FACTORS INFLUENCING THE SUSTAINABILITY OF RURAL WATER PROJECTS: A CASE OF KALONGONI WATER PROJECT IN KILIFI COUNTY, KENYA.

BY

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DECLARATION

This research project report is my original work and has not been presented for any academic award in any university.

EVA KADZO KONDE

Reg No: L50/78004 /2015

Signed ……Date ……..

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

Signed …….....

Date…….....

Mr Kisimbi

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DEDICATION

This research project is dedicated to my parents Mr. Samuel Konde and Mrs. Mary Dhahabu Konde, and to my beloved husband Mr. Darwin Mogoa.To my siblings Margret, Judy, Gideon, Simon, Steve and my dear friend Miriam, I hope this study will inspire you to work hard and achieve your ambitions.

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LIST OF ABBREVIATIONS

GOK: Government of Kenya

MDG: Millennium Development Goals

NGO: Non-Governmental Organization

NWP: National Water Policy

O&M: Operation and Maintenance

UN: United Nations

UNDP: United Nations Development Programme

UNICEF: United Nations Childrenôs Fund

USAID: United States International Development

WASH: Water, Sanitation and Hygiene

WCED: World Commission on Environment Development

WHO : World Health Organization

WSP : Water and Sanitation Programme

NWCPC: National Water Conservation and Pipeline Corporation

WRMA: Water Resources Management Authority

WUA: Water User Associations

NMWP: National Water Master Plan

UNEP United Nations Environment Programme

ABSTRACT

This research study investigated factors influencing sustainability of water projects in Bamba division, Kilifi County, Kenya. The researcher particularly sought to examine why in spite of the concerted efforts by developers, sustainability remains a challenge especially 12-15 months, after completion of the water project. This study applied descriptive survey. The study population constituted of the household heads. The respondents were reached through household survey. The study exploited both probability and non-probability. The topic was conceived after the researcher conducted monitoring and evaluation on the micro projects and found out that sustainability of the projects was questionable since most of the groups had disintegrated and some projects were un-attended to. The study was conducted through descriptive research survey, data amassed from 1st November to 5th November 2016 using questionnaires from the sample of 90 respondents out of 2,520 beneficiaries. Research findings established that economic factors such as presence of income generating activities and over reliance on donor funding have major effect on sustainability of community projects.. Technology has an impact in ensuring the sustainability of community projects in this area. Community participation especially the role played by the community in the project selection was found to be having a major impact on long term maintenance of the community projects. And the study recommends that the community members need to understand the need to engage in income generating activities so as to boost their earnings. There is a need for the local developmental organizations to promote community awareness on the viable income generating projects such as bee keeping (dry land fanning) that can be initiated in the area, need to ensure availability of spare parts and inputs that are necessary in day to day operations of development projects in the area, government to improve road network in the area so that these supplies can reach the local markets for easy access locally and a need for alternative and long lasting ways of sustaining water access all year round. The researcher suggests that it is necessary to conduct further studies to identify the alternative measures to be done for water.

CHAPTER ONE
INRODUCTION

1.1 Background of the study

In his book, Kidd (1992) stated that series of ideas have largely emerged since 1950 about the relationships among rates of demographic development, use of resources and pressure on the .these include the ecology root, resources root, the biosphere root, technology root, the ñno growth/slow growth rootò and the eco development root. These concepts were fully developed before the term ñsustainabilityò came into light. The roots are antagonistic evaluations of coming future generation. The roots are defined by their physical and normative concepts .Some include values like equity, wide participation in governance, and decentralized government. Normative concepts were common when the term, sustainability, was used in 1972. This continued later in the United States to justify a ñno growthò economical conditions. In 1978, the term, sustainability, was used by the United Nations in their documentations. Normative concepts known as ,eco development, were widely applied in the United Nations publications.

Brown, et al, (1987), say that sustainability is reliably and importantly viewed as an aim growth and management of the environment. This term has been applied in different disciplines such as the forestry and fisheries. The explanation of the idea highly depends on the discipline in question. It can be economic, social or even in an ecological perspective. Sustainability can either be narrowly or widely explained, however, a useful definition must explicitly give a descriptive specification the context and temporal scales that are considered. In the year 2010, the Academic Advisory Committee for the Office of Sustainability at the University of Alberta defined sustainability being ñthe process of living within the limits of available physical, natural and social resources in ways that allow the living systems in which humans are embedded to thrive in perpetuity.ò Therefore sustainability of water projects would involve making use of the available natural resources to ensure security, financial independency and attaining basic necessities to achieve the set objectives for the future and our future generations. This requires good management.

The Aswan High dam was completed after an 11 yearsô construction on July 21, 1970. The massive dam brought to an end the cycle of flood and drought in the Nile River region, and used as a source of renewable energy. The Dam ended the Nileôs frustrating

floods, recovered more than 100,000 acres of desert land for cultivation. The damôs 12 giant Soviet-built turbines boost the Egyptian economy by producing as much as 10 billion kilowatt-hours annually and introducing 20th-century life into many villages.

The Water Resources Management (2015) points out the vitality of water as a unique source of life, if there was no water there would be no life on earth. Globally, water is considered both a social and economic right. This double faceted approach has in many occasions been used more to the detriment rather than the well-being of citizens. Water is important for human survival, health and dignity and is classified as a basic resource for human development. The worldôs freshwater resources are under increasing pressure. The Millennium Development Goals (MDGs), in 2000, put an agreement directing to halve the proportion of people without sustainable access to safe drinking water and basic sanitation between 1990 and 2015. To attain the requirements of the right to access to safe drinking water requires real improvements for several billions of people.

The Millennium Development Goals (MDG) has targeted reduction by half the proportion of people without sustainable access to safe drinking water by 2015. Advancements have been done towards meeting the water supply needs for the worldôs poor, for example, in 2002, 79% of the population in developing countries had access to improved water supplies, bringing up the total world coverage to 83%. (WHO/UNICEF 2008)

According to UNEP (2010) the availability and access to water is more crucial in Africa than elsewhere on earth. In Africa, Poverty is widespread and although it is rapidly urbanizing, the majority of its population is still rural-based and dependent on agriculture. In sub-Saharan Africa, 40% of the population has no reliable access to safe water.

Kenya, being, a sub-Saharan African nation with statistics that mirror the UNEP baseline, is among the water-scarce countries in the world. The World Bank (2004) however noted that, water heavily impacts major sectors of Kenyaôs economy hence inadequate quality water is therefore a significant obstacle to development. The World Resources Institute, (2007) realized that increased investment in rural water supply development in the last decade by both Government and development partners has not resulted in the desired levels of anticipated service. Many rural water supplies completed have either stopped operating or are not operating optimally in spite the major efforts. Most of the

dysfunctional water sources are operated and managed by community-based organizations such as Community Water and Sanitation (WASH) Committees, Water User Associations (WUA) or Women groups.

Kenya is a water scarce country, whose challenge has increased due to deforestation, wetlands encroachment, over grazing and increase of human settlements into areas previously under forest cover. These activities, have grossly contributed to degradation of forest and vegetation cover with a corresponding decline in renewable water resources .As a result springs, aquifers, rivers and lakes water levels are reducing alarmingly.

The National Stakeholders Consultation on water (2015) discovered a range of technical solutions in Kenya, which could really work if good management structures are put in place. They outpointed that for sustainable development and management of water resources, there is need to comprehend water resources potential and limitation, ensure sustainability of water resources ,stop and reverse abjection in water catchment areas, develop and draw in more water resources, be informed on adaptation measures and mitigation of climate change and reduced effects of water based emergencies. In addition, they highly recommended the sustainable access of water for productive purposes by improving knowledge, ensuring sustainable and efficient use of water with more emphasis on tertiary use of water.

The Integrated Water Resources Management Authority adopted by the government of Kenya demand participation of community members in making decisions concerning their resources. The management holds that the distribution of water and its use is one of the leading causes of conflict both at local or regional levels. In fact, with climate change water is seen to be the most fought over natural resource of our times.

The coastal region of Kenya especially Kilifi County has been for quite a long time suffered this predicament of shortage of water. This research will study the factors influencing sustainability of rural water projects in Ganze Division, Kilifi County Region.

1.2 Statement of Problem.

The Pacific Institute for Studies in Development, Environment and Security, observe that it is increasingly obvious that the water policies set aided the state of Californiaôs River

Colorado to become the agricultural and economic giant. in Egypt, The reservoir created by the Aswan High Dam brought to an end, the Nileôs floods .They recovered 100,000 and more acres of desert land for cultivation, and made additional crops possible on 800,000 other acres. As stated by the water management resource authority, (2015), the Water Resources sub-sector launched and disseminated the National Water Master Plan 2030 (NMWP 2030). In addition the sub-sector reviewed the catchment management strategies for Athi and Lake Victoria North catchment areas which resulted in the development of 38 sub-catchment management plans. The Groundwater Survey in Northern and Central Turkana was completed. 12 new water resources monitoring stations were established and 72 Water Resource User Associations (WRUAs) were formed. The trans-boundary policy was finalized and approved. The management and protection of sea water within the territory of Kenya is to be included in Water Resource Management by the Water Bill 2014. Successful implementation of these guidelines ensures water resources continue to be available for all users and uses in adequate quantity and quality. However , according to the Kenya report of 2005 more than a half of the rural dwellers in Kenya have little access to safe drinking water. Harvey and Reed (2003) outlines what commonly controls sustainability to most African countries which include: commercialized involvement and sustainable structures most African Governments have taken over the hand pump policies as in regard to the donors.

Ogendi and Ong'o(2013) ascertain that many people in the county depend on many forms of daily water provision like dependency on wells and rivers. Moreover, this dependency on the two sources is not sustainable all year round, since during the dry season most of them dry out. The Governmentôs attempt of sinking boreholes and water pans, water shortage still remains a problem among the poor rural inhabitants.

1.3 Purpose of the Study

The purpose of the study was to establish factors influencing sustainability of rural water projects in Kenya. The case of Bamba Division in Kilifi County.

1.4 Objectives of the Study

The study was based on the following objectives.

i. To find out the degree to which community participation influences the sustainability of water projects.

ii. To evaluate the influence the government has on the sustainability of rural water projects.

iii. To establish the extent to which technology influence the sustainability of rural water projects

iv. To determine how external factors influence the sustainability of rural water projects

1.5 Research Questions

The research answered the following research:

i. To what degree do community members influence the sustainability of rural water projects?

ii. Does the government influence affect the sustainability of water projects?

iii. To what degree does technology influence the utility of water projects?

iv. To what degree do external factors influence the sustainability of water projects?

1.6 Research Hypothesis

The research was guided by the following alternative hypotheses tested at 95% significance;

$H_1$1: There is a significant relation between community memberô participation an d sustainability of rural water projects.

$H_1$2: There is a significant relation between the influence of th government and sustainability of rural water projects.

$H_1$3: There is a relation between technology used and the life span of rural water projects.

$H_1$4: There is a significant relation between external factors and the sustainability of rural water projects.

1.7 Significance of the study

Itôs desired that this study will generate recommendations on sustainability strategies that have more influence on the performance of rural water projects, which has just received funding from the Kenyan government to help the local people implement the set water policies that would otherwise lead to drought and famine if not implemented.

It is desired that the study will be a critical contribution to knowledge on sustainability of water resources and how they influence performance of productive sectors of economy. The study contributes to the knowledge that assists the sector to develop strategies for enhancing already existing projects and lessons for upcoming projects. The findings also assist in the design and formulation of future sector rural projects and contribute into the research process and educate the content of the field study in addition to serving as an instrument, or reference source, for those working on the planning and design of rural water projects and contribute to sector knowledge more expansively. It is desired that the discoveries of this research will be useful to stake holders such as the county government, NGOs, community members come up with sustainable interventions to advance uninterrupted domestic water access in Kilifi County.

1.8 Delimitations of the study

The study on factors influencing the sustainability of water projects was restricted to Kilifi County. The subjects targeted are mainly households, water management committees and the District water officer as key informant .This project is selected since it is working in Kilifi County where it invested heavily water projects under study. In Bamba, many water projects have been implemented. Additionally, the study is delimited to the study variables only.

1.9 Limitations of the study

One limiting factor was the time availability. In trying to overcome this challenge, a reach assistant was involved to assist in data collection for the study. Through the research assistant, the researcher was able to interview the subjects over the phone. Those easily accessed were directly interviewed.

Some of them were illiterate and may not read the questionnaire which is in English as they are only conversant in Giriama and Swahili languages.

1.10 Assumptions of the study

In conducting this study, the researcher took into assumption that:

i. The respondents taking part in the study were willing to honestly answer questions to the best of their ability and knowledge.

ii The respondents represented a major population of membership of the water project.

1.11 Definition of significant terms.

Participation- Involvement, either actively or passively, in the process of project implementation.

Inconsistency - unreliable water supply.

Maintenance- things required or undertaken to conserve as nearly, and as long, as possible the original condition of an asset or resource while compensating for normal wear and tear.

Sustainable structure-This is a structure and the using of processes that are environmentally responsible and resource-efficient throughout a structureôs life-cycle: from citing to design, construction, operation, maintenance, and renovation.

Water supply system- Refers to all physical infrastructure constructed for the purpose of extraction, storage, supply, distribution and treatment of water for use.

Project-This is an undertaking that is planned and that involves money, personnel and equipment.

Sustainability- This is basically the ability to be supported and sustained

Government- The countryôs administrative unit.

1.12 organization of the study

Chapter one touches the background of the research in which the contextual and conceptual issues are surveyed including evolution of sustainability, water sustainability and the influences of sustainability of water projects from a global perspective to a local

one. The chapter gives direction for the study through stating of objectives, the significance of the study, its delimitation and limitations.

Chapter two talks about theoretical literature on the sustainability and how factors influencing sustainability of water projects. The chapter provides a foundation upon which the findings of the study are discussed and conclusions drawn. The chapter finally identifies the knowledge gap from the literature studied

Chapter three involves an explanation of research methodology used in the study in the field. Chapter four analyses data presents and interprets the data of the study findings while Chapter five discusses, summarizes, concludes and give the way forward

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This layouts literature related to the factors influencing sustainability of water projects in different parts of the world to, Kilifi County in Kenya. It includes findings of other researchers and a conceptual framework on which the study is based.

2.2 The concept of sustainability

Sustainability originates in the United Nations 1987 Brundtland Commission Report and even earlier in the 1980s World Conservation Strategy. The concept, starting from an ecologically based concept in the 1970s and in the World Conservation Strategy, it changed into an understandable socio-economic approach. The Brundtland Report of the World Commission on Environment and Development (WCED 1987) viewed sustainability as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. According to the WCED (1987), sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.

"Sustainable development is a normative concept that embodies standards of judgment and behavior to be respected as the human community the society seeks to satisfy its needs of survival and well-being"

2.3 community members' participation in sustainability of water projects

Batchelr, McKemey, and Scott (2000) have shown that strong leadership for community management is Critical to sustainability of water projects. Mushtaq (2004) defined community participation as a process by which people from all sects of community (rich, poor, Men, women, uneducated, educated, and so on) can influence or control those decisions, which affect their lives. This involves participation of project beneficiaries, women and men in decision making, design, construction and operation and maintenance of community projects.

Effectiveness of organization requires some basic competencies in the area of knowledge, attitudes and skills. In most cases, these competencies are lacking in community

organizations as highlighted by (Korten 1989, in Munguti 2008). This is also confirmed by Constantino-David (1995). One such essential competence is the financial management of the post project implementation phase, as cited in Binder (2008), budgeting, accounting and proper financial records and transparency for community water supply systems is critical to ensuring accountability and proper maintenance. Financial feasibility during project planning is critical to ensuring project sustenance without continued external support. Projects should therefore include long term benefits during planning.

In Nigeria, rural water projects have suffered as a result of poor co-ordination, poor maintenance culture, and lack of community ownership, poor technical and institutional structure and over bearing bureaucratic control by various supervising ministries. Due to lack of community participation this has led to poor operation and maintenance of water projects. This is because of use of inappropriate technology, incorrect location of supply systems, water being sold expensively and lack of social acceptability because of presence of minerals which affects water taste for a few water sources. The demand for community water supply projects are localized demands, hence managerial decisions about levels of service, location of water facilities and cost sharing should be made locally (Mamburi ,2014).

Kenya has a strong culture of self-help which has been harnessed for many development activities especially in the rural areas. According to a report by World Bank, 2003 for the eight million Kenyans who had access to improved water in rural areas, 30% were served by management water supply schemes. These schemes are led by water community committee or caretakers. One challenge observed in the management of these committees is the relationship between the water committee and community that is often disrupted because of lack of communication, misunderstanding of the rules of the executive, lack of accountability of the management of the systems.

Other issues of conflict relate to: - water conflict between the rich and the poor in the community, the need to involve all groups in conflict management, the need for clear and transparent roles and regulations, the rules of outside agencies such as donors and the government, and the need to monitor system (Bretty, 2003) and the need for personal responsibility/ commitment for the community water project.

The ministry of water and irrigation in Kenya has made efforts time and again to enlighten the community on the importance of their participation in the water issues including the projects of the same. According to CPC (2007), CPC is an approach developed to enhance the capacity of the communities to apply for, implement, manage, and maintain their own water supply projects, It has done a lot in empowering community members (Mulwa,2013).

Indicators of community ownership and management include; the community legally owning and controlling services, site selecting, choosing the kind of services it needs , can afford and can support with local and financial resources, the community has to set up a committee that is :accountable for management of water projects, responsible in operating and maintaining the water systems, including collection of funds and purchasing goods and services required in maintaining the systems. The community should allocate its own custodian to receive training and tools and be responsible for corrective maintenance and repairs. Mamburi, (2014) backed this up and said that sustainability rate of rural water supply systems increases as a result of communitiesô owning and managing their schemes, existence of management organization at the village level, protection of the water point, communities cost recovery for operation and maintenance, technology type and availability of their spare parts.

2.4 The influence the government has on the sustainability of the water project

Oduor,(2015) said that leader in sub Saharan African countries mostly deviate resources meant for the poor and De Wit and Berner (2009) strongly suggest that this selfishness halts the projects development especially when they establish a relationship with the local elites creating room for exploitation of resources meant for the impoverished. In Nigeria, the role is divided up between three levels of government ï the federal government, the state government and the local government. The federal government manages water resources; state governments supplies water to the urban areas and local governments together with communities deal with water supply in rural areas which do not have resources to do so. State and federal governments provide limited finance while most of the water projects are financed by donors.

The Kenyan government through its ministry of water and sanitation has helped come up with water projects, for instance, Maruba Dam.The dam supplies water to parts of

Machakos town and its environs. The ministry should aim at involving the local community and licensed expertise in logical matters involving community projects.

2.5 Influence of technology on the utilization of water projects.

Numerous studies have repeatedly shown a positive relationship between a projectôs technological innovation and project sustainability, and concluded that technological innovation is important for performance and sustainability (Foster, 1986).

In a study conducted in rural India, it revealed that approximately a third of Indiaôs hand pump in rural water projects are either nonfunctional or in need of repairs. Through the program access to safe water increased from less than 10 per cent to 31 percent. This achievement was as a result of NGOs organizations, NGOs using technologies and pumps that require village level operation and maintenance. The government of India created demand so that private companies stepped in to produce the hand pumps and spare parts. The government also trained engineers and mechanics to use and repair these new technologies at the community level so as to enhance ownership of community water projects (Mackenzie and Isha, 2005).

Technological innovation has enormous influence on community based project (Nohria and Gulati, 2006). In a quest to save themselves from drought, villagers from Tamil Nadu planned to follow traditional practices of water harvesting. Villagers started old water harvesting practices in a structure called Oorani. With the help of Dhan Foundation, the villagers set up a Tank Users Association to restore these ponds. Oorani is a dug out pond that traps rainwater run-off and stores it for future use. This was practised almost 2000 years back, and since then they have been left abandoned. It is found in areas where water is either inadequate or unfit for use. The stored water is mainly used for drinking and for livestock. They play a huge role in conserving water and are very beneficial for farmers. It is a source of irrigation for farmers who cannot afford other sources of water for irrigation. Oorani can be used to store rainwater which will help farmers to irrigate their lands without depending on other expensive sources of water supply. The water can also be used for drinking and can be consumed by livestock. It not only helps the local people but also the neighboring villagers who come to the village to draw water. The lives of women and children have been improved since they donôt have to walk miles to fetch water. (Indiatimes, 2016).

Sustainable structure create environments that are livable, comfortable, safe, and productive.(WBDG-whole building design guide- Sustainable Committee,2015) Building owners, designers, and builders face a unique challenge to meet demands for new and renovated facilities that are accessible, secure ,healthy, and productive while minimizing any negative impacts on society, the environment, and the economy. Ideally, building designs should result in net-positive benefits to all three areas.

Factors involved in the non operational state of rural water facilities in Ghana include: low income, lack of access and purchasing ability of spare parts. To cub this, the spare parts need to be accessible. Ownership of projects is influenced by the ease of operation and availability of spare parts for the technology incorporated in the water systems (Fielmua 2011).In Tanzania surveys have found that only 46% of existing rural water points are functional, and a quarter of the newly installed systems fail after only two years of operation. This problem of lack of sustainability is associated with lack of finance especially for operation and maintenance, lack of technical personnel at the project level, lack of spare parts and lack of community participation and ownership. (Alexia Haysom, 2006).

2.6 External factors

Factors such as political, environmental, legal and social factors are external to business. According to UN report(1996)which assessed world water resources, there is a growing water dependency on fresh water due to increase in population. Over a third of the world population live in areas under stress of water .It is assumed that in future ths areas might be forced to import products that need water in processing and production.

According to research Jordan and Israelós population is likely to rise above 3 percent

And 2 percent respectively .This is likely to create pressure on water resources. The conflicts in the Middle East that have led to immigration and other forms of transitions will lead to pressure on the available water resources .According to (Howe and Linaweaver, 1967; Bruvold, 1988). The consumption of water in households is controlled by those living in those areas. Income has also been cited as the cause of water in availability because the poor lack money in digging water holes, construction of water tanks and payment of water bills.

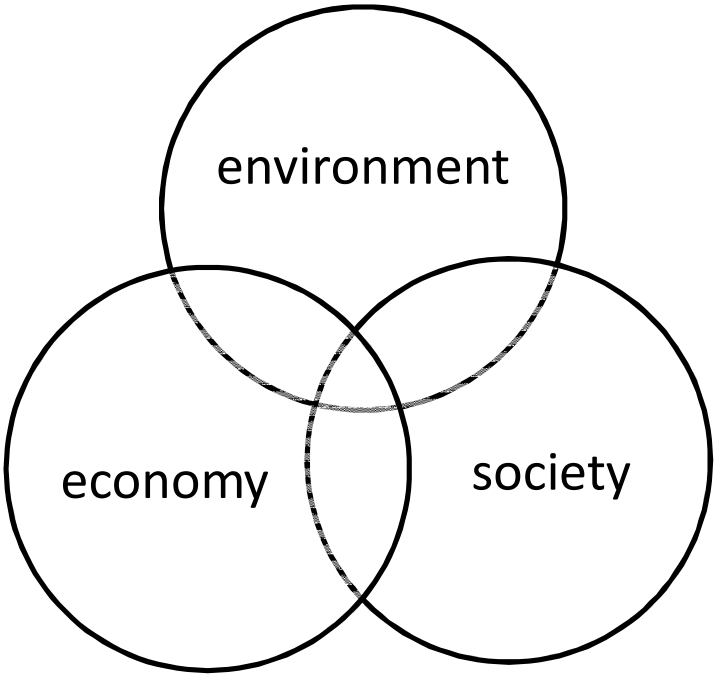
2.7.1 Sustainability theory.

The Brundtland Report gave the term ñsustainable developmentò international public prominence. It defined ñsustainable development as development that meets the needs of the present without compromising the ability of the future generations to meet their own needsò (WCED 1987).

Sustainability means meeting our own needs without compromising the ability of future generations to meet their own needs. In addition to natural resources, we also need social and economic resources. Sustainability is not just environmentalism. Embedded in most definitions of sustainability we also find concerns for social equity and economic development.

In his report, Tifow, (2013) comments that many theories of sustainability have been espoused and have been organized through such terms as weak or strong or eco centric or anthropocentric. These have become too complex. Increasingly sustainability models have begun to look at sustainability in the context of what must be sustained. These models- economic, ecological or political- are not mutually exclusive and often integrate complementary strengths of the other

Figure 1.1: Three pillars of sustainability



2.7.1.1 Environmental Sustainability

The natural resources within the society are free to all but used in a way so that they can regenerate by themselves for future use.

2.7.1.2 Economic Sustainability

This is where everybody has been empowered economically such that they are financially able to meet their needs .These economical systems are available to everybody.

2.7.1.3 Social Sustainability

All people have access to human rights and resources that keep the societies healthy and secure. There is little discrimination in labor and cultural rights.

2.7.2 Four capital model

This model is subdivided int four:

Human Capital, Financial Capital, Environmental Capital and Manufactured Capital.

I. Human capital refers to resources related to human and their abilities which include labour, influence and Power. Effective utilisation of human capital creates social sustainability.

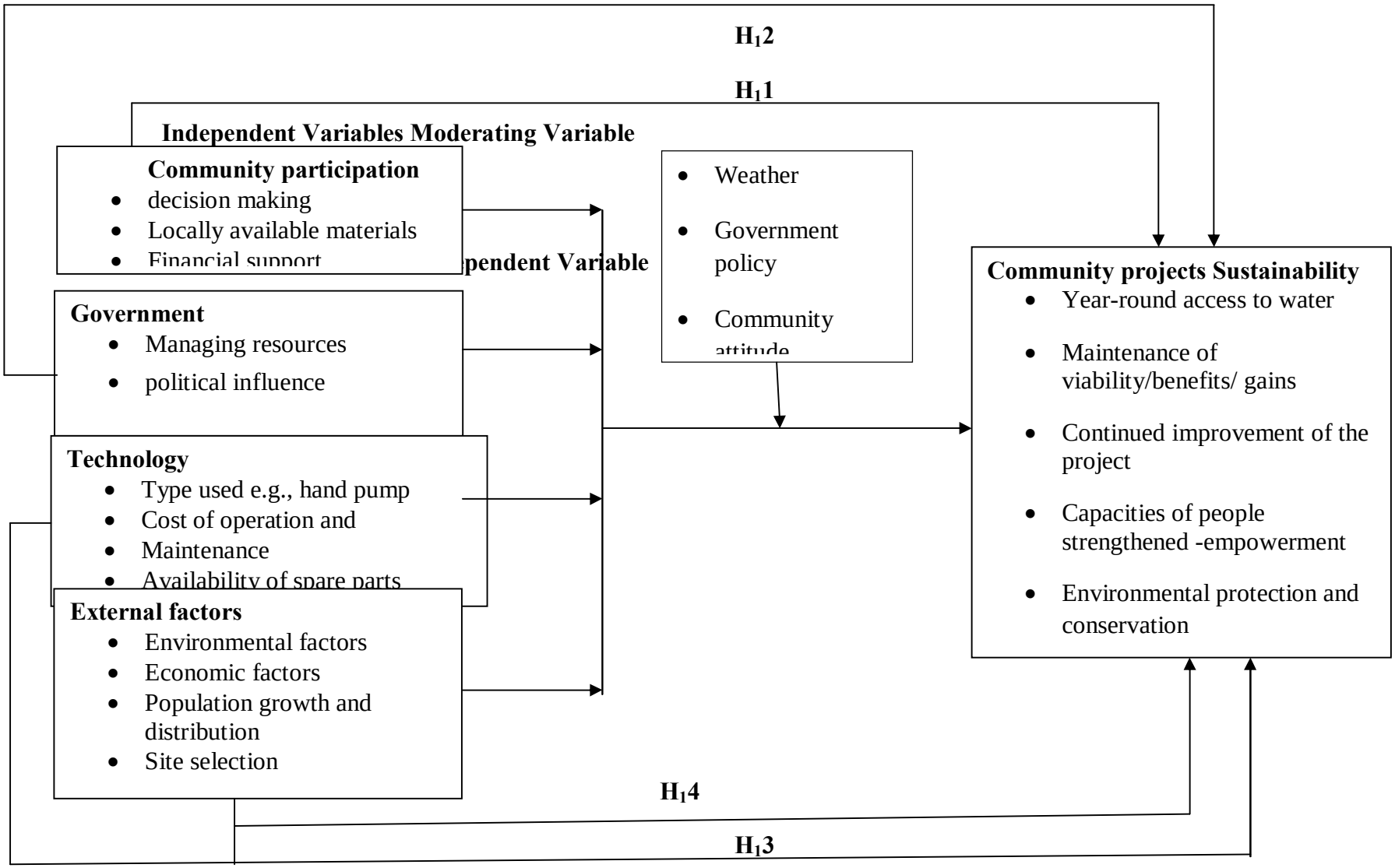
II. Financial capital is related to money: cash, debt, monetary policies that are aimed at maintaining balance in creating financial sustainability.

III. The Environmental Capital encompasses the natural resources in the society.

IV. The manufactured capital includes the man-made infrastructure and machines utilised for production.

This model put all these four capitals next to each other and talks about this fact that sustainable society is not possible to build without maintaining the balance among these four capitals and maintenance of their sustainability.

Figure 1.2: Conceptual Framework



2.8 Conceptual Framework

The conceptual framework above is a diagrammatic representation of the relationship between the variables. Community participation, governance and sustainable structures are the independent variables for this study. They influence the dependent variable which is; community ownership of water projects.

This relationship is affected by the Government policy which is an intervening variable and will not be measured in this study. The intervening variables which can affect the relationship between the dependent and independent variable are; weather conditions government and the attitudes of community members.

2.9 Relationships among the variables and the research gap

From the literature reviewed, it is clear that low sustainability of many rural water supply schemes is due to lack of community ownership and unsustainable structures. Community ownership of water projects is negatively influenced by the use of inappropriate technologies, unavailability of spare parts, lack of local maintenance and operational capacity, lack of local community education and participation, ineffective community demand, lack of co-ordination of sector agencies and water facilities being sited from the beneficiary households.

If community water projects are to succeed, technical, social, economic and environmental aspects must be well coordinated. Without the interest and support of the target beneficiaries using the system, no project will succeed. This study will adopt the four capital model because combination or interaction of technical, institutional, social, financial and environmental factors influence the sustainability of The Water project. From the literature reviewed such a study has never been conducted in Bamba division of Kilifi County. This study will contribute towards the bridging of the knowledge gap.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

Basically the part involves a systematic analysis of the methods that the researcher applied when carrying of the study. This includes the research design, sampling procedure, data collection method, validity, reliability, data interpretation and ethical issues.

3.2 Research Design

This research applied the descriptive survey design..Thus, this approach was appropriate for this study as it helps to describe the state of affairs as they exist without manipulation of variables which will be the aim of the study. According to Churchill (1991) descriptive study is appropriate where the study seeks to describe the characteristics of certain groups, estimate the proportion of people who have certain characteristics and make predictions. Orodho, (2004) notes that the choice of the descriptive survey research design is made based on the fact that in the study, the research is interested on the state of affairs already existing in the field and no variable would be manipulated. Further, According to Bryman and Bell, (2003) descriptive study is concerned with determining the relationship between variables.

Three sub locations (Nambani, Katendewa and Kalongoni) with different projects that were formerly supported by Ngos and other donors were purposively considered. Some of these projects are actively operational however they are seasonal in nature.

3.3 Target Population

The population under study constituted the inhabitants of the three sub locations and the water and sanitation key informants are found in the same locality. This forms and cross section of people involving those who have been engaged in the development of projects, use, management, and experts about these community based projects. The respondents were indentified through household survey Further, the study focussed on the 20 employees in the water projects.

3.4 Sampling Procedure

The study employed the cluster sampling procedure where the population was not evenly distributed. Questionnaires were administered to the households with each cluster. The probability sampling technique used was purposive sampling which was used in conducting interviews to various local institutional leaders, NGOs and departments of the Governments. The purposive sampling was also applied in the selection of the participants in the group discussions.

3.4.1 Sample Size

The area of study is found in Kilifi County. According to the 2009 census, Bamba division has several locations and sub locations. The 3 identified sub locations under study are Nambani, Katendewa and Kalongoni. The identified three sub-locations forms part with a total population of 44,568 (Census data, 2009). The region has high and low potential areas in terms of resource distribution. The low potential areas constitute the ASAL with many water projects that have been undertaken by the local community with different external donors.

A sample from the households was picked because a household was taken in this study as an appropriate unit providing reliable information regarding the objectives of the study. Van Dalen (1979) lists three factors that he considers to determine the size of an adequate sample as (l) the nature of the population, (2) the type of investigation, and (3) the degree of precision desired. The formula for estimating the sample size based on confidence level needed from a given population was used from Yamaneôs formula(1967) below 95% level of confidence and a degree of variability of

50% $n= N/\{1+N(e)^2\}$

n is the sample size,

N is the population size

e is the sampling error

Applying a sampling error of 5% the sample size was obtained thus

$n=116/ \{1+116(0.05)^2\} =90$

3.5 Methods of Data Collection

The study collected quantitative data using a questionnaire from the respondents (community members that benefits from the community project water). Also, the study sought responses from staffs working in the projects. The researcher told the participants that the instruments administered were for research purpose only and that their responses were to be kept confidential. The researcher obtained an introductory letter from the University for collecting data from the community with the help of research assistants.

3.5.1 Pretesting of the instrument

The research tools were given to the participants to ensure that the question were relevant and comprehensible. It helped at checking the validity and reliability of the research tools.

3.5.2 Validity of the Research Instrument

According to Bridget and Lewin (2005), validity is the degree by which the sample of test items represents the content the test is designed to measure. Saunders et al., (2007) indicated that content validity is a measure of the degree to which data collected using a particular instrument represents a specific domain or content of a particular concept as intended. Lacity and Jansen (1994) define validity as making common sense, and being persuasive and seeming right to the reader while Cronbach, (1971), indicated that validity refers to results that have the appearance of truth or reality. A pilot study was conducted to perfect the research instrument to obtain a true representation of what is happening.

3.5.3 Reliability of the Research Instrument

Reliability is the stability and uniformity of the measurement. Itôs tested using the test retest reliability method Reliability refers to the consistency of measurement and is frequently tested using the test-retest reliability method. The questionnaires were split into two equal parts for the 5-likert scale questions correlation coefficient for the two parts was worked out and adjusted to reflect the questionnaire using Spearman Brown prophecy formula: $r_{sb}=2r_{hh}/(1+r_{hh})$: where r_{hh} is the correlation coefficient between the

two parts and r_{sh} is the adjusted correlation also known as SpearBrown reliability. A correlation of 0.946 was computed from the two parts and was corrected using spearman Brown prophecy formula. The instrument was reliable since the correlation was above 0.8 which is considered the threshold of a reliable instrument according to Monette (2005)

3.6 Data Collection Procedures

Data was collected using questionnaires. The researcher obtained approval from the university to conduct the research. The researcher elaborated on why the activity was being carried out and how to fill in the questionnaires. The researcher interviewed and did the filling of the information given by the respondents who were illiterate

3.7 Data Analysis Techniques

The researcher edited completed questionnaires for completeness and consistency. Data clean-up followed; this process involves editing, coding, and tabulation in order to detect any anomalies in the responses and assign specific numerical values to the responses for further analysis. . The findings were presented using tables for further analysis and to facilitate comparison. The coded data was then analyzed by use of descriptive statistics comprising of frequency tables .The hypotheses was tested by use of Chi Square. Data analysis was done using of SPSS 20.0

3.8 Ethical Issues

The researcher first obtained a research permit from the Ministry of water so that they were legally authorized to carry out the research and collect data. The researcher then wrote a transmittal letter informing the respondents that the research was for academic purposes and assuring them of confidentiality of their identities. Enumerators were asked not to record the names of the respondents in the questionnaire. Informed consent was obtained from the respondents before data collection was done, and only those that agreed to participate were engaged in the survey.

3.9 Operationalization of Variables

Operational definition of independent, dependent and moderating variables will be as shown

Table 1.1 Operationalization of Variables

Objectives	Variables	Indicators	Measurement scale	Tools of analysis	Specific tool
To establish the extent to which the role of community members participation influence the sustainability of the community water project	Independent: community members participation Dependent: Sustainability of the rural community based water projects.	• decision making • Locally available materials • Financial support • sense of ownership	Nominal	Causal relationship	Correlation analysis
To assess the influence the government has on the sustainability of the water project	Independent: government	• Managing resources • political influence	Nominal	Central Tendency Dispersion, and Causal relationship	Mean, standard deviation, regression and Correlation analysis
To establish the extent to which established technology influence the utilization of the water project	Independent: technology	• Type used e.g., hand pump • Cost of operation and • Maintenance • Availability of spare parts	Interval	Central Tendency Dispersion, and Causal relationship	Mean, standard deviation, regression and Correlation analysis
To determine how external factors influence the sustainability of the water project	Independent: External factors		Nominal	Central Tendency Dispersion, and Causal relationship	Mean, standard deviation, regression and Correlation analysis

CHAPTER FOUR
DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

The section gives the data on the study carried out on factors influencing sustainability of water projects in Kilifi County.

4.2 Questionnaire Return Rate

Questionnaire response rate indicates the percentages of the questionnaires that were filled and returned by the respondents. The returned questionnaires were the ones analyzed. Table 4.1 shows the response rate from the sample size.

Table 4.1 Questionnaire Return Rate Rates Targeted

	Targeted	Returned	Percent
Household respondents	90	74	82.22%
Water project employees	20	20	100%

Out of the 90 respondents targeted in the study, 74 completed and returned the questionnaire which constitutes 82.22% of response rate. This is excellent in representing the target population as noted by Mugenda and Mugenda (2003) who posits that a response rate above 70% is excellent while a rate of 60% is good and 50% is adequate for analysis and reporting.

4.3 Socio-Demographic Information

The study focused to finding out the participantsô background information so as to know the appropriateness of the answers given.

4.3.1Being a resident

The study was seeking to find out whether the participants were residents. From the Table 4.2, majority (100%) of the household respondents were residents of Kilifi County and therefore they would give valid and reliable information about water projects in Kilifi County

Table 4.2 Being a resident

Response	Targeted	Percent
Yes	74	100%
No	0	0
Total	74	100%

4.3.2 Years of being a resident

The research was seeking to establish for how long participants had lived in Kilifi County

Table 4.3 Years of being a resident

	frequency	Percentage
10 years and below	10	13.5
11-20 years	12	16.2
21-30 years	21	28.4
31 years and above	31	41.9
Total	74	100

The findings in the table show 41.9% of the participants had lived in Bamba division for 31 years and above, 28.4% for 21-30 years while 16.2% had lived for 11-20 years. This implies that the household respondents had lived in Bamba division for long enough to give credible information about the sustainability of water projects in Bamba division.

4.3.3 Gender distribution of Respondent

The study focused to discover the gender of the participants.

Table 4.4 Gender distribution of Respondent

	Frequency	Percent
Female	33	44.6
Male	41	55.4
Total	**74**	**100%**

From discovery 55.4% of the participants were male and 44.6% were female. The findings indicate that majority of the households were headed by males who were involved in the water projects in the locality.

4.3.4 Highest level of school level

The study sought to find the highest academic qualifications of the respondents

Table 4.5 Highest level of school level

Education level	Frequency	Percent
Never	6	8.11
Primary level	38	51.35
Secondary level	19	25.68
Tertiary level (polytechnic)	9	12.16
University level	2	2.7
Total	**74**	**100**

From the Table 4.5 majority of the household respondents (51.35%) had primary level of education, 25.68% had secondary, and 12.16% had tertiary level while 8.11% had never attended school. Therefore it can be noted that majority of the household respondents had attained the basic education and thus would provide valid and consistent information about sustainability of water project in their locality.

4.3.5 Occupation

The respondents were requested to indicate their occupation.

Table 4.6 Occupation

Occupation	Percent
Farming	50
Vegetable sale	0
Charcoal sale	9.46
Firewood sale	2.7
Carpentry	0
Casual labour	35.14
Employment	2.7
Total	**100**

From the findings in Table 4.6, 47.% relied on farming, 35.3% were casual laborers, 12% sold charcoal, 2.7% were involved in firewood sale, while 2.9% were in the employment. Therefore the majority of the respondents worked in the informal sector and were poor since their occupation could only help them raise income for daily household needs.

4.3.6 Average income range per month

The study sought to find out the respondentsô average income range per month from all their income sources

Table 4.7 Average income range per month

Income	Frequency	Percent
Less than 2500	46	60.81
2500-5000	24	32.43
2500-5000	3	4.05
7500-10000	2	2.7
More than 10000	0	0
Total	**74**	**100**

From the Table 4.7, majority of the households (60.81%) had an average monthly income from all their financial sources of less than 2500, 32.43% had Kshs 2500 ï 5000 , 4.05% had an average monthly income from all their financial sources of 5000-7500

while 2.7% had an average of 7500-10000 from all their financial sources. Therefore the majorities of the household respondents were poor and could barely afford the basic household needs due to lack of finances.

4.4 Community members' participation and the sustainability of the rural water projects

The first objective of the study was to demonstrate how the membersô engagement influenced the sustainability of water projects.

4.4.1 Participation in the initiation/start of water projects

The study sought to find out whether the households respondents participated in the creation of the water projects.

Table 4.8 Participation in the initiation/start of water projects

Response	Frequency	Percent
Yes	36	48.6
No	38	51.4
Total	**74**	**100**

From the study findings in Table 4.8, the majority (51.4%) of the householdsô respondents never participated in the institution of the water projects while only 48.6% participated in the institution of the water projects. This depicts the degree of community membersô involvement in the water projects was low.

4.4.2 Community members' participation in water projects operation

The respondents were required to indicate whether community participation was important for sustainability of the water projects

Table 4.9 Community members' participation importance in water projects operation

Response	Frequency	Percent
Yes	69	93.24
No	5	6.76
Total	**74**	**100**

According to the findings in Table 4.9, majority (93.24%) of the respondents indicated that community membersô participation was important for sustainability of water projects. This illustrates that involvement of all the community members determined the efficiency and sustainability of the water projects

4.4.3 Degree of community members' involvement in planning of the water project

The respondents were to the degree community members participated in planning of this project

Table 4.10 Degree of community members' involvement in planning of the water project

Scale	Frquency	Percentage
A very very great degree	41	55.4
A very great degree	24	32.43
A great degree	8	10.81
A low degree	1	1.35
Not at all	0	0
Total	**74**	**100**

Here, many household members (55.4%) posited that the community members were engaged in the planning of the water project to a very very great extent, 32.43% indicated that community members were involved to a very great extent, 10.81% indicated that the members were involved to a great extent while 1.35% of members indicated that they were involved but to a low extent. Thus the community members were involved in the planning of the water projects.

4.5 Influence of the government on the water project

The second objective was assessing how the government influenced sustainability of the rural water projects.

4.5.1 Government practices and sustainability of the rural water facilities

The study was seeking to find out the influence of government practices on the sustainability of the water projects. The participants were requested to indicate how the government had helped in the water project

Table 4.11: Government practices and sustainability of the rural water projects

Activities	Frequency	Percent
Initiation /construction	72	97.3
Management	0	0
Maintenance	2	2.7
Others	0	0
Total	**74**	**100**

Table 4.11 shows that majority of the respondents who constitute 97.3% indicated that the government only involved itself in the initiation stage of the rural water projects. Thus the government performed less in maintenance and management of the water projects. After the project was initiated, there was no follow up

4.5.2 Factors considered in choosing their leaders

The study sought to establish the factors considered in choosing their leaders on the sustainability of the rural water projects. The respondents were requested to indicate basis to which the community members considered in electing their leaders

Table 4.12: Factors considered in choosing their leaders

Qualifications	Frequency	Percent
Academic qualifications	11	14.86
Academic qualifications and experience in community service	11	14.86
Academics, community service experience and ability to persuade	13	17.57
Ability to persuade	24	32.43
Closeness to political leadership	15	20.28
Total	**74**	**100**

From the findings, the respondents indicated that most of the leaders ,32.43% were appointed on the basis of their ability to persuade, 20.28% leaders on their closeness to political leaders, same percentage ,14.86% leaders appointed on the basis of their academic qualification and experience in community service. This shows that most leaders appointed to head the projects were not competent enough

4.5.3. The degree of interference of political leaders

This was seeking to find out the degree of political leaders interference to matters on the water projects

Table 4.13 The degree of interference of political leader

Scale	Frequency	Percentage
A very very great degree	25	33.78
A very great degree	21	28.38
A great degree	15	20.27
A low degree	11	14.87
Not at all	2	2.7
Total	**74**	**100**

The findings show, 33.78% of the participants indicated that the government interfered to a very very great degree, 28.38% of the participants indicated that government interfered to a very great degree, 20.27% indicated that the government interfered to a great extent, 14.87% indicated that the government interfered to a low extent while 2.7% indicated that the government did not interfere at all. From the findings, it dhows that the government interfered in most parts

4.6Influence of technology on sustainability of water projects

The third objective of the study was to examine how technology influences sustainability of the rural water projects

4.6.1Technology for operating the water project

The household respondents were to indicate if they were happy with the technology used.

Table 4.14: **Technology for operating the water project**

Response	Frequency	Percent
Yes	69	93.24
No	5	6.76
Total	**74**	**100**

From the discovery, many participants 93.24% werenôt happy with the type of technology used for operating the water facility.

4.6.2 Type of water facility

The respondents were to indicated the different types of water facility use

Table 4.15: Type of water facility

Water facility	Frequency	Percent
Protected shallow well	44	59.46
Borehole	8	10.81
Surface water supply	9	12.16
Tap	13	17.58
Total	**74**	**100**

From the findings in table 4.15, 59.46% of the household respondents use the protected shallow well, 17.58% of the household respondents use tap water,12.16% use surface water while 12.16% of the respondents use boreholes. This shows a majority of the community members use an unreliable source of water supply.

4.6.3 When the facility was developed

The household respondents were to indicate if they were the time the facility was developed

Table 4.16: When the facility was developed

Age	Frequency	Percent
Under 3 years	3	4.3
3-4 years ago	4	4.3
4-5 years ago	12	16.4
5-6 years ago	19	25
7 years and above	37	50
Total	**74**	**100**

From the discovery in table 4.16, 50% of the participants indicated that the water source they used was developed more than seven years ago, 25% of the respondents indicated that the water facility was developed between 5-6 years ago, 16.4% of the respondents indicated that the water facility was developed 4-5 years ago, while two categories of respondents shared the same percentage, one having been developed 3-4 years ago and the other under 3 years.

4.6.4 Functionality of the operation

The respondents were to indicate whether the water facility relied on was functional or not.

Table 4.17: Functionality of the operation

Response	Frequency	Percent
Yes	23	28.06
No	51	68.92
Total	**74**	**100**

From the findings in figure 4.17, the majority of the household respondents, 68.92% indicated that the water facility relied on was not functioning while 28.06% of the respondents indicated that the water facility was functional.

4.6.5. Influence of technology on sustainability of water projects

The study was seeking to find out whether the respondents thought if technology influences the sustainability of their water projects.

Table 4.18: Influence of technology on water projects

Response	Frequency	Percent
Yes	46	62.5
No	28	37.5
Total	**74**	**100**

As shown in the table majority, 62.5% of the respondents think that technology influences the sustainability of a water project while 37.5% do not think that technology influences sustainability of water projects.

4.6.6 Community involvement in technology

The study sought to find out if the community members were involved in deciding the choice of technology used in the water project

Table 4.19: Community involvement in technology extent

Response	Frequency	Percent
Yes	23	30.77
No	51	69.23
Total	**74**	**100**

From the findings in table 4.19, 69.23% of the respondents were not involved in deciding the choice of technology for the water facility while 30.77% were involved in decision making.

4.6.7 Degree of community involvement

The respondents indicated to what extent the community members were involved in deciding the technology to be used in the water facility.

Table 4.20: Degree of community involvement in technology decisions

Scale	Frequency	Percent
A very very great degree	5	6.76
A very great degree	6	6.76
A great degree	26	35.14
A low degree	30	40.54
Not at all	8	10.81
Total	**74**	**100**

From the findings in table 4.20, the respondents indicated that a majority of them 40.54 were involved to a low degree in making decisions on the technology of the water facility,35.4% to a great extent,10.81% were not at all involved,6.76% were involved to great extent and 6.76% were involved to a very very great extent.

4.7 External factors

This fourth objective sought to find out whether external factors affect the sustainability of water project.

4.7.1 Environmental calamity

This sought to find out whether there has been any environmental calamity in the area

Table 4.21: **Environmental calamity**

Response	Frequency	Percent
Yes	66	89.19
No	8	10.81
Total	**74**	**100**

As shown from the table above, a majority, 89.19% indicated that there has been an environmental calamity, famine and drought, while 10.81% indicated otherwise.

4.7.2 The extent of these calamities

This was seeking to find out the degree to which the environmental calamities affected the sustainability of the water facility.

Table 4.22: The Degree of these calamities

Scale	Frequency	Percent
To a very very great degree	33	44.59
To a very great degree	25	33.78
To a great degree	14	18.92
To a low degree	2	2.71
Not at all	0	0
Total	**74**	**100**

From the table above, 44.59% of the respondents indicated that drought and famine influence the sustainability of a water project to a very very great degree,33.78% indicated that drought and famine influenced the sustainability of a water project to a very great extent,18.92% of the respondents indicated that drought and famine influenced the sustainability of a water project to a great degree while 2.71% of the respondents indicated that drought and famine influence the sustainability of a water project to a low extent

4.8 Testing of the hypothesis using chi square

The chi square was used to prove the relationship between the variables. The alternative hypotheses (H_1) were used for the four objectives

4.8.1 Testing of the first hypothesis using chi square

H_1: There is significant relationship between community members participation and sustainability of rural water.

Table 4.23 showing observed and expected responses community members' participation and the sustainability of the community water project

SCALE	5	4	3	2	1
OBSERVED	41	24	8	1	0
EXPECTED	74	74	74	74	74

Table 4.24 showing chi square testing for the first hypothesis

O	E	O-E	$(O-E)^2$	$(O-E)^2/E$
41	74	-33	1089	14.7162
24	74	-50	2500	33.7838
8	74	-66	4356	58.8649
1	74	-73	5329	72.0135
0	74	-74	5476	74
				Ɛ $(O-E)^2/E$=253.3784

ɑ2C =253.378> ɑ2= 9.488 at 4 degrees of freedom and 5% level of confidence

Since the calculated chi square value is greater than the critical chi square value at 5% level of confidence, the hypothesis is accepted

4.8.2 Testing of the second hypothesis using chi square

H_1: There is a statistically important relation between the influence of the government and the sustainability of water projects.

Table 4.25 showing observed and expected responses influence of government and the sustainability of the community water project

SCALE	5	4	3	2	1
OBSERVED	25	21	15	11	2
EXPECTED	74	74	74	74	74

Table 4.26 showing chi square testing for the second hypothesis

O	E	O-E	$(O-E)^2$	$(O-E)^2/E$
25	74	-49	2401	32.4459
21	74	-53	2809	37.9595
15	74	-59	3481	47.0405
11	74	-63	3969	53.6351
2	74	-72	5184	70.0540
				Ɛ $(O-E)^2/E$=241.135

g2C =241.135> g2= 9.488 at 4 degrees of freedom and 5% level of confidence

Since the calculated chi square value is greater than the critical chi square value at 5% level of confidence, the hypothesis that there is significant relationship between the government and the sustainability of water projects is accepted

4.8.3 Testing of the third hypothesis using chi square

H_1: There is significant relationship between technology and lifespan utility of water projects.

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Table 4.27 showing observed and expected responses influence of technology and the sustainability of the community water project

SCALE	5	4	3	2	1
OBSERVED	33	25	14	2	0
EXPECTED	74	74	74	74	74

Table 4.28 showing chi square testing for the third hypothesis

O	E	O-E	$(O-E)^2$	$(O-E)^2/E$
23	74	-51	2601	35.1486
50	74	-24	576	7.7838
				$\mathcal{E}$ $(O-E)^2/E=42.9324$

The tested chi square value is more than the critical chi square value at 5% level of confidence, the hypothesis that:

H_1: there is significant relationship between technology and the lifespan utility of water projects is not rejected.

4.8.4 Testing of the forth hypothesis using chi square

H_1: There is a statistically important relation between external factors and the sustainability of water projects.

Table 4.29 showing observed and expected responses influence of external factors and the sustainability of the community water project

SCALE	Yes	No
OBSERVED	23	51
EXPECTED	74	74

Table 4.30 showing chi square testing for the fourth hypothesis

O	E	O-E	$(O-E)^2$	$(O-E)^2/E$
33	74	-41	1681	22.7162
25	74	-49	2401	32.4459
14	74	-60	3600	48.6486
2	74	-72	5184	70.0540
0	74	-74	5476	74.0000
				Ɛ $(O-E)^2/E$=247.8647

The worked out tested value is greater than the critical chi square value 5% level of confidence .The hypothesis that there is a relation between external factors and the sustainability of water projects in rural areas is not rejected.

CHAPTER FIVE
SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This part submits briefings, interpretations of the findings, the conclusion and the courses of actions to be taken in Bamba Division.

5.2 Summary of the Findings

This part gives a summary of the findings based on the objectives of the study.

5.2.1 Community members' participation and sustainability of rural water projects.

The study found out that (51.4%) of the householdsô respondents were never involved in the creation of the water projects. This depicts that the level of community membersô involvement in the water projects was low which in turn influenced the sustainability of the water project. The community members indicated that involvement of the all the community members determined the efficiency and sustainability of the water projects. The community membersô participation positively enhances the sustainability of the rural water projects to a great extent. The main benefit associated with community membersô participation in water projects are continuity of the project, timely maintenance/repairs, harmony/conflict management, and strong ownership of the projects, better service delivery and expansion of the project. The community members were not adequately involved in the project. Therefore the lack of sufficient participation in the project implementation contributed to the project failure.

The study also established 74.32% of respondents posited that members were engaged in the first stages of water projects. Thus the community members were engaged in planning of the water projects but just for ñofficial purposesò but their ideas were not put into considerations hence the community membersô involvement in the institutionalization of the project was considerably low.

The study established there is a relation between the community memberôs engagement and the sustainability of water projects

5.2.2 Influence of the government on the water project

The findings proved that the government influences the sustainability of water projects thus the study established that the government only participated in the initiation stage of the rural water projects, this was indicated by 97.3% of the respondents. Thus the government performed less in maintenance and management of the water projects. Later, when the water project had been initiated, there was no follow up. The study also revealed that those appointed to manage the water project responded to a low extent to interests raised by the community members. The custodians appointed to maintain and manage the water project were not effective, 32.43% were appointed on the basis of their ability to persuade, 20.28% leaders on their closeness to political leaders, same percentage, 14.86% leaders appointed on the basis of their academic qualification and experience in community service. This shows that most managers appointed to head the projects were not competent enough**.**

It was also established that the political leaders in government influence the leadership in managing the water project by choosing some of the managers and committee members close to them to manage the water project

5.2.3 Influence of technology on sustainability of water projects

The study established that 62.5% of the respondents think that technology influences the sustainability of a water project but a high percentage 59.46% of the household respondents use the protected shallow well which requires technology in its operation to a low extent, 17.58% of the household respondents use tap water that occasionally run dry, 12.16% use surface water while 12.16% of the respondents use boreholes.

The study revealed that majorities of the household were not happy with the kind of technology used in construction and management of the water project as majority of them 59.46% of the household respondents used the protected shallow well and it wasnôt sustainable for this county. Therefore, the level of adoption of technology in the initiation management of water project was very low impairing the sustainability of water projects. It was also established that most of the water projects had been started a very long time ago. 50% of the respondents indicated that the water source they used was developed more than seven years ago. With the poor level of management, a

majority of these water projects are not operational; those using protected shallow wells now consume the water with animals since itôs no longer protected.

5.2.4 External factors

It was established that the most calamity that affected this area mostly was drought and famine**.** 44.59% of the respondents indicated that drought and famine affected the sustainability of the water project to a high extent,33.78% indicated that drought and famine affected the sustainability of the water project to a very great extent,18.92% of the respondents showed that drought and famine affected the sustainability of a water project to a great extent while 2.71% of the respondents indicated that drought and famine affected the sustainability of a water project to a low extent.

5.3 Discussion of Findings

The findings showed positive significant correlation between all the four variables. The discussion of findings from this study is presented as follows;

5.3.1 Community participation

It was revealed Householdôs income levels affect the economic sustainability of community projects in varied ways. According to the findings, 60.82 percent of the respondents earn less than Kshs. 100 a day which may be translated as living at less than a dollar a day based on the World Health Organizationôs preference. In his analysis of factors influencing participation and management of community project Awortwi (2012) realized that households with high incomes participate in organization and production of community projects than low income households. Lee (1998) observed that communities in which many household have low income residents tend to put most of their time in search of stability and therefore have less time to participate in community activities. Similarly Omoka (1991) argued that households with low income levels activities are geared towards attaining life stability.

The study also disclosed a significant relationship between sustainability of water projects and community members. This finding concurs with Walker (2008).who states that Communities that have adequate sources of income are more likely to sustain their development projects as compared to communities without inadequate income generating projects. Awortwi (2012) affirmed that local communities are more likely to

participate in community projects since they are long term beneficiaries. The research findings indicated that close to half of the respondents were involved in the choice of the technology to use, most of them were capacity built and got the assistance of the extension officer and could replicate the technology. The communities in Bamba area were involved in planning of the projects in the area, this kind of participation is necessary for the community projects to be sustained. The study established a significant relationship in sustainability and decision making. These findings hold with those of Awortwi, (2008) Moser (1989) and Cornwall, (2008) who suggested that community participation is essential in ensuring sustainability of community projects, by being active in identifying their needs and mobilizing locally available manpower and other resources.

5.3.2 Government influence on sustainability of water projects

97.3% indicated that the government involved itself in the initiation stage of the rural water projects. However, the government performed less in maintenance and management of the water projects. Maintenance of the water project was done occasionally when they needed something from the community, like asking for votes. These findings hold with Oduor, (2015), who stated in that in most semi arid African countries, the leadership in community based organizations exploit finances meant for the impoverished.

5.3.3 Technology influence on sustainability of water projects

Technology enables the community to increase its agricultural productivity hence raising living standards. This study realized high levels of community participation both in selection and being capacity built with regards to the technology being used water projects. This promotes a sense of ownership, eliminates redundancy and empowers the community to use the new technology with minimum interruptions thus ensuring sustainability of community projects. This finding agrees with that of Dercon et al., (2008) who argued that integration of innovations is necessary if sustainable development is achieved in a community.

At least 94% of the respondents agreed that technology choice influenced the sustainability of rural water facilities at least to a moderate degree. From the study findings a few water management committees have been trained on operation and maintenance of water facilities out of the many water management committees in the division. These findings agree with Toole (2002), that capacity building sessions to build community awareness of the problems related to water projects will automatically increase participation and demand a project that suits their needs as well as technical coaching in operation and maintenance.

The study again found out that 62.5 of the respondents thought that technology influences the sustainability of a water project. This corresponds with (Nohria and Gulati, 2006) who believe that Technological innovation has enormous influence on community based project.

5.3.4 External factors influence on sustainability of water projects

Climatic factors such as rainfall were realized to be having some effect on water projects in Bamba area. Findings revealed that change in the rainfall pattern was considered disturbing as since most of these water projects relied on rain water. Rainfall provides the vegetation and animals with water that is essential for their growth. The community needs rainfall both for their domestic and farm use, therefore such inadequacies may have a crippling effect on implementation of community projects especially the agricultural based. The findings showed that there is a relation between external factors and water projects sustainability.

5.4 Conclusion

The study found community participation was important for achieving sustainability of rural water projects. The increased participation of community members in water management has significant implications for enhancing future sustainability of rural water projects. More importantly the study shows sustainability is a sector issue requiring interdependent actions of many stakeholders at all levels including national and regional governments and other stakeholders. Communities on their own cannot be expected to achieve long term sustainability of rural water supplies without an enabling

environment. The sector must take deliberate steps to address itself to sustainability as a sector issue and put in place policy frameworks needed to achieve it.

Sustainability of rural water projects is associated with high levels of managerial skills of the WASH committees. The high number of members of water management committee members with basic and college level education has increased capacity of water committees to develop and utilize management, operation and maintenance skills required for enhancing sustainability. Those committees who indicated that they had adequate management skills, also felt that their water projects were sustainable to a great extent. Committees with higher levels of education and skills network better with their consumers increasing participation of beneficiaries and partner agencies. In addition, such committees can use and make decisions on shared information including use of information technology. Project planners should set new criteria for election of management committees including minimum education levels.

The study saw that that sustainability of rural water projects relies on; coaching. Use of modern technology has improved sustainability of water projects and has helped to curb poor management and accountability of the project, enhancing productivity .Community projects that embrace technology exhibit better performance and sustainability. sustainability driven by technology depends largely on the effective management of the innovation process, the project using modern technology, technological innovation has enormous influence on community based project,. Technology was therefore a critical factor affecting the sustainability of water projects.

5.5 Recommendations

Itôs recommended that:

1. Programme and project designers should make a provision for community participation right from the start of the project. This includes making funding available for the community processes including social mobilization, organization and training of the communities.
2. The sector should put in place an enabling environment that includes legal and framework policy for accountability necessary for achieving sustainability. Selecting appropriate technology is a primary concern of every project manager,

for without technology safe sources cannot be exploited. Increasing community participation in project design and implementation is associated with sustainability of rural water projects in Kenya. Increased community participation increases sense of ownership of projects among the community members

3. Project designers must take into account all parameters mitigating selection of technology including need for innovations, source characteristics, demand and adequacy of source and cost of operation and maintenance before making choices. Such factors as affordability, access to spare parts and quality of water are also important factors that influence long term sustainability of facilities.
4. Skilled water management committees are important to attaining sustainability of rural water projects. The skills help in making decisions, coordinating and responding to challenges skills of water committees should therefore be increased including setting an educational description on academic level.
5. Motivating water committees should be considered as a way of retaining people with skills to volunteer .such incentives could include participation in exchange programmes visits.

5.6 Suggestions for future research

On the basis of what has been found out from this study, the researcher recommends that similar studies be conducted in other locations in the ASALS. Further studies are needed to look into the effect of unsuccessful community projects on sustainability of community development. Based on the findings of this study, there is also need to look at the effects of global warming on community development projects so as to develop suitable means of addressing this problem

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APPENDICES

LETTER OF TRANSMITTAL OF DATA COLLECTION INSTRUMENTS

P.O Box 11890-00100
Nairobi,
12th November 2016

Dear Respondent,

RE: REQUEST TO PROVIDE RESEARCH INFORMATION

I am a Masterôs student at the School of Continuing and Distance Education at the University of Nairobi currently conducting a research study on *factors influencing sustainability of rural water projects*

You have been selected as one of the respondents to assist in providing the requisite data and information for this undertaking. I kindly request you to spare a few minutes and answer a few questions. The information obtained will be used for academic purposes only, and will be treated with utmost confidentiality. Your identity will be anonymous and your name shall not be recorded.

Kindly respond to all the questions honestly and truthfully.

Yours faithfully,
EVA KADZO KONDE

Appendix II: Household Survey Questionnaire

Research Questionnaire for a study on factors affecting sustainability of rural water supplies in Kenya. This questionnaire seeks to establish the various determinants of project sustainability that influence the sustainability of water projects. The items in the questionnaire are for academic research purposes only. All information given will be treated with utmost confidentiality. You are not required to fill in your names.

Instructions Please fill in the blanks or circle where appropriate to provide the information requested.

Regioné é é é é é é é Name of Data Collectoré é é é é é Dateé é é é é .

Name of Water Supplyé é é é é é é .

SECTION A: PROJECT IDENTIFICATION INFORMATION

1) Location: _____Sub-location: _____

2) Village: _____

3) Name of the Water project: _____ Year of Establishment é é é é

SECTION B: SOCIO-DEMOGRAHIC CHARACTERISTICS

(To be answered by a person above 18 years in a household, preferably a household head)

4) Are you a resident of é é é é é é . village (village named above)

Yes [ ] No [ ]

i) If yes, how long have you lived here,

10 years and below [ ] 11-20 years [ ]

5) 21-30 years [ ] **31 years and above [ ]**	**6)**	**7)**	**8)**
Gender Of Respondent	**What is your highest level of school/level completed?**	**What is your occupation**	**What is your average income range per month (from all sources)**
1. Male 2. Female	1. Never, 0 2. Primary; 3. Secondary level; 4. Tertiary level; (colleges, polytechnicsé ..) 5. University level	Livestock, Vegetable sale, Charcoal sale, Firewood sale, Carpentry, Quarrying (sand/stone), Casual labour, Employment Other (specify) é é ..	Less than 250 1. 250 ï 500 2. 500 ï 750 3. 750 ï 1000 More than 10,000

Section C: Community participation and sustainability: Please select one

9. To what extent do you think the community participated in the planning and implementation of this project? (Rank 1 - 5)

    5. To a very great extent
    4. To a very good extent
    3. To some extent
    2. To a low extent
    1. Not involved

10. Do you think community participation is important for sustainability of your project?

    Yes( ) No( )

11. If yes, to what extent? (Rank 1 - 5)

    5. To a very great extent
    4. To a very good extent
    3. To some extent
    2. To a low extent

1. Not important

12. If No, Please explain...

13. Suggest what can be done on community participation to enhance sustainability of your water facility?

é é

é é

14. Do you think the community participated in the planning of this project?Yes ( ) No ( )

15. If yes, to what extent did the community participate?

5- To a very very great extent

4 ï To a very great extent

3 ï To a great extent

2 ï To a low extent

1 ï Not at all

Section D: Influence of the government on the water project?

16) How has the government helped in the water project?

1. Initiation/construction( )
2. Management( )
3. Maintenance ( )
4. Others ( ),

   specifyé ..

17) What factors do the members mostly consider in choosing their leaders?

(1) Academic qualifications ( )

(2) Academics and experience in community service ( )

(3) Academics, community service experience and ability to persuade ( )

(4) Ability to persuade only ( )

(5) Closeness to political leadership ( )

18) Do political leaders interfere in the water project?

If yes, to what extent? (Rank 1 - 5)

5. To a very great extent

4. To a very good extent

3. To some extent

2. To a low extent

1. Not important

19) If No, Please explain.....

20) Is there favourable taxation measures,If yes, to what extent? (Rank 1 - 5)

5. To a very great extent

4. To a very good extent

3. To some extent

2. To a low extent

1. Not important

If No, Please explain.....

Section E: Choice of Technology and sustainability

1. Are you happy with the technology used for operating your water Facility?

   Yes ( ) No( )

2. Do you think it has enabled the sustainability of your water facility? Yes No
3. What do you recommend about the technology to better enable sustainability of your water facility
4. Type of water facility
   a. Protected shallow well
   b. Borehole
   c. Surface water supply
   d. Others,specifyé é é é é é é é é ..
5. Power source for the facility
   a. Hand pump
   b. Electricity
   c. Diesel powered generator
   d. Solar power
   e. Other (please specify)é é .....é .....
6. When was the facility developed?
   a. Under three years
   b. Between three and four years ago
   c. Between four and five years ago

d. Between five and six years ago

e. Other (please specify)é .....é é .....é .....

7. Is the facility functional? Yes ( ) No ( )
8. If no, for how long?
    i. One Week
    ii. Two Weeks
    iii. Three weeks
    iv. One Month
    v. Other, please specifyé .....é é é é é é ..
9. Give the reason for facility not operating?
    a. Broken down equipment
    b. Electricity disconnected
    c. No fuel for the equipment
    d. No one to operate
    e. Other (please specify) é é é é .....é é .
10. Do you think your water supply is Sustainable? Yes ( ) No ( )
11. If yes, to what extent? (Rank 1 - 5)

    5 - A very great extent

    4 - A great extent

    3 - Sometimes good, sometimes bad

    2 - To a low extent

    1 - To a very low extent

12. If no, explainé ..

13. What do you think influences sustainability of the facility? Tick all that apply.

    1. Community participation
    2. Technology used
    3. Skills of the Water Committee
    4. Post implementation support
    5. Other,

       explainé é é é .....é é é é é .....
       .....

14. Was the technology choice appropriate for the water facility? Yes( ) No ( )
15. Do you think technology influences sustainability of your project? Yes ( ) No ( )
16. Was the community involved in deciding the choice of technology used in your water facility? Yes ( ) No ( )
17. If Yes, to what extent? (Rank 1 - 5)

    5 - To a very great extent

    4-To a great extent

    3- To some extent

    2-To a low extent

    1-Not involved

18. If No, Please explainé ..
19. Do you think this is the most appropriate technology for the facility? Yes ( ) No ( )
20. If yes, to what extent? (Rank 1 - 5)

    5 - To very very great extent

    4 - To a very great extent

    3 - To a great extent

    2 - To a low extent

    1. - Not at all

21. If no, why

    é
    é

22. What do you think should be done to the current technology to enhance sustainability of the water facilityé ..

23. Do you get any post implementation support from funding agency/partner

Yes( ) No ( )

24. If yes, please state type

a. Community sensitization and organization
b. Operation and Maintenance training
c. Supply of spare parts
d. Monitoring and guidance
e. No external support

25. Other (please specify)é é é é é é .....é é é ..

26. From which agencies do you get post implementation support?

a. District Water Office
b. Regional Water Service Board
c. Donor
d. NGO partner
e. Other (please specify)é é é é é é é é é .....é é

27. For how long is post construction support required?

a. A few months after handing over of project
b. One year after handing over
c. Two years after handing over
d. Continuously
e. Other (please specify)é é é é é .....é é é .....

Section F: External factors: Please select one

1. Has there been any environmental calamity? Yes ( ) No ( )
2. If yes ,specify which one……
3. To what extent have these calamities affected the water project

5 - To very very great extent

4 - To a very great extent

3 - To a great extent

2 - To a low extent

1-Not at all

4. How have the community members been affected by the effects, explain please……
……
5. What has been done to prevent the community members from being affected? Please explain…….

Section G: Water Supply and Sustainability

1. Do you think your water supply is Sustainable? Yes No 4. If yes, to what extent? (Rank 1 - 5)

5 - A very great extent

4 - A great extent

3 - Sometimes good, sometimes bad

2 - To a low extent

1 - To a very low extent 1 5. If no, please

2. explain.....
3. Where do you get your water when facility is not operational?
    a. River/open well ( )
    b. Buy from vendors( )
    c. Alternative facility( )
    d. Other (please specify é é é é é é é é é é é é é é é é
4. How often does facility break down?
    a. Once every two weeks ( )
    b. Once a month ( )
    c. Once every three months( )
    d. Other, please specify é é é é é é é é é é é
5. How fast is facility restored when it breaks down?
    a. A week ( )
    b. Two weeks ( )
    c. Three weeks ( )
    d. A Month ( )
    e. Other (please specifyé é é é é é é é é é é é é é .
6. . How well do you think your facility is managed? (Rank 1 - 5)

5 - Very Very well

4 - Very well

3 - Some whatwell

2 ï Poorly Managed

a. 1 - Not managed at all

7. 10. What can be done on community participation to enhance sustainability of the facility? é
8. 13. Who do you think should be involved in the community?
    a. WASH Committees ( )Women Groups( ) Community leaders ( )All Community members( )

APPENDIX IV: List of Research Project Sites

Selected projects in Bamba

	Name of Project	**Type of Project**	**Location**
1			
2			
3			
4			
5			
6			
7			
8			