make major decisions relating to the project and determine the outcome of the decisions.

According to Nikkhah and Redzuan (2009), it is impossible to achieve community development without participation and involvement of the community in particular projects. They emphasize on participation as a means as well as an end. Participation as an end ensures people are directly involved in the project and they can take the control of decision that affect their lives. Furthermore, participation as a bottom-up approach of community development will be high, and consequently the particular community will have access to a sustainable development.

According to Dungumaro and Madulu (2003), the level of involvement of communities in water projects is still low in most developing countries including Tanzania. Bell (2001) argues that community involvement in environmental issues is based on three basic reasons which include: first, local communities consent in taking part in public decision-making processes that affect their lives. Secondly, the need to use indigenous knowledge and opinion that are vital to environmental protection including proper water resource use and management. Finally, the need to build public trust to avoid protest and antagonism between water resource users and other stakeholders due to varying interests and demands.

Livingstone and McPherson (1993) observe that lessons from successful water supply program in Western Canada suggest that a sustainable community managed water supply project must be demand driven, that the implementing agency provide an enabling environment, and that beneficiaries be legally empowered to assume ownership and responsibility for the completed systems.

Nikkhah and Redzuan (2009) note that participation in which people get directly involved in the projects ensures that they can take control of decisions that affect their lives. They conclude that participation as an end would lead to empowerment through top-down, bottom-up and partnership. Empowerment and type of participation as an end in bottom-up approach of community development will be high, and consequently the particular community will have achieve sustainable development.

Rono and Aboud (2003) in a study of the Nandi community participation in projects recommends that policy makers, development planners and implementers should ensure that people in the community are made aware that their level of work ethic, involvement and participation is responsible for the poor performance of their community development projects. If the Nandi rural economy is to be revived, agents of change ought to guide the rural population towards involvement and full participation in projects which are meant to improve their welfare.

Yuerlita, Febriamansyahv and Saptomo (2004) in a study in Indonesia notes that there is need to emphasize on equal participation between men and women in decision-making process, implementation, operation and maintenance and monitoring and evaluation. In decision-making process, men more actively participate and they attend meetings more frequently than women. Women also participate in the project construction as well as men as unpaid laborers. However, women do not get any knowledge about the schemes during the project construction or trainings. Women use the facilities more often than men but lack of general knowledge on the schemes make the women unable to do maintenance tasks. The sustainability of a project may be threatened because women are not effectively involved in the project. Therefore, involving both men and women effectively

in the project phases need to be emphasized and implemented in the achievement of project sustainability.

Brett, Margaret and Tammo (2007) in the results of a study in Mali indicate that while community-based rural water supply is a positive step in responding to the needs of rural Malians, the installation of boreholes with hand pumps informed merely by consultative participatory approaches and limited extension involvement will not necessarily proffer sustainable rural water supply in the region. A “platform” approach to rural water supply management that can mobilize the assets and insights of different social actors to influence decision making at all stages, including the design and choice-of-technology stages, in water supply interventions is instead advocated.

2.5 Financing Water Projects

According to Binder (2008), the financing process which involves raising and maintaining adequate funding for water facilities is of critical importance for sustainability. Insufficient financing is a major factor for poor maintenance, which is often cited as the main reason for failure. Failure to address financial issues is a main obstacle to achieving water supply and sanitation goals in many countries. There is usually a significant underfunding even for basic costs of operating and repairing facilities in operation. Particular problems exist in rural areas, where the cost of water services is higher while affordability is lower as tariffs rarely cover operation, maintenance, repair and replacement, and attracting small-scale private sector investment is often difficult. Additionally, cost estimates do not always accurately reflect all capital maintenance expenditures, on-going support costs and indirect support costs.

In 2003, a study by the Water Supply and Sanitation Performance Enhancement Project (WPEP) assessed the performance and sustainability of these projects. The main findings showed that sustainability would increase with the investment in institution and capacity building to operate and maintain the system and would require the development of cost recovery mechanisms, as well as provide an incentive towards local investment. This indicates that it is necessary to consider the level of investment that will be required during the operation and maintenance of the project. The government and the international community should not be expected to finance all expenditures required in the life of the water system. However, the government has a crucial role in establishing the proper regulatory and institutional framework as well as the incentive structure within which resources from end users, local budgets, enterprises and potentially capital markets can be mobilized to complement the initial financing. After the completion of a project, it is essential to address its post-construction sustainability in order to ensure that institutions, funds, and expertise are available to keep rural water supply systems viable and functional. If all the foregoing processes are in place, then systems are sustainable.

Various approaches have been tried by donors and governments to address the issue of sustainability in financing of water projects. According to the World Bank ((UNESCO 2003) such approaches include promoting increased capital cost recovery from users, In-kind contributions, improving community level financial management and resource mobilization, especially for major repairs/replacements and service expansion, financing mechanisms through public private partnerships through Special arrangements with the banking sector or other water-related organizations to bridge the gap between donor and user funding. There is also need to provide detailed

information on technologies and costs to allow for informed choices, and seeking to reduce these investment costs through lower costs options and more efficient delivery mechanisms. External funding does not promote long-term solutions as donor funds focus on new projects or those that have completely collapsed, as it is easier to show resultant impacts from the provision of new infrastructure. Hence, and perversely, there are minimal incentives for existing small projects to invest in maintenance or in business expansion through capital investment. Therefore, small projects need to find innovative financial solutions to sustain their operation. Those solutions need to be reliable and therefore need to be found in the realm of internal process and operations.

According to Ijjasz E. (2006), there is potential of microfinance for rural water supply. There is need for alternative financing mechanisms especially where there is basically no grant financing for expansion after initial project is completed. Microfinance would leverage the use of capital construction grants to reach more un-served and to promote sustainability. However, lack of exposure to 'project finance' and 'water sector' leads to high transaction costs that prevent microfinance institutions (MFI) from coming to the sector. A phase-out strategy should be incorporated in the original design document and described as part of the sustainability strategy. The overall duration of the program or project will have a determining influence over the phase-out strategy. Longer planning perspectives (more than the usual 3 to 5 years) are often required, particularly for complex programs. Phase-out may also be uneven with some components being under local responsibility sooner than others. Smooth phasing out is related to stakeholder ownership and capacity, therefore early stakeholder involvement in the design, the determination of needs, and implementation (including decision-making) is important.

Ijjasz E. (2006) also observes that for effective sustainability of programmes, the responsibilities of the counterparts should increase while the expatriates' are phased out over the length of the project. This assumes that the counterparts have ability and are given professional roles in the project in line with their skills. The final year of a project may see minimal input from the donor in direct operation and management as their role shifts to one of consultation and support. Expatriates should be working themselves out of a job from the beginning, and demonstrate collaborative work and mentoring skills.

Ijjasz E. (2006) further proposes that operation and maintenance costs which are met by the donor during implementation, and which must be continued to sustain benefits, should be phased out over time with the stakeholders taking on responsibility for meeting these costs. Mechanisms such as depreciation funds may need to be set up. The source of local funding should not be restricted to Partner Government budgets, and might include user pays, commercial operation by the private sector, or additional fund-raising activities by non-governmental organizations. Furthermore, equipment and asset maintenance procedures need to be well in place before project completion, but introducing a culture of Operation and Maintenance requires time and planning. Therefore this may still require some level of post-project intervention including follow up visits, some funding for maintenance contracts and depreciation.

2.6 Project Management Practices

According to Project Management Institute 2004, project management is defined as the application of skills and techniques to project activities to meet or exceed the stakeholder's needs and expectations. Project handling can be challenging as it is composed of several stages that must be managed. These stages include preparation of a

plan, forming a project group, execution, control and monitoring, and termination of the project. Each of these stages requires attention and demands special skills from team managers. Project management has three main aims, namely to ensure a project is completed within its preset budget, concluded in its stipulated time frame, to ensure it meets the desired functional and technical performance and ultimately to satisfy end user requirements.

According to the Project Management Institute (1996) “the three important processes are organizational planning, staff acquisition and team development”. Forming a project management process group involves selection of a project team, including the project leader. When the management decides to initiate the group, required funding and necessary resources are allotted. The project team should be involved at all the stages especially in the execution of the project, although at different scale.

According to Sahlin (1998) as well as Zimmerer (1998), a project manager should be competent in the science of project management and also have technical competence in some aspects of the work being performed on a project. Meredith J. and Mantel S. (2009) further have the opinion that a project manager should be both generalist and facilitator and should have a reasonably high level of technical competence in the science of the project. The most popular attributes, skills, and qualities that of a project manager include a strong technical background; a mature individual; someone on good terms with senior executives; and a person who keeps the project team motivated. An effective project manager should therefore have a high level of credibility and political sensibility and be able to cope with personal and technical victories and frustrations of the project. These skills and competencies are necessary for project managers as they are responsible for the planning, organizing, coordinating, controlling and directing of the available

resources and budget of a project or programme. The project manager is ultimately responsible for executing the project activity by providing leadership.

According to Clements (2006) a project should have a team that is as small as possible, avoiding members with duplicate skill sets and non-essential members. Larger teams usually face communication challenges especially when the members have different levels of commitments. Gido (2009) further notes that it is also essential for every member of the project team to clearly understand the goals and each objective at every stage of the project and have the responsibility to be ethical at work and try to be as efficient as possible. Staff who is critical to the success of the project should form part of the project team and report to the project manager. They should be staff expected to have a long term relationship with the project, those required for continuous or close communication and those with rare skills necessary for the project success.

Rico (2009) observes that communication within a team can be a factor to influence the fate of most components of team management and their interdependencies. Aula et al. (2010) further note that conflicts in a project can be related to the level of communication within the team.

Hendarto (2007) notes that the overall characteristic of a project team is its ability to work together based on mutual cooperation and understanding between all individuals in the team, with each individual working towards the ultimate goal of the project. It is the duty of the project manager to keep all the individuals together and successfully travel through the storming stage of team development. The team should be provided with all the necessary support required for effective implementation of the project. The support

includes allocation of resources and team skills development and motivation. Therefore, the project team should have the support of top management. Training is an important element of phasing out and sustainability of donor funded projects. Training must not only be technical (such as maintenance skills), but should also include management and planning skills, coordination with other bodies, analysis and problem solving, monitoring, training needs analysis and the training of trainers. Training materials in the local language should be left behind at completion as well as the skills and access to (local) resource needed to up-date them.

2.7 Government Policies on Water Projects

Better governance is a prerequisite for, and probably also a product of, steps towards sustainability. Much is expected from 'good governance'. According to Kemp, Parto and Gibson (2005), good governance consists of openness and participation, accountability, effective coherence, efficiency (proportionality) and greater sensitivity to the immediate context that is promised by subsidiarity. For sustainability, other requirements include means of internalizing external costs and ensuring integration of policy considerations, evaluation of options and dealing with trade-offs. It is worth noting that good governance emphasizes the role of institutions as entities that are largely viewed as being 'up there' and at least currently, insufficiently within the reach of ordinary citizens. As such, this view of governance seems concerned primarily with minimizing bureaucratization and hierarchy. Kemp, Parto and Gibson (2005) further indicate that governance for sustainability has certain key features and components which include policy integration, shared sustainability objectives, criteria, trade-off rules and indicators, information and incentives for practical implementation, programmes for system innovation.

Policy integration involves the coordination of government policies and the corresponding and complementary positions and initiatives of other governance actors. Organization for Economic Co-operation and Development (OECD) (2002) agrees that sustainability requires policy integration, along with improved interaction between government and non-government institutions and the creation of a longer-term view in government. In this regard, OECD observes that shared long-term objectives, common criteria for planning and approval of significant undertakings, specified rules for making trade-offs and compromises, and widely accepted indicators of needs for action and progress towards sustainability are necessary for governance institutions which have broad sustainability ends in mind. Furthermore, information and incentives for practical implementation of policies is required for achievement of sustainability as this guides appropriate action.

Policy making on sustainability has, for the most part, relied on performance standards or the prescription of certain solutions. The solutions adopted help to secure partial sustainability benefits. However governance for sustainability requires policy making frameworks that incorporate programmes for system innovation that actively seek to identify, nurture, and coordinate action for more sustainable technological niches.

According to the United Nations Economic and Social Council, Economic Commission for Africa (2005) appropriate regulatory frameworks and institutions at national level to oversee water and sanitation services provision are essential to operationalize national policies, protect property rights, and generate equitable returns on private investments through efficient tariff structures and levels, service standards, and expansion targets. When responsibility is delegated to local bodies for provision of services, an appropriate

distribution of roles between national and local authorities is essential and should be clearly defined. Also, partnering with private sector will entail a stable and predictable regulatory regime that promotes essential values, such as independence in legislation, accountability, transparency and professionalism in the process. It is therefore necessary for government institutions in the water sector to consider proper legislative framework. In designing the broad regulatory framework that will support a conducive environment for private sector participation, governments consider a wide range of specific laws, constitutional rules, and measures from central and local bodies. These include the constitutional and legislative separation of responsibilities for water and sanitation supply services among national, regional and local governments. Furthermore, there should be general legislation that regulates different types of public private partnership arrangements with private sector, including foreign companies.

United Nations Economic and Social Council, Economic Commission for Africa (2005) also observes that there also has to be specific measures that allow close oversight of water and sanitation management, general health, and environmental protection by applying service standards and penalties for default. The government has to come up with equitable rules to ensure fair competition in subcontracting and procurement procedures, and tax liability and systems. There has to be social policy measures aimed at protecting the rights of vulnerable groups of consumers, such as tariff adjustment rules, government subsidy policies, disconnection procedures for delayed or unpaid water bills, and dispute resolution mechanisms.

2.8 Community Training

According to Narayan (1995), Wakeman (1995) and Wijk-Sijbesma (1995) human capacity development is important through specialized training of project managers, staff,

community members and the whole project team. Campos (2008), in an intervention model introduced in Peru for water supply considered community training as an important component in which the project used various methods of training such as audio-visuals. Campos argued that training on issues like operation and maintenance empower the communities to look after water supply systems thus aiding sustainability.

Ademiluyi and Odugbesan identified lack of community education as one of the important factors which could lead to breakdown and non-sustainability of water supply projects in developing countries such as Nigeria. They further point out that even where full community participation or management is planned from the start, community-level committees and caretakers may lose interest or trained individuals may move away. This can be a particular risk if community-level organization is on a voluntary basis.

Mengesha A., Abera K. and Mesganaw F. (2003) in their study on sustainability of drinking water supply projects in Rural of North Gondar, Ethiopia recommend that building adequate skills and capacity to maintain water sources is an essential factor to sustain the water system.

The National Academy of Sciences (1997) observes that competent operating personnel are vitally important to the sustained, safe operation of small water systems. Accordingly, good operator training is as essential to improving small water systems as are improved technologies, organizational fixes or regulatory oversight. Without adequately trained personnel, even a well-financed and organized system with the most advanced technology and regular compliance visits will fail to reliably deliver safe drinking water to its customers.

2.9 Theoretical Framework

The concept of sustainability was first employed in relation to natural resources and how they should be used. It is believed that natural resources are finite and cannot support the world's projected population at current levels of resource utilization and growth (Gerald and Adam, 2009). Sustainable development has been viewed as "development which meets the needs of the present without comprising the ability for future generations to meet their own needs." (WCED, 1987, p.43).

In order to carry out this study that aimed at investigating factors that influence sustainability of community water projects in arid and semi arid areas in Kenya, two theories that support sustainability were considered upon which also the study was hinged. The two theories were Resources Dependency Theory and Ecological Modernization Theory as discussed in the following section.

2.9.1 Resource Dependency Theory

Prior theorists had argued for the relevance of inter-organizational power to strategy and structure (e.g., Thompson, 1967), but resource dependence theory added an elaborate catalog of organizational responses to interdependence that could inform empirical work. The basic theory might be summarized by a piece of advice to top managers: "Choose the least-constraining device to govern relations with your exchange partners that will allow you to minimize uncertainty and dependence and maximize your autonomy." The array of tactics described by the theory forms a continuum from least- to most-constraining. If dependence comes from relying on a sole-source supplier, then an obvious solution is to find and maintain alternatives.

Other tactics require more-or-less coordinated efforts with other organizations, thereby entailing somewhat more constraint. The least entangling of these is to join associations

or business groups. A somewhat more constraining choice is to form an alliance or joint venture with the source of one's constraint. Alliances "involve agreements between two or more organizations to pursue joint objectives through a coordination of activities or sharing of knowledge or resources" (Scott and Davis, 2007: 206-7) and can include joint research and development contracts, licensing and franchising agreements, shared manufacturing and marketing arrangements, minority investments, and equity swaps, among other possibilities.

Additionally, Hillman and colleagues (2007) found that the presence of women on corporate boards is consistent with the predictions put forth by resource dependence theory. Specifically, large firms that face legitimacy pressures, companies operating in industries that are heavily dependent on female employees, and firms with ties to companies with female board members are likely to have women directors on their board. Thus, the composition of boards seemingly mirrors the environmental constraints faced by firms, giving some credence to the proposition that firms strategically select board members as a means to reduce uncertainty.

Resource-Dependency Theory focuses on cultural and economic linkages, rather than life cycle assumptions (Oliver-Smith 1996; Picou and Gill 1996; Gill and Picou 1998). As such, traditional knowledge of indigenous subsistence cultures provides an alternative discourse narrative. Such a consideration broadens resource management concerns to include elements of traditional culture within the framework of impact assessment. In contradistinction to the discourse of opposing scientific experts, resource-dependency theory identifies alternative epistemological positions as legitimate participants in a mutual beneficial discourse network. Resource dependency theory focuses on threats to cultural and economic resources. The economic and cultural connections to the

biophysical environment of “renewable resource communities” provide another dimension of consideration for resource dependency theory (Picou and Gill 1996; Gill and Picou 1997). Resource contamination threatens economic stability and quality of life, thereby producing “resource loss spirals” for victims dependent on harvests of renewable natural resources (Picou and Arata 1997). Resource-dependency theory extends the scope of resource management to include traditional ethnic knowledge and economic harvesters as stakeholders in an expanded discourse on environmental degradation in the modern world.

2.9.1.1 Implications of the Theory for Resource Management

There is a general understanding that modern societies are striving to enhance rational decision-making for resource management through expanding the “nature of” and “participation in” environmental discourse. For example, for the concept of “risk”, an expanded field of players is now required. As the National Research Council’s recent panel on *Understanding Risk* stated that “interested and affected parties” take part in a discourse on “risk characterization,” it is apparent that technical assessments of risk cannot stand alone while an extension of stakeholder participation is occurring (Stern and Fineberg 1996).

2.9.2 Ecological Modernization Theory

The emergence of this “alternative” macro-theoretical model of ecological degradation came in response to the failures of the initial wave of environmental management of the 1970s and early 1980s (Cohen 1997). During this phase pollutants were dispersed over time and space, rather than reduced. Furthermore, industrial responsibility for “ecological harm” provided an irresolvable discourse on causality, impact and responsibility that resulted in, at best, ambiguous claims and counter-claims (Cohen 1997). Out of this impasse came ecological modernization, a model of resource and risk management that

purportedly “transcends” these various conflicts and interests. The “dissolution of conventional antagonisms between economic progress and responsible environmental management” is based on a “reframing” of environmental discourse.

In other words, ecological modernization reframes the terms of discourse by interpreting pollution reduction as a means of enhancing economic competitiveness rather than as an externality requiring the installation and maintenance of expensive remedial technologies (Cohen, 1999). Cohen (1997) has summarized the theory of ecological modernization in terms of six general principles. First, ecological modernization will correct “the design flaws” of industrial technology through the process of “super industrialization” (Cohen 1997). This process involves a change to cleaner, less resource intensive technologies and production processes that will reduce the necessity for expensive, add-on, remedial technologies. The correlation between economic development and environmental degradation will be significantly reduced, thereby “propelling” modern industry” onto a new developmental trajectory” (Cohen 1999). Second, acknowledging the ineffectiveness of past corporate volunteerism, ecological modernization requires the existence and implementation of “strict government regulations” (Cohen 1999). Such regulation should promote “first-mover advantages” and economically viable “green” products to innovative production systems (Cohen 1999). Third, ecological modernization promises to overcome the transfer of pollutants within the biophysical environment by developing “integrated pollution management” strategies. Such strategies would be part of the redesign of regulatory procedures and production processes. Fourth, ecological modernization requires industry to be more timely and responsive to their generated health and environmental hazards through “anticipatory planning practices”. Based on the German notion of vorsorgeprinzip, or “the precaution principle,” this tenet argues that “the lack of scientific certitude is insufficient reason to postpone the taking of prudent

measures” for reducing environmental risk (Cohen 1999). Fifth, most proponents of ecological modernization endorse the “organizational internalization of environmental responsibility” through the Dutch principle of *verinnerlijking*. (Cohen 1999) notes that this concept requires all public and private entities to integrate a concern for environmental quality into all of their activities as a means of overcoming the standard approach of treating ecological considerations as add-on considerations.

Ecological modernization theory requires that “stand alone” organizational components for assuring ecological responsibility should be dissolved and re-embedded throughout all decision-points in production systems. Sixth, in response to emerging ecological antagonisms and conflict over environmental policy, ecological modernization requires a broader organizational network for decision making. The development of “constructive relationships” between industry, government, non-governmental organizations and the public need to be achieved. The resulting discourse should be “grounded in good faith and the free exchange of information” (Cohen 1999).

2.9.3 Relevance of the Two Theories to the Study

As seen above under this section of theoretical framework, it can be deduced that sustainable development should be that development that allow the satisfaction of existing needs in the long term, which means that sustainability ought to be directed towards the relationships between nature and society. These relationships should not just be functional for a short period of time but also make it possible for future generations to meet their needs (Gerald and Adam, 2009). Resource dependency theory and ecological modernization theory proposes various tenets that tries to enhance realization of sustainable development.

Some of the tenets fronted by the resource dependency theory include choosing the least constraining devices to govern relationships with partners that will allow you to minimize uncertainty and maximize autonomy. An autonomous group has the space to manage their resources and projects in a more sustainable manner than dependent and more controlled group. It proposes more coordinated efforts with other organizations or partnerships y joint coordination of activities and sharing of knowledge and resources. Sharing of knowledge is a capacity building strategy for partners like community members and beneficiaries of various projects while resource sharing ensures commendable participation and contribution by others partners and these help in enhancing sustainability of community projects. The theory also fronts the need for resource decontamination. It is of the view that resource contamination threatens economic stability and quality of life. It therefore pushes for the need for cleaner environment that will quarantine economic stability even into the future. This theory also proposes for expansion of participation in environmental management discourse which should bring together many other players, that is, stakeholder participation. This envisaged participation is expected to enhance all the stakeholders or community members who are the beneficiaries of community projects to embrace and own the community projects and also to take full responsibility for the maintenance of such projects after the project implementation stage. Ecological modernization theory agrees with resource dependency theory in various ideas that supports sustainable development and also proposes other tenets of sustainable development. It proposes a model of resource and risk management. It also proposes the need for a balance between economic progress and responsible environmental management through reduction of pollution as a means to enhancing economic competitiveness. This view also proposes for cleaner and less resources intensive technologies and production processes which are good avenues for enhancing

sustainability of development processes. It also calls for existence and implementation of government regulations that governs development agenda and ensures that sustainability strategies are entrenched. This theory also proposes the need for information sharing amongst the development stakeholders. This ensures that capacities of the stakeholders are built to be able to manage their own development. In the lights of the views proposed above, this study is therefore considered to have a clear fit into the two theories and are therefore expected to be guided by the two theories.

2.10 Conceptual Framework

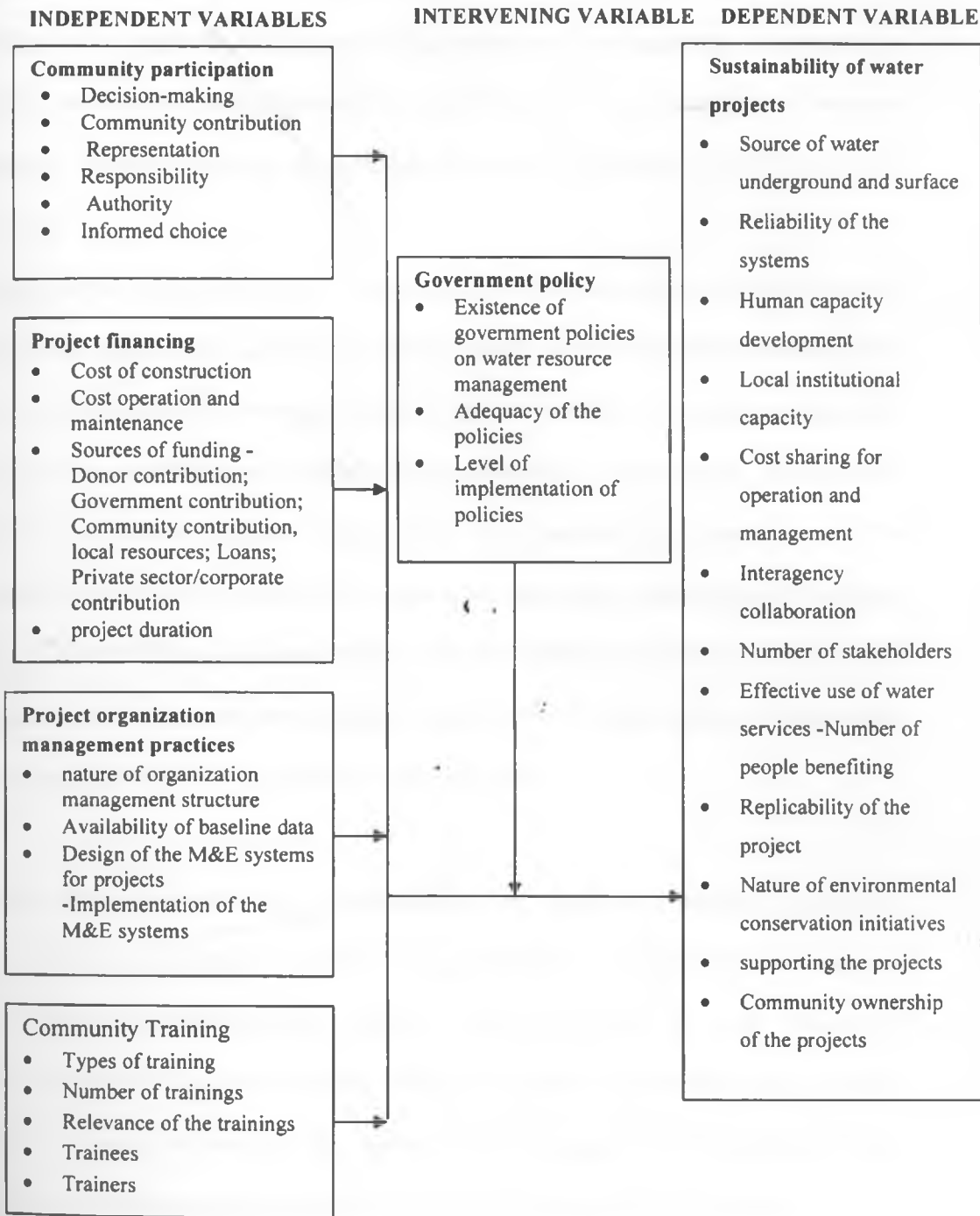


Figure 1: Conceptual Framework

2.11 Summary of literature reviewed

This chapter has provided literature reviewed from existing secondary data and presented according to the variables of the study. It has also provided theoretical framework by providing two theories which guided the study. The two theories consisted of resource dependency theory and ecological modernization theory. It has also provided conceptual framework.

According to the reviewed literature, community participation implies a proactive process in which the beneficiaries influence the development and management of development projects rather than merely receiving a share of project benefits. Community participation also involves capabilities and willingness of communities to take charge, influence and determine the nature of project during its life cycle to ensure long lasting impacts. The identified indicators of community participation are community participation in Decision-making, Control, Community contribution, Representation, Responsibility, Authority and Informed choice. It has also been indicated that the level of involvement of communities in water projects is still low in most developing countries.

Project financing process which involves raising and maintaining adequate funding for water facilities is of critical importance for sustainability. Insufficient financing is a major factor for poor maintenance, which is often cited as the main reason for failure. Sustainability would increase with the investment in institution and capacity building to operate and maintain the system and would require the development of cost recovery mechanisms, as well as provide an incentive towards local investment.

Project management practices have been defined as the application of skills and techniques to project activities to meet or exceed the stakeholder's needs and

expectations. Project management has three main aims, namely to ensure a project is completed within its preset budget, concluded in its stipulated time frame, to ensure it meets the desired functional and technical performance and ultimately to satisfy end user requirements. The three important processes involved in project management practices are organizational planning, staff acquisition and team development. Engaging skilled managers and establishing effective communication structures are key for sustainable water projects.

Human capacity development is important through specialized training of project managers, staff, community members and the whole project team. Lack of community education is one of the factors which could lead to breakdown and non-sustainability of water supply projects.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides an overview of the research methodology. It includes research design, research location, the population studied, details of the sample size and sampling procedure, instruments used, issues of validity and reliability, data collection and data analysis procedures.

3.2 Research Design

The study employed a descriptive survey research design. According to Frankfort-Nachmias and David Nachmias (1996), descriptive survey research design is a type of research used to obtain data that can help determine specific characteristics of a group. A descriptive survey involves asking questions (often in the form of a questionnaire) of a large group of individuals either by mail, by telephone or in person. The main advantage of survey research is that it has the potential to provide us with a lot of information obtained from quite a large sample of individuals.

By employing this study design, this study focused on obtaining quantitative data from a cross-section of community members. It was also used to collect qualitative data from key informants.

3.3 Target Population

According to Mugenda and Mugenda (1999), target population is the entire group a researcher is interested in or the group about which the researcher wishes to draw conclusions. Mugenda and Mugenda (1999) further add that a population is any set of persons or objects that possesses at least one common characteristic. Mulala division has

thirty two (32) water management committees spread across the division. Each of the water management committees are made up of eight (8) members with an executive leadership consisting of chairman, treasurer and secretary. The water management committee members were involved in the study because they are in a position of providing vital information on sustainability of water projects as opposed to the general community members. This study targeted ninety six (96) executive members of thirty two (32) water management committees as the target population who provided relevant data for studying sustainability of water projects.

There are two non-governmental organizations; ChildFund Kenya and Africa Harvest implementing water projects in Mulala division. The study targeted one key management staff of each of these two non-governmental organizations.

3.4 Sample Size and Sampling Procedures

According to Nachmias, 1996, researchers use a relatively small number of cases (a sample) as the basis for making inferences about all the cases (a population). Simple random sampling and purposive sampling was used in this study. Through random sampling, twenty (20) committees were selected from the 32 water committees for the study. Through purposive sampling, the study involved three (3) executive members of each of the twenty (20) selected water management committees. The views from the sixty (60) executive members of the water management committees were expected to represent the views of all the other members.

Two key informants were selected from two non-governmental organizations selected through purposive sampling where the organizations' key management staffs preferably project managers were targeted. A sample size of 62 respondents (63% of the population) was used which was deemed adequate as Orodho (2003) recommends a sample size of

between 30% to 50%, where the target population is small. The study ensured the sample frame is accurate, accessible and also less expensive. This is summarized in the table 2.

Table 3.2: Sampling and Sample Size

Group	Population	Sample
1. Water Committees Executive members	96	60
2. NGOs' Project Managers	2	2
Total	98	62

3.5 Research Instruments

The instruments used in this study include questionnaires and interview guides. Primary data was collected by the use of questionnaires and interview guides. The questionnaires were used to collect data from the executive members of water management committees while the interview guides were used to collect data from Non-Governmental Organizations management staff. Personal interviews were used because of the advantages of the method. The method allows for face-to-face contact with the respondents thus enabling provision of in-depth data. The method allowed the interviewer to clearly explain to the respondents the purpose of the study.

The questionnaires and interview guides had sections consisting of questions on demographic characteristics, community participation, project financing, project organization management practices, community training and recommendations.

3.5.1 Piloting the Research Instruments

The questionnaires were reviewed by the researcher's professional peers and the research supervisor and then tested on a small pilot sample of respondents with similar characteristics as the study respondents. The pilot sample consisted of 3 executive

members of one water management committee. Mugenda and Mugenda suggest that the piloting sample should be 1 to 10% of study sample depending on the study sample size (Mugenda and Mugenda, 1999). The piloting was done in the neighboring division (Mbitini division) for executive committee members of Kwa Mbevo Sand Dam water project. Piloting helped in revealing questions that were vague which allowed for their review until they conveyed the same meaning to all the subjects (Mugenda and Mugenda, 1999).

3.5.2 Validity of the Research Instruments

Validity is the quality of a data gathering instrument that enables it to measure what it is suppose to measure. Creswell (2003) notes that validity is about whether one can draw meaningful and useful inferences from scores on the instrument. Validity is therefore about the usefulness of the data and not the instrument. To ensure content validity, the instruments were reviewed by the research supervisor and other 2 research experts. Content validity yields a logical judgment as to whether the instrument covers what it is supposed to cover. Content validity ensures that all respondents understand the items on the questionnaire similarly to avoid misunderstanding. Response options were provided for most of the questions to ensure that the answers given were in line with the research questions they were meant to measure.

3.5.3 Reliability of Research Instruments

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trial (David, 1999). Reliability answers the question “Are scores stable over time when the instrument is administered a second time?” (Creswell, 2003). To ensure reliability, the researcher used split-half technique to calculate reliability coefficient (Spearman-Brown coefficient) which was found to be 0.8 which is within the

recommended reliability coefficient of 0.7-1 (Nachmias and Nachmias 1996). This involved scoring two-halves of the tests separately for each person and then calculating a correlation coefficient for the two sets of scores. The instruments were split into the odd items and the even items. Statistical Program for Social Sciences (SPSS) was used to calculate the reliability of the instrument (equal length Spearman-Brown coefficient).

3.6 Data Collection Procedure

After consent was given by the University of Nairobi to collect data, the researcher coordinated data collection process after having sought permission from local authorities. The researcher engaged three research assistants who assisted in data collection. The research assistants were taken through training to clearly understand the research instruments, purpose of the study and ethics of research. The researcher and research assistants administered the questionnaires and the interview guides to the respondents face to face. Locals were preferred in selecting research assistants who understood the local language to avoid communication barrier.

3.7 Data Analysis Techniques

Data was cleaned, coded, entered and analyzed using Statistical Package for Social Science (SPSS, Version 17.0). SPSS was used because it is fast and flexible and provides more accurate analysis resulting in dependable conclusions. Technically speaking, data processing implies editing, classification, coding, and tabulation of collected data so that they are amenable to analysis (Kothari, 2004). Data analysis involves computation of certain measures along with searching for patterns of relationships that exist between the dependent variables and independent variables. The data was analyzed according to variables and objectives of the study. Descriptive statistics was used to analyze, present

Table 3.3: Summary of Operational Definition of Variables

Objective	Variable	Indicator	Measurement Scale	Source of Data	Instrument	Data analysis
1. To examine the extent to which community participation influences sustainability of community water projects in semi arid areas	Community Participation	• Representation	◆ Nominal	◆ Water committee members		Descriptive
		• Decision-making	◆ Nominal	◆ key informants-project managers	Questionnaire	
				◆ Water committee members	Interview guide	
		• Informed choice	◆ Nominal	◆ key informants-project managers		
		• Responsibility and Authority	◆ Nominal			
2. To determine the level to which project financing influences sustainability of community water projects in semi arid areas	Project Financing	• Cost of construction	• Ordinal			Descriptive
		• Cost operation and maintenance	• nominal		Questionnaire	
					Interview guide	
		• Donor contribution	• nominal			
		• Government contribution	• interval			
		• Community contribution	• Ordinal			

and internet data. Descriptive analysis involved use of frequency distribution tables and cross tabulation which was used to generate values between dependent and independent variables used in the study.

3.8 Ethical Considerations

While conducting the study, the researcher ensured that research ethics were observed. Participation in the study was voluntary. Privacy and confidentiality was observed. The objectives of the study were explained to the respondents with an assurance that the data provided would be used for academic purpose only.

3.9 Operationalization of variables

Operationalization of variables allows variables to be expressed in measurable terms. The indicators to be measured for each variable are identified together with the measurement scales.

Table 3.3: Summary of Operational Definition of Variables

Objective	Variable	Indicator	Measurement Scale	Source of Data	Instrument	Data analysis
1. To examine the extent to which community participation influences sustainability of community water projects in semi arid areas	Community Participation	• Representation	◆ Nominal	◆ Water committee members		Descriptive
		• Decision-making	◆ Nominal	◆ key informants- project managers ◆ Water committee members	Questionnaire Interview guide	
		• Informed choice	◆ Nominal	◆ key informants- project managers		
		• Responsibility and Authority	◆ Nominal			
2. To determine the level to which project financing influences sustainability of community water projects in semi arid areas	Project Financing	• Cost of construction	• Ordinal			Descriptive
		• Cost operation and maintenance	• nominal		Questionnaire Interview guide	
		• Donor contribution	• nominal			
		• Government contribution	• interval			
		• Community contribution	• Ordinal			

Objective	Variable	Indicator	Measurement Scale	Source of Data	Instrument	Data analysis
3. To assess the extent to which project organization management practices on project management influences sustainability of community water projects in semi arid areas	Project Organization management practices	<ul style="list-style-type: none"> • Clarity of project goals and objectives • Project team development • Clarity of Functions, responsibility and lines of authority • Knowledge and skills of project managers • Standards project management tools and techniques • Effectiveness of project reporting • Effectiveness of communication within the project team and with stakeholders • clarity of the roles of all project team • Top management support • usefulness of monitoring and evaluation 	<ul style="list-style-type: none"> • Nominal 	<ul style="list-style-type: none"> • key informants- project managers 	Interview guide	Descriptive
4. To explore the level to which community training influence sustainability of community water projects in semi arid areas	Community Training	<ul style="list-style-type: none"> • Types of training • Number of trainings • Relevance of the trainings • Trainees • Trainers 	<ul style="list-style-type: none"> • Nominal 	<ul style="list-style-type: none"> ◆ Key informants ◆ Committee members 	Questionnaire Interview guide	Descriptive

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

The chapter contains the analysis and presentation of data and its interpretation. The data has been presented according to the objectives of the study and variables on sustainability of water projects; community participation, project financing, project management practices and community training.

4.2 Response Rate

The research instruments which were administered had the following response rates shown in table 4.1:

Table 4.1: Gender of Respondents

Responses	Frequency	Percentage
Male	35	58
Female	25	42
Total	60	100

Among the respondents interviewed, Thirty five (35) representing 58% were men while twenty five (25) representing 42% were women. This shows that there is a good gender balance in the composition of the water management committees especially at the executive level.

4.3 Demographic characteristics of respondents

The demographic characteristics of the respondents were as shown in tables 4.2 and 4.3 below:

Table 4.2: Age of respondents

Responses	Frequency	Percentage
20 years and below	0	0
21-35 years	9	15
36-50 years	35	58
51-70 years	14	23
71 and above years	2	4
Total	60	100

Among the respondents, nine (9) representing 15% were aged between 21-35 years, thirty five (35) representing 58% were aged between 36-50 years, fourteen (14) representing 23% were aged 51-70 years while two (2) representing 4% were aged over 71 years. This shows that the management committees are dominated by members who are between 36-70 years.

Table 4.3: Highest level of education of the respondent

Responses	Frequency	Percentage
Primary level	12	20
Secondary level	41	68
College level	7	12
Total	60	100

Among the respondents, twelve (12) representing 20% had attained primary level education; forty one (41) representing 68% had attained secondary level education while seven (7) representing 12% had attained college level education. This indicated that most of the members of the members of these committees are literate and are therefore able to contribute constructively in the management of these projects.

Two key informants consisting of project manager for ChildFund Kenya water projects and Africa Harvest project manager were also interviewed.

4.4 Community perception on sustainability of specific water projects

The study sought to find the opinion of respondents on how they view the sustainability of specific water projects. This is because managing and maintaining water projects differ depending on the technology involved, cost factors and technical skills needed for operation and maintenance. Among the water projects commonly implemented in arid areas which were considered were: boreholes, sand dams, shallow wells, water tanks and water pipelines. The results are presented in Table 4.4 to Table 4.8.

Table 4.4: Sustainability of Borehole Water Projects

Responses	Frequency	Percentage
Yes	7	12
No	52	86
No response	1	2
Total	60	100

Seven (7) respondents representing 12% indicated that they considered bore hole water projects as sustainable, fifty two (52) respondents representing 86% considered bore hole projects not sustainable while one (1) respondent representing 2% did not respond which could mean that the respondent do not have a good experience with boreholes to aid a judgment. This shows that borehole water projects have many challenges that complicate their operation and maintenance.

Table 4.5: Sustainability of Shallow Well Water Projects

Responses	Frequency	Percentage
Yes	24	40
No	36	60
Total	60	100

Among the respondents, twenty four (24) representing 40% indicated that they considered shallow well water projects are sustainable while thirty six (36) respondents representing

60% considered shallow well water projects not sustainable. This is an indication of probable high costs and technical skills required to manage and maintain shallow well water projects that communities may not be having.

Table 4.6: Sustainability of Sand Dam Water Projects

Responses	Frequency	Percentage
Yes	26	43
No	33	55
No response	1	2
Total	60	100

Twenty six (26) respondents representing 43% indicated that they considered sand dam water projects as sustainable; thirty three (33) respondents representing 55% were of the contrary opinion while one (1) respondent representing 2% did not respond that could mean the respondent is not well versed with sand dams. Sand dam water projects are therefore generally not very challenging to maintain.

Table 4.7: Sustainability of Pipeline Water Projects

Responses	Frequency	Percentage
Yes	35	58
No	25	42
Total	60	100

Thirty five (35) respondents representing 58% indicated that they consider pipeline water projects as sustainable while twenty five (25) respondents representing 42% were of the contrary opinion.

A section of the respondents indicated that pipeline water projects were more sustainable as they draw more ownership from the community members due to the fact that water

from pipelines is always cleaner for domestic use. This shows that community members are in a place of working hard to sustain pipeline water projects.

Table 4.8: Sustainability of Water Tank Projects

Responses	Frequency	Percentage
Yes	17	28
No	43	72
Total	60	100

Among the respondents, seventeen (17) representing 28% indicated that they considered water tank projects as sustainable while forty three (43) respondents representing 72% were of the contrary opinion. This indicates that water tank projects are generally not sustainable thus not the preferred water project.

4.5 Influence of community participation on sustainability of water projects

The study sought to establish the influence of community participation on sustainability of water projects. The results of the opinions of the respondents are presented in Table 4.9 to Table 4.17.

Table 4.9: Community participation in conception and design of water projects

Responses	Frequency	Percentage
Yes	60	100
No	0	0
Total	60	100

All the respondents representing 100% indicated that the community participated during conception and design of water projects. This shows that there is a satisfactory involvement of community members during inception and design of the water projects.

The key informants from the two non-governmental organizations concurred with the committee members by indicating that the community members do contribute during conception and design of water projects especially by participating during feasibility studies and needs assessments.

Table 4.10: Level of community participation in conception and design

Responses	Frequency	Percentage
Poor	3	5
Fair	16	27
Good	36	60
Excellent	5	8
Total	60	100

In responding to the level of community participation during conception and design of water projects, three (3) respondents representing 5% indicated that the level of participation was poor, sixteen (16) representing 27% said community participation was fair, thirty six (36) respondents representing 60% indicated the level of participation was good while five (5) respondents representing 8% indicated that community participation during inception and design of water projects was excellent.

The key informants indicated that there is always active and adequate participation of the community during conception and design. During this stage, they contribute in identifying the water situation in the community, the appropriate water projects for the community and the identification of the beneficiaries. It is at this stage that the community members also form water management committees which are always key and supportive during implementation and management of the water systems after implementation.

Table 4.11: Community participation in implementation of water projects

Reponses	Frequency	Percentage
Yes	58	96
No	2	4
Total	60	100

Fifty eight (58) respondents representing 96% indicated that community members participated during the implementation of water projects; two (2) respondent representing 4% indicated that community members did not participate during the implementation of water projects. This shows that there is a satisfactory involvement of community members during implementation.

The staff from the two organizations agreed with the committee members by both indicating that the community members participate during implementation.

Table 4.12: Level of community participation in implementation

Responses	Frequency	Percentage
Poor	4	7
Fair	12	20
Good	41	68
Excellent	3	5
Total	60	100

In responding to the level of community participation during implementation of water projects, four (4) respondents representing 7% indicated that the level of participation was poor, twelve (12) respondents representing 20% submitted that community participation during implementation was fair, forty one (41) respondents representing 68% indicated that the level of participation was good while three (3) respondents representing 5% indicated that community participation during implementation of water projects was excellent.

It was indicated by the management staff of the two organizations that community members contribute in various ways during implementation. These include making contributions in cash or by availing locally available materials, provision of cheap or free human labor, assisting the implementing organizations in appropriate citing of the water projects, contributing land, monitoring the implementation process and provision of security of materials during implementation among others.

Table 4.13: Community contribution on decisions made during conception, design and implementation

Responses	Frequency	Percentage
Yes	52	87
No	8	13
Total	60	100

Fifty two (52) respondents representing 87% were of the opinion that community contribution influence decisions made during conception, design and implementation of water projects while eight (8) respondents representing 13% were of the contrary opinion. This is an indication that implementing organizations are taking into consideration the community contributions during decision making processes.

From the key informants' perspectives, community contribution is very cardinal at all stages of water projects. During conception and design of the projects, contributions of community members help implementers in designing projects which are appropriate to the community, that will address the needs of the target beneficiaries and that the community can manage and maintain affordably. During implementation, communities participate in deciding on appropriate and preferred sites and also the best season for implementing some specific water projects. For example, sand dams should only be implemented during dry season. *"Listening to the views of the community is very*

important as this will help the donor to discern the real needs of the people and in turn provide to them what they will appreciate” said a key informant.

Table 4.14: Community contribution in cash or kind during implementation and maintenance

Responses	Frequency	Percentage
Yes	54	90
No	6	10
Total	60	100

Fifty four (54) respondents representing 90% indicated that the community members contributed either in cash or in kind during implementation and maintenance of water projects while six (6) respondents representing 10% were of the contrary opinion. This indicates that community members contribute well either in cash or kind.

It was indicated by the key informants that community members contribute during implementation in cash and in kind. In kind contributions include provision of locally available materials like sand, hard core, timber, water, among others and cheap or free human labor. During management and maintenance of the water projects, community contributes mainly in cash through household contributions or collections from sale of water. They also provide security to the water projects.

Table 4.15: Registration of water projects by government

Response	Frequency	Percentage
Yes	39	65
No	21	35
Total	60	100

Respondents were asked to indicate whether their water projects were registered by government. Thirty nine (39) respondents representing sixty five (65%) indicated that

their projects were registered while twenty one (21) representing 35% indicated that their projects were not registered. This is indicating that there is a gap in relation to the registration of the water projects.

Table 4.16: Women representation in the membership of water committees

Response	Frequency	Percentage
Unsatisfactory	19	32
Satisfactory	25	41
very satisfactory	16	27
Total	60	100

Respondents were asked to assess the level of women representation in the water project committees. Nineteen of the respondents who represented 32% indicated that the representation of women in the committees was unsatisfactory, 25 respondents representing 41 percent indicated that it was satisfactory, sixteen representing 27% indicated that it was very satisfactory.

On the other hand, one key informant indicated that women representation in the committees managing the water projects implemented by their organization is 30% of the members. The other key informant indicated women representation in the committees is unsatisfactory. This shows there is need for more women to be incorporated into the management committees of water projects.

Table 4.17: Failed or non-functional water projects

Response	Frequency	Percentage
Yes	55	92
No	5	8
Total	60	100

Fifty five respondents representing 92% indicated that they were aware of projects in their community which had either failed or were non-functional, while five respondents representing 8% were not aware of any projects that had failed or were non-functional. This shows that there were many water projects that have been implemented in the community but are not sustainable.

The respondents were also asked to indicate some of the factors that could have contributed to the failure or non-functioning of these water projects. Some of the main causes indicated are as follows:

There were failures resulting from poor choice of site of water projects resulting from poorly conducted surveys. Hydrological surveys when poorly conducted especially using ineffective machines lead to wrong decision like drilling a borehole at a wrong site.

Failure to involve community members from conception and design stages led to lack of community ownership of some of these projects. Some of the projects that failed were implemented by donors who never involved the community members so as to appreciate their interests.

Some projects were never implemented to completion due to inadequate funding. The donors' budgets were never adequate to meet the overall costs of implementing such projects thus leaving them mid-way thus not beneficial to the community members.

Some projects were brought down to a halt due to lack of accountability and transparency among the water management committee members. There was poor accountability on the sales of water and how the revenue from water was being spent. This betrayed the loyalty and trust among community members to pay for water or contribute towards maintenance costs.

Lack of technical skills for management and maintenance by the committee members due to inadequate training caused the failure of some of these projects. Committee members were mere lay people who did not have skills on operation and maintenance of water projects. This often led to mismanagement of these water structures.

It was also indicated that community conflicts often resulted from lack of transparency and accountability by the committee members especially in the management of collected funds.

Negative politics hindered efficient implementation or proper management of some projects. Such negative politics were geared towards inciting the community members against supporting such projects for the benefit of the individual politicians. The politics were also partly hinged on clan differences which tended to stop owners of appropriate pieces of land for projects like boreholes to decline to donate their private land for community good.

Substandard implementation of water projects led to failure of some of these projects. This happened when projects were not implemented according to design and plan or implemented using substandard materials. This compromised the overall quality of the projects implemented and reduced their life span.

Over-dependence on donors during implementation and maintenance was one of the factors that contributed towards failure of some projects. The community depended on donors to meet the cost of implementation and maintenance without their contributions. Immediately the donors pulled out, the community felt incapable of running some of these projects.

Some water projects were implemented but community water management committees were never formed to operate them. There was therefore a responsibility vacuum thus leading to mismanagement and failure of the projects.

Some water projects suffered from conflicts arising from land ownership. This is because most of community water project are implemented on pieces of private land contributed by individual land owners who donate them for such projects. Conflicts arose among the beneficiaries sometime later in the life of these projects after the implementation especially in the cases where no proper and legal land donation agreements were made.

4.6 Influence of project financing on sustainability of community water projects

The study sought to establish the influence of project financing on the sustainability of community water projects. The results of the opinion of the respondents are presented in Table 4.18 to Table 4.22.

Table 4.18: Main sources of financing for implementation of water projects

Response	Frequency	Percentage
NGOs/Donors	38	63
Government	9	15
Community members	13	22
Total	60	100

A proportion of the respondents consisting of thirty eight respondents representing 63% indicated that the main source of financing for implementation of water projects was non-governmental organizations and donors, 9 of them representing 15% indicated that it was the government while 13 of the respondents representing 22% indicated that it was community members who meet the implementation costs.

It was also indicated by the key informants that financing of water projects was being made by both their organizations and the community. One key informant indicated that their organization contributes 93% of the total costs while the community contributes 7%. On the other hand, the other key informant indicated that their organization contributes 85% of the total cost of water projects while the community contributes 15%. This shows that community contribution towards water projects is still low.

The key informants also indicated the community members make their contributions in cash or in kind during implementation and maintenance of water projects. In kind contributions involve contributing locally available materials, unskilled labor and land among others.

Table 4.19: Community members' knowledge of the cost of water projects

Response	Frequency	Percentage
Yes	28	47
No	32	53
Total	60	100

Twenty eight respondents representing 47% indicated that community members had knowledge of the cost of water projects implemented in their areas while thirty two (32) respondents representing 53% were of a contrary opinion. This is an indication that as much as community members contribute towards the implementation of water projects, they are not properly informed of the costs of these water projects may be because the main funders are the non-governmental organizations and donors who are not keeping them informed of every detail of the water projects.

Table 4.20: Source of financing for maintenance of water projects

Response	Frequency	Percentage
NGOs/Donors	4	7
Government	5	8
Community members	51	85
Total	60	100

With regard to the maintenance of water projects, 4 respondents representing 7% indicated that this cost is being supported by non-governmental organizations and donors, 5 respondents representing 8% indicated the support is being made by the government while 51 of them representing 85% indicated that it is the community members who meet the maintenance costs. This trend is expected to increase the capacity of the community to manage the projects and enhance their feeling of ownership thus increase sustainability.

Table 4.21: Community capacity to meet cost of operation and maintenance of water projects

Response	Frequency	Percentage
Yes	31	52
No	29	48
Total	60	100

Thirty one respondents representing 52% indicated that the community had the capacity to meet the cost of operation and maintenance of water projects in the area. However, twenty nine (29) respondents representing 48% indicated that the community did not have the capacity. The two key informants interviewed also indicated that the community members have the capacity to meet the costs of operation and maintenance of the water projects. This indicates that the capacity of the community to operate and maintain the water projects needs to be enhanced.

Table 4.22: How community members raise finance for operation and maintenance

Response	Frequency	Percentage
Individual community members' contribution	20	33
Sale of water by the committee members	30	50
Loans	1	2
No Response	9	15
Total	60	100

Twenty respondents representing 33% indicated that individual community members do contribute funds for operation and maintenance of water projects, 30 respondents representing 50% indicated that funds were raised through sale of water by the water committees. Only one respondent indicated that the funds were raised through loans. Nine respondents representing 15% did not respond to this question. The non-responses could be from those respondents that are of the opinion that the cost of maintenance is being supported by non-governmental organizations and government. This shows that finances for maintenance mainly come from the resources of the community members which therefore calls for the need to enhance the economic status of community members.

The key informants from the two non-governmental organizations indicated that the community members raise funds for operation and maintenance of the water projects from revenue collected through sale of water, monthly household contributions and initiating alternative livelihoods around the water projects like tree nurseries and agricultural activities and thereafter giving back part of the income to the water projects.

4.7 Influence of community training on sustainability of community water projects

The study sought to establish the influence of community training on sustainability of community water projects. The results of the opinion of the respondents are as presented in Table 4.23 to Table 4.28.

Table 4.23: Training of water committee members on operation and maintenance

Response	Frequency	Percentage
Yes	46	77
No	14	23
Total	60	100

Forty six respondents representing 77% indicated that they as members of water committees had been trained on operation and maintenance of water projects while 14 respondents representing 23% had not been trained. This shows that most of the committee members have been trained though there is still a big population of the committee members who have not been trained.

Data from key informants indicated that the water committees especially for the projects implemented by the two non-governmental organizations have been trained on operation and maintenance of the water projects.

Table 4.24: Number of trainings attended by the water committee members

Response	Frequency	Percentage
1-2 trainings	40	67
3-4 trainings	5	8
5-6 trainings	1	2
None	14	23
Total	60	100

Among the respondents who had been trained, 40 of them representing 67% had attended between 1 and 2 trainings on operation and maintenance of water projects. Five of the respondents representing 8% had attended 3 to 4 trainings, while one of them had

attended 5 to 6 trainings. On the other hand, 14 respondents representing 23% indicated that they had not attended any training. This shows that adequate training and capacity building has not been done to these committee members.

Table 4.25: Trainers with technical background on water resources

Response	Frequency	Percentage
Yes	39	65.
No	5	8
No response	16	27
Total	60	100

Thirty nine respondents representing 65% indicated that the trainers on operations and maintenance of water project were conducted by trainers with relevant technical background. Five respondents indicated that the trainers did not have technical background. Sixteen people did not respond to this question probably because they had not attended any training thereby rendering them incapable of assessing the trainers.

It was confirmed by the key informants that the trainings were facilitated by government officers from the ministry of water and irrigation. These are technically trained staff on water issues.

Table 4.26: Rating of effectiveness of trainings on operation and maintenance

Response	Frequency	Percentage
Poor	4	7
Fair	11	18
Good	25	42
Excellent	6	10
No response	14	23
Total	60	100

Four respondents representing 7% indicated that the trainings on operation and maintenance of water projects were poor, 11 respondents representing 18% indicated that they were fair, twenty five (25) respondents representing 42% indicated that they were

good and six (6) respondents indicated they were excellent. However, 14 respondents who had not attended any training did not respond. This shows that the trainings being delivered are generally of good quality.

Key informants confirmed that the trainings were relevant and effective as a number of trained committee members currently have basic skills for water management and maintenance. Their capacities were also built in financial management and group dynamics to enhance their conflict resolution skills.

Table 4.27: Involvement of the trained members of water committees in operation and maintenance

Response	Frequency	Percentage
Yes	39	65
No	5	8
No response	16	27
Total	60	100

Thirty nine respondents representing 65% indicated that there was adequate involvement of the trained water committee members in operation and maintenance of water projects while 5 of the respondents representing 8% indicated that there was no involvement of the water committee members in operation and maintenance of water projects. Sixteen respondents who had not been trained did not respond. This shows that trained community members are being involved satisfactorily in the operation and maintenance of the water projects.

Table 4.28: Reason why trained members are not involved in operation and maintenance

Response	Frequency	Percent
Lack of technical skills	5	8
No response	55	92
Total	60	100

Five respondents indicated that lack of technical skills was the main reason why trained members are not involved in operation and maintenance of water projects. Fifty five respondents representing 92% did not respond to this question. This could be because they feel the trained members are satisfactorily involved in operation and maintenance. Part of the non-responses was also from the committee members who had not been trained.

4.8 Influence of project management practices on sustainability of community water projects

The study sought to establish the influence of project management practices on sustainability of community water projects. The managers of the two non-governmental organizations were asked to indicate the performance of their organizations in the application of project management practices.⁴ The respondents were to rate their organizations in a scale of 1-5 with one being the poorest performance while 5 being the best performance. The results from the key informants are as follows:

The key informants rated their organizations at 3 and 5 in relation to the clarity of goals and objectives of water projects to all the staff. This shows that there is need for reinforcement of clarity of goals and objectives of water projects in all organization.

The two interviewed managers rated their organizations at 4 and 5 in relation to proper definition of functions, responsibilities and lines of authority of the project managers and water committees. This shows that there are few conflicts if any between the implementing organizations and the water management committees.

In assessing whether the project managers of the two organizations have the necessary knowledge and skills required for successful implementation of water projects, the two

respondents rated their organizations' performance at 4 and 5. This indicates that there are qualified staffs to manage the projects thus increasing chances of implementing sustainable projects.

The key informants rated their organizations at 5 and 4 in relation to the usage of standard project management tools and techniques such as work plans and monitoring and evaluation plans for managing the projects. This shows usage of these project management practices is satisfactory.

In relation to frequency of reporting the progress of water project implementation during project meetings, the two organizations were rated at 3 and 4. This indicates average performance in relation to reporting of progress of projects thus need for enhancing reporting systems.

The performance of the two organizations in relation to availability of adequate, quality and timely communication within the project teams was rated at 2 and 3. This indicates poor communication in these organizations.

The clarity of the roles of all project team members of the two organizations was rated at 5 and 4. This is a show that these organizations are ensuring that all the staff are clear of their roles and responsibilities.

Support for monitoring progress of water projects by top management of the two non-governmental organizations was rated at 3 and 2. This shows that there is low support for monitoring progress of water projects by top management.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Chapter five provides a summary of findings, discussions, conclusions and recommendations of the study.

5.2 Summary of findings of the study

The findings of the study have been summarized according to the four variables of the study namely community participation, project financing, project management practices and community training.

5.2.1 Community Participation

According to the findings of the study, pipeline water projects are considered by community members to be more sustainable at 58% as compared to borehole at 12%, shallow well at 40%, sand dams at 43% and water tank projects at 28%.

Community participation in conception, design and implementation of water projects is satisfactory with 100% of the respondents indicating that community members participated at the design level with 60% of them indicating that the level of their participation during conception and design was good, while 96 percent indicated that the members participated at the implementation stage with 68% of the respondents indicating that the level of participation at this stage in the life cycle of the water projects was good. Majority of the respondents at 87% also indicated that the contributions by the community members influenced decisions made during the conception, design and implementation stages. The contribution by the community was found to be both in cash

and kind as indicated by 90% of the respondents. In relation to the registration of the water projects by government bodies, only 65% of the water projects had been registered. Furthermore, the study established that there is a good representation of women in water project committees with 42% and 26 % of respondents indicating that women representation was satisfactory and very satisfactory respectively. It was also found out that there were a number of water projects that had been implemented but are currently non-functional with 92% of the respondents indicating that they are aware of some non-functional water projects in their community.

5.2.2 Project Financing

With regard to financing of water projects, the study established that the design and implementation of water projects were mainly funded by nongovernmental organization and donors as implied by 63% of respondents. Majority of the community members were not aware of the cost of the projects as indicated by 53% of respondents. However, maintenance of the projects was mainly funded by the community as implied by 85% of respondents. The sources of funds for maintenance of the water projects are from individual community members' contributions as indicated by 33% of the respondents and sale of water by committee members as indicated by 50% of the respondents. The respondents (52%) indicated that the community had the capacity to meet the cost of operation and maintenance water projects.

5.2.3 Project Management Practices

The key informants rated their organizations at 3 and 5 in relation to the clarity of goals and objectives of water projects to all the staff. This shows that there is need for reinforcement of clarity of goals and objectives of water projects in all organization.

The key informants rated their organizations at 5 and 4 in relation to the usage of standard project management tools and techniques such as work plans and monitoring and

evaluation plans for managing the projects. This shows usage of these project management practices is satisfactory.

The performance of the two organizations in relation to availability of adequate, quality and timely communication within the project teams was rated at 2 and 3. This indicates poor communication in these organizations.

Support for monitoring progress of water projects by top management of the two non-governmental organizations was rated at 3 and 2. This shows that there is low support for monitoring progress of water projects by top management.

5.2.4 Community Training

The majority of the members of the water committees had been trained on operation and maintenance of the projects as indicated by 77% of the respondents. Majority of the trained members at 67% had attended 1-2 trainings. The majority of the respondents at 65% and 42% were of the opinion that the trainers who conducted trainings had technical knowledge and that the trainings were good respectively. It was also found out that there is a satisfactory involvement of trained committee members in operation and maintenance of the water projects with 65% of the respondents responding affirmatively.

5.3 Discussion of the findings of the study

The findings of the study have been discussed according to the four variables of the study namely community participation, project financing, project management practices and community training.

5.3.1 Community Participation

According to the findings of the study pipeline water projects are more sustainable than borehole, shallow well, sand dams and water tanks projects. This is in agreement with the observation made by Narayan (1995) that the source of water has to be reliable and this may be guaranteed by ground and surface water. Since the pipeline water originates from

predetermined surface catchments such as Mt. Kilimanjaro there good level of reliability in water availability in the system. Pipeline water is mainly managed by government agencies while communities are responsible for operation and maintenance of the extensions to their specific water points thus the cost is within the capacity of the community to manage. Pipeline water is often clean and safe and also soft water as opposed to underground water like bore hole and shallow wells that are often salty. This contributes to a higher attention paid by community members in their management of pipeline water projects.

The study established that community participation in conception, design and implementation of water projects is above average. It was also established that contributions by the community members influence decisions made during design and implementation stages. These findings are in agreement with the observations by Sara and Katz (1998), Yacoob and Walker (1991) Narayan (1995), McCommon, Warner and Yohalem (1990) and Wright (1997) who indicate that beneficiaries have to select services which they are willing to pay for and guide key investment and management. They also note that participation is characterized by control, community contribution, and participation in decision making, representation, responsibility, authority and informed choice. Furthermore it was found out that the contribution by the community is both in cash and kind as emphasized by the same authors.

The study found out that the representation of women in water project committees is above average. This agrees with observations by Yuerlita, Febriamnsyahv and Saptomo (2004) who note that there is need to emphasize on equal participation between men and women in decision making processes, implementation, operation and maintenance and monitoring and evaluation of water projects.

The study established that ownership of community water projects by the beneficiaries is very important for sustainability. The level of community ownership depends largely on the extent of community participation during conception, design and implementation of projects.

It was also found out that one of the avenues to promoting community participation and ownership of the water projects is by enhancing transparency and accountability levels among the committee members. There is need to encourage openness in the management of finances raised from sale of water besides keeping proper records and bank statements. Auditing of these financial records should be encouraged to ensure that there is proper management of the resources. This will encourage community members to contribute promptly towards operation and maintenance of these water projects.

It was also discovered that close monitoring and evaluation of water projects is very important for enhancing sustainability. The beneficiaries especially through the management committee members should keep monitoring the progress of their water projects and also evaluate their performance over time.

In order to aid the management committees to carry out the functions successfully and to avoid conflicts and negative politics which can be detrimental to the success of water projects, it was found out that it is necessary to develop bi-laws and constitutions governing such projects. Such constitutions will help in ensuring that management of such projects steer away from avoidable conflicts. The committees should also use such constitutions to process registration for the water projects with the government especially with Ministry of Gender and Social Services. These committees should also work towards being members of Water Resources Users Associations. This will give room for effective oversight by government bodies thus enhancing effective management.

5.3.2 Project Financing

The study established that the design and implementation of water projects was mostly funded by non-governmental organization and donors. However, majority of the community members were not aware of the cost of the projects. Maintenance of the projects was mainly funded by the community. The source of funds for maintenance of the project is from individual community members' contributions and sale of water. These findings are in agreement with a study by Water Supply and Sanitation Performance Enhancement Project (2003) which recommended that government and international community should not be expected to finance all expenditures required in the life of water system.

It was also discovered that a number of water projects failed to be implemented to completion due to underfunding and this confirms the observations of Binder (2008) that there is usually a significant underfunding even for basic operation and maintenance.

The study established that there is need to establish diversified livelihoods around water projects. This should include income generating activities such as irrigated agriculture which should be geared towards raising income by community member for meeting operation and maintenance cost. This agrees with the observation by Water Supply and Sanitation Performance Enhancement Project (2003) that sustainability would increase with investment in institutions and capacity building to operate and maintain the system and would require development of cost recovery mechanisms.

5.3.3 Project Management Practices

The study findings indicated that implementing organizations have clear goals and objectives on water projects. The organizations also have proper definition of functions, responsibilities and lines of authority of the project managers and water committee. Managers also have necessary knowledge and skills required for successful

implementation of water projects. There is also clarity on the roles of all project team members. These findings are in agreement with observations made in other studies. According to Sahlin (1998) and Zimmerer (1998), a project manager should be competent in the science of project management and also have technical competence in some aspects of the work being performed on a project. Meredith J. and Mantel S. (2009) further have the opinion that a project manager should be both generalist and facilitator and should have a reasonably high level of technical competence in the science of the project. Gido (2009) further notes that it is also essential for every member of the project team to clearly understand the goals and objectives of the water projects at every stage of the project implementation.

On the other hand, it was found out that the use of standard project management tools and techniques such as work plans and monitoring and evaluation plans for managing the projects is not satisfactory. It was also found that reporting the progress of water project implementation during project meetings, availability of adequate, quality and timely communication within the project teams and support for monitoring progress of water projects by top management were likewise not satisfactory. This is in contrary to the recommendations given by other authors like Rico (2009) and Aula et al. (2010). Rico (2009) observes that communication within a team can be a factor to influence the fate of most components of team management and their interdependencies. Aula et al. (2010) further note that conflicts in a project can be related to the level of communication within the team.

It was discovered that a number of water projects in the community were non-functional because their implementation was poorly done. To ensure that projects are implemented qualitatively, close monitoring and supervision by technical staff and trained community members should be part of the implementation process. If quality materials are used

during implementation then the final project executed is expected to be durable thus ensuring that there will not be consistent system breakdowns. Monitoring of implementation process should be done to ensure that installation of fittings and pumps by contractors and the general structural works are done correctly and as per the plans and designs.

5.3.4 Community Training

According to the study findings, majority of the members of the water committees had been trained on operation and maintenance of the projects. It was also found that the trainers who conducted trainings had technical knowledge. According to the responses the trainings were crucial for the success of water projects. This agrees with observations by Campos (2008) who argued that training on issues like operation and maintenance empower communities to look after water supply systems thus aiding sustainability. Ademiluyi and Odugbesan (2008) identified lack of community education as one of the important factors which could lead to breakdown and non-sustainability of water supply projects in developing countries.

It was also found out that some water projects collapsed or became non-functional because they were being operated by untrained community members. The National Academy of Science (1997) observes that competent operating personnel are vitally important to the sustained and safe operation of small water systems. Without adequately trained personnel, even a well-financed and organized system with the most advanced technology and regular compliance visits will fail to reliably deliver safe drinking water to its customers.

5.4 Conclusions of the study

The study sought to establish the factors influencing sustainability of water projects in semi arid areas in Kenya. The study targeted executive members of water management committees and management staff of two non-governmental organizations. It was concluded that the factors investigated influences sustainability of community water projects in different ways.

1. The researcher concludes that community participation during conception, design, implementation and operation and maintenance of water projects influences sustainability of community water projects. Their participation ensures that projects being designed borrow from their opinions being the end users and are those that are in line with their interests. This factor increases community ownership of water projects thus enhancing their willingness to effectively manage these projects after implementation.
2. Sources of project financing whether government, non-governmental organizations or community member's contributions influence sustainability of community water projects. There is need for adequate funds for implementing water projects according to the designs and plans. The water systems and technologies established should be those that do not need heavy financial investments during operation and maintenance that may be beyond the capacity of the community members. If the operation costs are higher than the community's capacity to meet, then such water projects can easily stall.
3. It is concluded that project management practices influences sustainability of water projects in semi-arid areas. Project management practices like project monitoring and evaluation, establishing skilled project team and ensuring effective communication

structures ensure that projects are implemented according to the expected quality, within schedule and budget. Qualitatively implemented water projects with proper operation rarely experience breakdown thus are more sustainable.

4. Training of community members especially those responsible for operation and maintenance of water projects influences sustainability of water projects. Trained operators are more efficient while operating the water structures thus minimizes any breakdowns during maintenance or operation. In cases of breakdowns, availability of trained community members on maintenance ensures that maintenance are done more promptly and cheaply as opposed to when community members have to depend on hired skilled labor.

5.5 Recommendations of the study

The following are the recommendations of the study:

1. Training of water management committee members on water resources operation and maintenance is very crucial. It is recommended to the water management committees that untrained community members should not be entrusted to manage these facilities as this can lead to mismanagement and unwarranted system breakdowns. It is also recommended that implementers of water projects should ensure that water management committees are formed and members adequately trained.
2. There is need to enhance transparency and accountability levels among the committee members. Openness should be encouraged in the management of finances raised from sale of water and community contributions with proper records and bank statements being kept by the water management committees. Auditing of these financial records by independent parties should be encouraged by implementing organizations to ensure proper management of the resources. This will encourage community

- members to contribute promptly towards operation and maintenance of these water projects.
3. Close monitoring and evaluation of water projects by implementing organizations is recommended to enhance sustainability. The staff of implementing organizations and the beneficiaries should keep monitoring the progress of their water projects in order to enhance quality and also evaluate their performance over time.
 4. Community participation right from conception and design of water projects to implementation is recommended so as to enhance community ownership of water projects. The views of community members should be appreciated by the donors implementing water projects. Community members should also be encouraged to contribute either in cash or by providing locally available materials during implementation and post implementation periods.
 5. All management committees for water projects should develop bi-laws and constitutions governing such projects. Such constitutions will help in ensuring that management of such projects steer away from avoidable conflicts. They should also use such constitutions to get registered by government especially by Ministry of Gender and Social Services. These committees should also work towards being members of Water Resources Users Associations. This will give room for effective oversight by government bodies that will enhance effective management.
 6. There is need to encourage diversified livelihoods especially those that can be directly supported by water resources. Such livelihoods like irrigated agriculture, kitchen gardening and establishment of tree nurseries for sale of tree seedlings should be encouraged by the implementing organizations. Community members should be encouraged to plough back part of their incomes from such income generating

activities to these water projects to be used for operation and maintenance of the water projects.

5.6 Suggestions for further research

1. The researcher proposes the need to carry out further research on the level other factors that have not been studied here may influence sustainability of water projects in semi arid area. Such factors like culture of the local community and level of education of community members should be investigated.
2. It is also suggested that further research should be conducted to investigate the possible livelihoods that can be initiated around the water projects from which community members can raise income for maintenance of water projects for sustainability.

REFERENCES

- Adams W. M. et al., (1994). *Indigenous Farmer-Managed Irrigation in Sonjo, Tanzania*.
The Geographical Journal.
- Ademiluyi, I.A. and Odugbesan, J. A. (2008). *African Journal of Agricultural Research*
Vol. 3 (12), pp. 811-817, December, 2008.
- Arata C. M., Picou J. S. and Johnson, G. D. (2000). *Copying with technological disaster:
An application of the conservation of resources model to the Exxon Valdez Oil
Spill*. Journal of Traumatic Stress.
- Bell R. G., (2001). *The Conceptual Perspective for Public Participation: The
Proceedings of the Workshop on Good Governance, Public Participation and the
Decision Making Process for Environmental Protection, March 18th-19th 2001*.
Saitharn Publication House, Bangkok, Thailand.
- Binder D (2008). *Sustainability of Water Service Delivery in Rural Environment: Past
Approaches and the Way Forward*. Emerging Markets Group, Ltd.
- Brett A. Gleitsmann, Margaret M. Kroma and Tammo S (2007). *Analysis of a rural water
supply project in three communities in Mali: Participation and sustainability*.
Natural Resources Forum 31 (2007) 142–150.
- Brooks C. P. J., (1996). *Getting the Private Sector Involved in Water-What to Do in the
Poorest of Countries?* Public Policy of Private Sector. Wahington D.C.: The
World Bank.
- Campos, M. (2008). *Making sustainable water and sanitation in the Peruvian Andes: an
intervention model*. Journal of Water and Health 6 (1) 2008.
- Cleaver, F. (2001). *Institutions, agency and the limitations of participatory environments
are critical competencies needed in supporting approaches to development*.

- Cohen, M. (1999). *Sustainable development and ecological modernization: National Capacity for Environmental reforms*. OCEES Research Paper No. 14, Oxford center for the Environment, Ethics and Society, Oxford.
- Cohen M., (1997a). *Risk Society and Ecological Modernization: Alternative Visions for Capacity for Rigorous Environmental Reform*. Oxford England: Oxford Center for Environment, Ethics and Society. OCEES Research Paper.
- Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods and approaches* (2nd ed.). Thousand Oaks, CA: Sage.
- David W., (1999). *Globalization, Uneven Development and Poverty: Recent Trends and Policy Implications*. UNDP.
- DFID 2001. *Addressing the water crisis: healthier and more productive lives for poor people*. Department for International Development, London
- Diane R., (undated). *Theory and Practice in Sustainability and Sustainable Development: Lessons for USAID's Move towards Sustainability and Sustainable Development*. USIAD center for Information and Evaluation.
- Dungumaro E. Madulu N (2003). *Public participation in integrated water resources management: the case of Tanzania*. *Journal of Physics and Chemistry of the Earth* (2003) 1009–1014.
- Frankfort-Nachmias and David Nachmias(1996). *Research Methods In Social Sciences*. 5th edition. St. Martins Press Inc. Great Britain.
- Gerald F. Davis and Adam J. Cobb (2009), *Resource Dependence Theory: Past and Future*.
- Gido, J., and Clement, J. P. (1999). *Successful Project Management*. Cincinnati: South Western College Publishers.

- Gill D., A., and Steven P. (1998). *Technological Disaster and Chronic Community Stress. Society and Natural Resources.*
- GOK, *National Policy For The Sustainable Development of Arid And Semi Arid Lands of Kenya, 2004.*
- Hendarto H. (2007). *Project Failures and Project Success.*
- Hillman A. Shropshire, C. and Cannella, A. (2007). "Organizational predictors of women on corporate boards," *Academy of Management Journal*, Vol. 50, pp. 941-952
- IFAD (2009). *Sustainability of Rural Development Projects: Best Practices and Lessons Learned by IFAD. Asia.*
- Ijjasz E. *Exploring Access to Microfinance for Community-Managed Rural Water Supply Projects: Emerging Experience from Kenya.* Water and Sanitation Program, World Water Forum, Mexico, March 17, 2006
- JMP (2004). *Global Water Supply and Sanitation 2004 Report.* Joint Monitoring Programme WHO/UNICEF, World Health Organization, Geneva.
- Kaliba, Aloyce R.M (2000). *Participatory Evaluation of Community Based Water and Sanitation Programs: The Case of Central Tanzania.* Ph.D. Dissertation, Department of Agricultural Economics, Kansas State University.
- Kemp, R., Parto, S. and Gibson R. B. (2005). *Governance for sustainable development: moving from theory to practice.* *International Journal Sustainable Development*, Vol.8 (1/2).
- Livingstone, A and McPherson, H. J (1993). *Community Management of Rural Water Supplies: Lesson for Developing Countries from a Western Canadian Experience.* *Water International*, 18 (1993) 225 – 232.

- Mangin, J.M., 1991. *Rural water supply in southern Ethiopia: Failures and alternatives*. Canadian Journal of Development Studies, 12(2): 97–312.
- Manyan H., Offat I. and Kamuzungu T. (2009), *access to safe drinking water by rural communities in Zimbabwe: a case of Mundenda village in Mutasa district of Manicaland province in Journal of Sustainable Development in Africa* Vol. 11, No.1, 2009). Pennsylvania : Clarion University of Pennsylvania.
- McCommon, C., Warner, D. and Yohalem, D. (1990) Community management of rural water supply and sanitation services. WASH Technical Report Number 67. Washington DC: UNDP/World Bank Water and Sanitation for Health Program.
- Mengesha A., Abera K. and Mesganaw F. (2003) *Sustainability of drinking water supply projects in Rural of North Gondar, Ethiopia*. Ethiopian Journal of Health Development 2003; (3):221–229.
- Meredith J. R., and Mantel S. J., (1995). *Project Management: Management Approaches*. 3rd ed., New York: Wiley.
- Mugenda O. and Mugenda A., (1999). *Research Methods; Quantitative and Qualitative Approaches*. Nairobi, Africa Center for Technology Studies.
- Narayan, D. (1995) *Participatory evaluation: tools for managing change in water and sanitation*. World Bank Technical Paper Number 207. Washington, DC: The World Bank.
- National Academy of Sciences (1997). *Safe Water From Every Tap: Improving Water Service to Small Communities*. National Academy Press, Washington, D.C.
- Nikkhah H. A. and Redzuan M (2009). *Participation as a Medium of Empowerment in Community Development*. European Journal of Social Sciences – Volume 11, Number 1 (2009).

- Nikkhah H.A. and Redzuan M. (2009) *Participation as a Medium of Empowerment in Community Development*. European Journal of Social Sciences – Volume 11, Number 1: 170-176.
- OECD (2002) *Governance for Sustainable Development: Five OECD Case Studies*, OECD, Paris, France.
- OECD (2007) *Feasible Financing Strategies for Water Supply and Sanitation*. Policy Brief.
- Orotho J.A., (2003). *Regional Inequalities in Education, Population and Poverty Patterns in Kenya: Emerging Issues and Policy Directions, Population of Kenya*. Journal, 1.
- Paul, B. (1987) *Community participation in development projects*. World Bank Discussion Paper No. 6. Washington DC: World Bank.
- Policy and Resettlement Division. World Bank, Washington, DC. Water Assessment Programme (UNESCO-WWAP), 2003.
- Project Management Institute (1996). *A guide to Project Management Body of Knowledge (First Edition)*. PMBOK Guide. Newton Square PA:PM Publications.
- Project Management Institute (2004). *A guide to Project Management Body of Knowledge (third Edition)*. PMBOK Guide. Newton Square PA:PM Publications.
- Republic of Kenya (2004). National Policy on Disaster Management, Nairobi Kenya.
- Rico, D. F. (2009). *Business Value of Agile Methods for Systems Development*.
- Rono P. K. And Aboud A.A (2003). *The role of popular participation and community work ethic in rural development: the case of Nandi District, Kenya*. Journal Of Social Development In Africa Vol 18 (2).
- Sahlin J. P., (1998). *How much technical training does a project manager need in project management?*

- Sara, J. and Katz, T. (1998) *Making Rural Water Supply Sustainable: Reports on the Impact of Project Rules*. Washington, DC: UNDP/World Bank Water and Sanitation Program.
- Scott, W. R. and Davis, G. F. (2007), *Organizations and Organizing: Rational, Natural, and Open System Perspectives*, Pearson Prentice Hall, Upper Saddle River NJ.
- Sen, Amartya. (1999). *Development as freedom*. New York: Random House.
- Singh, N., Jacks, G., Bhattacharya, P. (2005). *Women and community water management. Natural Resources perspective*. Natural Resources Forum.
- Smith O., and Anthony (1996). *Anthropological Research of Hazards and Disasters*. Annual Review of Anthropology.
- Solow, Robert M. (1993). *Sustainability: An economist's perspective*. In Robert Dorfman and Nancy S. Dorfman (Eds.), *Economics of the Environment* (pp. 179–187). New York: Norton.
- Soriono C., and Test Consultants Inc. (2003). "*Rural Water: Models for Sustainable Development and Sector Financing*." Water Supply and Sanitation Performance Enhancement Project. Manila.
- Stern P. C., and Harvey v. Fineberg (eds. 1996). *Understanding Risk: Informing Decisions in a Democratic Society*. Washington, DC: National Academy Press.
- Thompson, J. D. (1967), *Organizations in Action*, McGraw Hill, New York.
- United Nation Economic and Social Council, Economic Commission for Africa: Third meeting of the Committee on Human Development and Civil Society, 2005, Addis Ababa, Ethiopia.
- Wakeman, W. (1995). *Gender Issues Source book for Water and Sanitation Projects*. Washington, DC: UNDP/World Bank Water and Sanitation for Health Program.

- Water Management in Africa and the Middle East Challenges and Opportunities* edited by Eglal Racked, Eva Rathgeber, and David B. Brooks, Published by the International Development Research Centre, Ottawa, ON, Canada K1G 3H9 May 1996
- Wekesa M. and Karani I. (2009). *A Review of the Status of Emergency Water Trucking in the Arid and Semi Arid Districts of Kenya*. FAO for the Water and Environmental Sanitation Coordination.
- Wijk-Sijbesma, C. Van (1995) *Gender in Community and Water Supply, Sanitation and Water Resource Protection: A Guide to Methods and Techniques*. The Hague: IRC International Water and Sanitation Centre.
- World Commission on Environment and Development (WCED) (1987). *Our common future*. Oxford U.K.; New York: Oxford University Press.
- WHO/UNICES (2004). *Joint Monitoring Programme for Water and Sanitation. Coverage Estimates for Improved Drinking Water*.
- WSP, AusAID, January 2004. *"Identifying elements of sustainability"*.
- Wright, A.M. (1997). *Towards a Strategic Sanitation Approach: Improving the Sustainability of Urban Sanitation in Developing Countries*. Washington DC: UNDP/World Bank Water and Sanitation for Health Program.
- Yacoob, M. and Walker, J. (1991) *Community management in water supply and sanitation project: costs and implications*. *Journal of Water SRT-Agua*, 40(1):30-34.
- Yuerlia, Febriamansyah R., and Saptomo A., ((2004). *Peoples' Participation in Rural Water Supply and Sanitation Project: A case study in Jorong Kampung Baru, West Sumatra, Indonesia*.
- Zimmerere, T. and Yasin, M. M. (1998). *A leadership Profile of American Project Manager*. *Project Management Journal*, 29(3).

APPENDICES

Appendix 1: Letter of Transmittal of Data Collection Instruments

Godfrey Okoth Ochelle

P.O.BOX 249

Emali

To whom it may concern,

Dear Sir/Madam,

RE: Investigation into the factors that influence sustainability of community water projects in semi arid areas in Kenya; a case of community water projects in Mulala division.

I am a postgraduate student at the University of Nairobi pursuing a Master of Arts degree in Project Planning and Management. I am currently undertaking a research project on the factors that influence sustainability of community water projects in semi arid areas in Kenya; a case of community water projects in Mulala division.

I am pleased to inform you that you have been selected to participate in the study. I therefore request you to provide data through the questionnaire that will be administered to you. Your identity will be treated with utmost confidence and the data provided will be used for academic purposes only.

Yours faithfully,



Godfrey O. Ochelle

Appendix 2: Questionnaire for members of water committees

Introductory Remarks

I am Godfrey Ochelle, a student at the University of Nairobi, School of Continuing and Distance Education. I am currently undertaking my research project as a requirement for award of the degree of Masters of Arts in Project Planning and Management. The study is on the factors influencing sustainability of community water development water projects.

The findings and recommendations of the study will contribute to the knowledge base in the water and community development sectors. Therefore, I would like to collect data that will assist in accomplishing the objectives of this study. Kindly answer the questions by ticking and/or explaining. Your contribution will be much appreciated and the information provided will be treated with utmost confidentiality. Kindly answer the questions in this questionnaire.

A. Demographic Characteristics

1. Please indicate your gender M () ; F ()

2. Please indicate your age group

Below 20 years

21-35 years

36-50 years

51-70 year

Over 71 years

3. What is your marital status?

Married

Single

Divorced

Others
(specify).....

4. Please indicate the highest level of education attained

- Never attended school
- Primary level
- Secondary level
- College level

B. Community Participation

5. Which are the water projects being implemented in your community you consider more sustainable?

- Bore holes
- Shallow wells
- Sand dams
- Pipeline extensions
- Water tanks
- Any other (specify)

6. Did the members of the community participate in the conception and design of the water projects?

- Yes
- No

7. If Yes, what is your assessment of the level of their participation in the conception and design of the projects?

- Poor
- Fair
- Good
- Excellent

8. Did the members of the community participate in the implementation of the water projects?

Yes

No

9. If Yes, what is your assessment of the level of their participation in the implementation of the project?

Poor

Fair

Good

Excellent

10. In your opinion, do you feel that your contributions influenced decisions made during conception, design and implementation of water projects?

Yes

No

11. Do community members make contributions in kind or cash for implementation and maintenance of water projects?

Yes

No

12. Is the water committee you are a member of registered by government?

Yes

No

13. What is your assessment of women representation in the membership of community structures for management of water projects?

Unsatisfactory

Satisfactory

Very satisfactory

14. Is there a water project that you are aware of that was initiated in your area but it failed?

Yes

No

If yes, why did it fail? Explain.

C. Project Financing

15. Which is the main source of financing for implementation of water projects in this community?

- NGOs/Donors
- Government
- Community Members
- Individual philanthropists
- Any other (specify)

16. Are you aware of the total cost of the water projects that you are involved in?

- Yes
- No

17. In cases of system breakdown, who always meet the financial cost of maintenance?

- NGOs/Donors
- Government
- Community Members
- Individual philanthropists

Any other (specify)

18. In your opinion is the community capable of meeting the cost of operation and maintenance of water projects without further donor support?

Yes

No

19. If yes, how does the community raise the finances?

Individual Community members' contributions

Sale of water by the committee members

Loans

Any other (specify) _____

D. Community Training

20. Have you been trained on operation and maintenance and management of water systems?

Yes

No

21. How many trainings have you received on operation and maintenance of water systems?

22. Were the trainings facilitated by trainers with technical background in water resources?

Yes

No

23. If you have been trained in operation and maintenance of water sources and systems, how do you rate the effectiveness of the training?

- Poor
- Fair
- Good
- Excellent

24. Are the trained members of your water committee involved in the operation and maintenance of the water projects?

- Yes
- No

25. If NO why?

- Lack of the technical skills
- Donors responsible for maintenance
- Government responsible for maintenance
- Individual philanthropists responsible
- Any other (specify).....

E. Recommendations

26. What are your recommendations in order to have sustainable water projects?



THANK YOU

Appendix 3: Key Informant Interview guide

Introductory Remarks

I am Godfrey Ochelle, a student at the University of Nairobi, School of Continuing and Distance Education. I am currently undertaking my research project as a requirement for award of the degree of Masters of Arts in Project Planning and Management. The study is on the factors influencing sustainability of community water development water projects.

The findings and recommendations of the study will contribute to the knowledge base in the water and community development sectors. Therefore, I would like to collect data that will assist in accomplishing the objectives of this study. Kindly answer the questions by ticking and/or explaining. Your contribution will be much appreciated and the information provided will be treated with utmost confidentiality. Kindly answer the questions in this questionnaire.

A. Respondent's details

1. Position of respondent _____

B. Community participation

2. To what extent do community members participate in the conception, design and implementation of the water projects?
3. How do contributions of community members influence decisions being made during conception, design and implementation of water projects?
4. Which community structures are in place for management of water projects and what are the functions of the structures?
5. What is the level of women representation in the membership of community structures for management of water projects?

C. Project Financing

6. What is the percentage of contribution by your organization to the projects costs?
7. Do community members make contributions in kind or cash for implementation and maintenance of water projects? If yes, how?
8. What is the percentage of community contribution to the projects?
9. In your opinion is the community capable of meeting the cost of operation and maintenance of water projects without further donor support? If yes, how?

D. Project Management Practices

On a scale of 1 to 5 (where 1 is the lowest scale at the poorest and 5 is the highest scale at the best) how do you rate the performance of your organization in relation to project management approaches? (Tick appropriately)

Practice		Scale				
		1	2	3	4	5
10	Water projects goals and objectives are clear					
11	Functions, responsibilities and lines of authority of the project manager and water committees are properly defined.					
12	Project manager has the necessary knowledge and skills required for successful implementation of water projects					
13	Standard project management tools and techniques such as work plans and monitoring and evaluation plans are used for managing the project					
14	The progress of water project implementation and project team work is frequently reported in project meetings					
15	There is adequate, quality and timely communication within the project team					
16	The roles of all project team members are clear					

Practice		Scale				
17	Top management entirely support the project monitoring and progress					

E. Community Training

- 18. Have water management committee members been trained on operation and maintenance and management of water systems?
- 19. In your opinion, were the trainings you delivered relevant towards enhancing the capacity of the community members to operate and maintain the water systems?
- 20. Who facilitated the training sessions and what were their qualifications?

21. Recommendations

What are your recommendations for enhancing sustainability of water projects?

.....

.....

.....

THANK YOU

Appendix 4: List of Water Projects with Water Management Committees

LIST OF WATER PROJECTS WITH COMMITTEE MEMBERS IN MULALA DIVISION		
NO.	NAME OF THE PROJECT	LOCATION
1	Kimbingo Pipeline Water Project	Mulala
2	Kambiwa Pipeline Water Project	Mulala
3	KwaMusyimi Sand Dam Water Project	Mulala
4	KwaMwaniki Sand Dam Water Project	Emali
5	KwaKakulu Pipeline Water Project	Mulala
6	Kwa Sammy Shallow Well Water Project	Emali
7	KwaMutukuShalloe Well Water Project	Emali
8	KwaMukusu Shallow Well Water Project	Emali
9	KwaKisalu Sand Dam Water Project	Emali
10	Mulala Pipeline Water Project	Mulala
11	Maatha Borehole Water Project	Mulala
12	Mwanyani Borehole Water Project	Mulala
13	Tutini Borehole Water Project	Emali
14	Emali Water Project	Emali
15	Matiku Earth Dam Water Project	Mulala
16	Mwanyani Earth Dam Water Project	Mulala
17	KwaMuthama Borehole Water Project	Emali
18	Kyunguni Sand Dam Water Project	Emali
19	Mutua Earth Dam Water Project	Mulala
20	Masaani Earth Dam Water Project	Mulala
21	KwaNgumbi Sand Dam Water Project	Emali

LIST OF WATER PROJECTS WITH COMMITTEE MEMBERS IN MULALA DIVISION		
22	Muini Sand Dam Water Project	Mulala
23	Wes Soil Sand Dam Water Project	Emali
24	Matiku Shallow Well Water Project	Mulala
25	KwaNgiti Shallow Water Project	Mulala
26	Barazani Shallow Water Project	Mulala
27	Kiliini Borehole Water Project	Mulala
28	Mutyambua Borehole Water Project	Mulala
29	KwaSelee Sand Dam Water Project	Emali
30	Kelengeni Water Project	Mulala
31	Manooni Water Project	Mulala
32	Kavuthu Dispensary Borehole Water Project	Mulala

Source: Divisional Water Office (Mulala Division)