

**FACTORS INFLUENCING SUSTAINABILITY OF COMMUNITY WATER PROJECTS  
IN SHIANDA DIVISION, KAKAMEGA COUNTY - KENYA.**

**BY**

**KANYANYA LOICE ONG'WEN**

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

**2014**

**DECLARATION**

This research project report is my original work, and has never been presented for any degree award in any other University or institution of higher learning.

Sign.....

Date.....

**KANYANYA LOICE ONG'WEN**

L50/69558/2011

This research project report has been submitted with my approval as the University supervisor.

Sign.....

Date.....

**DR. DOROTHY KYALO,**

Senior lecturer,

Department of Extra Mural Studies

University of Nairobi

## **DEDICATION**

I dedicate this work to my mother Mrs. Millicent A. Ong'wen, my brothers and sisters Alfred, Alex, William, Shadrack, Phelistus and Jackline for their support and encouragement that has always inspired me to work hard with determination in life.

## **ACKNOWLEDGEMENT**

I return all the glory and honor to God for the grace, knowledge and wisdom he gave me while undertaking this course. I express my solemn gratitude to the Administration of the School of Post Graduate studies of the University of Nairobi for giving me the opportunity to pursue my masters' degree in this prestigious institution of learning. My special thanks go to my supervisor Dr. Dorothy Kyalo, for her timely guidance and professional advice that she gave to me in fine tuning this work. I am indebted to appreciate the support of Shadrack Kilonzo, Alex Livingstone Mulima and Phelistus Chitechi, may God reward you abundantly. I acknowledge and appreciate the support and advice of friends and classmates which has been of great value in the course of my study, just to mention but a few for their outstanding support; Mrs. Jane Ong'eti, Mr. Jimmy Okello Onen, Mr. Paul Mutisya, Ms. Nancy Mwendu Mulandi, Mrs. Sabina Wachira, Ms. Susan Achieng' Otieno and Mr. Kirimi Peter Kimathi, may God bless you.

## TABLE OF CONTENT

	<b>Page</b>
DECLARATION .....	ii
DEDICATION .....	iii
ACKNOWLEDGEMENT .....	iv
TABLE OF CONTENT .....	v
LIST OF TABLES .....	viii
LIST OF FIGURES .....	ix
LIST OF ABBREVIATIONS AND ACRONYMS .....	x
ABSTRACT .....	xi
<b>CHAPTER ONE: INTRODUCTION .....</b>	<b>1</b>
1.1 Background of the Study .....	1
1.2 Statement of the Problem .....	3
1.3 Purpose of the Study .....	5
1.4 Objectives of the Study .....	5
1.5 Research Questions .....	5
1.6 Justification of the Study .....	6
1.7 Significance of the Study .....	6
1.8 Basic Assumptions of the Study .....	6
1.9 Limitations of the Study .....	7
1.10 Delimitations of the Study .....	7
1.11 Definition of Significant Terms .....	7
1.12 Organization of the Study .....	9
<b>CHAPTER TWO: LITERATURE REVIEW .....</b>	<b>11</b>
2.1 Introduction .....	11
2.2 Project Sustainability .....	11
2.3 Community Participation .....	12
2.4 Community Education and Training .....	15
2.5 Project Location .....	18
2.6 Community Capital Contribution .....	18

2.7 Summary of Literature Review.....	20
2.8 Conceptual Framework.....	21
<b>CHAPTER THREE: RESEARCH METHODOLOGY .....</b>	<b>23</b>
3.1 Introduction.....	23
3.2 Research Design.....	23
3.3 Target Population.....	23
3.4 Sample Size and Sampling Technique.....	23
3.5 Data Collection Instruments .....	25
3.5.1 Validity of Data Collection Instrument.....	26
3.5.2 Reliability of Data Collection Instrument.....	26
3.6 Data Analysis .....	27
3.7 Ethical considerations .....	28
3.8 Operational definition of variables .....	28
<b>CHAPTER FOUR: DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION .....</b>	<b>30</b>
4.1 Introduction.....	30
4.2 Questionnaire Return Rate.....	30
4.3 Demographic profile of Respondents .....	30
4.4 Factors Influencing Community Water Projects in Shianda Division.....	32
4.4.1 Influence of Community Participation on Sustainability of CWPs. ....	33
4.4.2 Influence of CE & T on Technology Used on the sustainability of CWPs. ....	34
4.4.3 Influence of Project Location on the Sustainability of CWPs .....	36
4.4.4 Influence of Community Capital Contribution on sustainability of CWPs .....	388
4.5 Project Sustainability .....	40
4.5.1 Regression Analysis.....	40
4.5.2 Goodness of Fit of the Model .....	40
4.5.3 Analysis of Variance.....	41
4.5.4 Regression Coefficients .....	412
<b>CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS.....</b>	<b>444</b>
5.1 Introduction.....	444

5.2 Summary of the Findings.....	444
5.2.1 Project Sustainability.....	44
5.2.2 Influence of CP on Sustainability of CWPs.....	44
5.2.3 Influence of CT on Sustainability of CWPs.....	44
5.2.4 Influence of Project Location on Sustainability of CWPs.....	45
5.2.5 Influence of CCC on Sustainability of CWPs.....	45
5.3 Conclusions.....	455
5.4 Recommendations.....	466
5.5.1 Suggestions for Further Studies.....	477
<b>REFERENCES.....</b>	<b>48</b>
<b>APPENDICES.....</b>	<b>522</b>
Appendix 1: Letter of Introduction.....	522
Appendix 2: Questionnaire.....	53

## LIST OF TABLES

Table 3.1 Sampling procedure for water projects.....	26
Table 3.2 Operationalization of variables.....	30
Table 4. 1: Respondents by Gender .....	31
Table 4. 2: Respondents by Education level.....	31
Table 4. 3: Respondents by Employment Type .....	32
Table 4. 4: The extent to which CP influences sustainability of CWPs. ....	33
Table 4. 5: Aspects of CP that influence sustainability of CWPs.....	33
Table 4. 6: How CE&T on Technology used Influence Sustainability of CWPs.....	34
Table 4. 7: Aspects of CE&T on technology used.....	35
Table 4. 8: Influence of Project Location on Sustainability of CWPs.....	36
Table 4. 9: Aspects of Project Location that influence sustainability of CWPs. ....	37
Table 4. 10: Influence of CCC on sustainability of CWPs. ....	38
Table 4. 11: Aspects of CCC that influence sustainability of CWPs.....	38
Table 4. 12: Trend of various aspects of Project Sustainability in community water projects.....	40
Table 4.13: Model Summary .....	40
Table 4.14: Summary of One-Way ANOVA results of the regression analysis be.....	41
Table 4. 15: Coefficients of Regression Equation .....	42

## LIST OF FIGURES

Figure 1: Conceptual framework .....	22
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## **LIST OF ABBREVIATIONS AND ACRONYMS**

CBP	-	Community Based Planning
CCCs	-	Community Capital Contributions
CDF	-	Community Development Fund
CT	-	Community Training
CMs	-	Community Members
CP	-	Community Participation
CWPs	-	Community Water Projects
IEA	-	Institute of Economic Affairs
KWAHO	-	Kenya Water and Health Organization
MDGs	-	Millennium Development Goals
NGOs	-	Non-Governmental Organizations
SWOT	-	Strengths, Weaknesses, Opportunities and Threats

## ABSTRACT

Project Sustainability is a desire of every community, private agency or Government as a means of ensuring that positive gains are delivered to the target communities in long term. This phenomenon is brought to focus in this study based on water projects that aim at improving the quality of life of community water users. The implementation of such projects is always easier but their sustainability poses a challenge. The research explored four research objectives: Establishing the extent to which community participation influence sustainability of CWPs; Investigating the influence that community training on water technology used had on CWPs; Assessing the extent to which project location influenced CWPs and determining the influence that CCCs had on CWPs in Shianda Division. Descriptive survey was used as the research design and the target population was 44,325 people. Stratified probability and purposive non-probability sampling techniques were used in sampling. Each location represented a stratum and the leaders were purposively selected. The sample for the study comprised of 23 Community Water Projects, 46 Community Project Leaders, 8 Local leaders and 142 community water users. Data was collected through questionnaires and analyzed through descriptive statistics where frequency tables and percentages were used to represent the data. In addition, a multivariate regression model was applied to determine the relative importance of each of the four variables with respect to Sustainability CWPs. The findings of the study revealed that both men and women were involved in leadership with more men (88%) in local leadership and more women (65%) in project leadership. Almost all CWUs as well as the leaders were employed with the highest percentage in self-employment thus able to contribute towards repair and maintenance of CWPs in monetary terms. The study also revealed that, of the four factors under study, (Community Participation, Community Training on water Technology used and Community Capital Contribution) community participation influenced sustainability of CWPs in Shianda Division to a very great extent (80.6%) and project location though an important factor to consider for CWP s sustainability, its influence was the least (41.3%). The findings further revealed the need for project initiators: to involve CMs at all levels of the project cycle as this will build ownership of the project, train CMs on how to operate and maintain the water facility so that its continuity is not affected by breakdown, allow CMs to contribute towards the choice of the site for the water point and advise them on the need for them to contribute money towards operation and maintenance of CWPs as this encourages ownership and assures sustainability.

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background of the Study

Projects are designed and implemented to meet specific goals and achieve desired change. Nokes and (Sean 2007) describe a project as a set of coordinated activities with a specific start and finish time, pursuing a specific goal with constraints on time, scope and resources. Some projects require that their activities be sustained over time to ensure continued flow of outputs and hence achievement of the desired change which could be social, cultural or economic. Implementation of most projects may be successful but their sustainability may be a challenge. According to (Hurtton et al 2007) water is the most important natural resource, indispensable for life and at the same time the backbone for growth and prosperity for mankind. The General Assembly of the United Nations drew critical attention to the importance of water to sustainable development and poverty alleviation by declaring 2003 The International year of Fresh water with one of its aims being to reassert the Millennium Development Goals (MDGs) target for water of reducing by half the proportion of people without the access to safe drinking water and stop the unsustainable exploitation of water resources (UNDP-WSP, 2006).

Despite there being a universal recognition for the importance of safe water in poverty alleviation and socio-economic development globally, the access to safe drinking water remains low and this are attributed to many water supply systems not being sustainable. (Smith and Marin 2005) states that worldwide, about two million people struggle daily for access to safe and sufficient water. In the entire world, Africa is the region that suffers most from inadequate access to water supply with only 62% of its population having access to potable water supply. Furthermore, 55 of the countries in the world whose domestic water supply is below 50 litres per capita per day, 35 of them are in Africa,

(Yahaya 2004). The Republic of Kenya in 2007 estimated that piped water coverage provided by Ministry of Water and Irrigation in 2007 stood at 47% nationally.

According to (Nerubucha, 2011), Kenya is a water scarce country and it is therefore important to ensure that water resources are continuously monitored, assessed and evaluated in order to plan for water security. It is important to understand the climate and identify trends. It is clear that the water resources (both surface and underground water) are unevenly distributed spatially in the country and hence the need for proper management (Whittington, Davis and McClelland, 1998). Failure to adequately manage water resources imposes huge costs on Kenya's economy as observed by (Kinoti, M. 2010). According to the Ministry of Water and Irrigation, there are approximately 680 piped water systems that provide over 740,000 water connections throughout the nation. Additional 350 community run water schemes exist in the country. A great percentage of these connections are however inactive due to poor management and maintenance (Republic of Kenya, 2007)

Water projects failure possess a problem that can be self-perpetuating. (Vanloon and Droogers, 2002) in their study on Water Evaluation and Planning System in Kitui, points out that bad experience on unsuccessful water projects in the past alienate people and make them likely to be hostile towards future initiatives. Projects implemented with funding limited to short term goals undermine capabilities of a local institution to sustain itself in long term. Hence in the case of water projects, community participation, their education and training on the technology used and how to use the water system and location of the water project are paramount for sustainability. According to (Themartic group, 2005) among the 24 million rural dwellers in Kenya about 10 million have access to improved water supply either through piped water or point source systems. Of those with access 30% of them are served by community based water supply schemes which are developed by self-help

groups through donor support and government institutions. The groups study further reveals that most of these community based water supply schemes are inactive yet the government has continued to establish more water projects with little regard to rehabilitation of non-functioning ones.

Community water projects in Shianda division presents a typical case of rural community with water projects previously developed either through self-help groups with donor support or Government institutions like Municipal council of Mumias, CDF and KWAHO or largely by the external institutions through influential people from the community. Most of these water projects are deep dug boreholes, hand pumps, piped water or springs and are run by community project committees/ leaders.

Some projects mostly under the support of KWAHO have been reported to be successful and this has largely been enhanced through strategies integrated before completion of projects such as: Effective mobilization of communities through sensitization and training to achieve ownership; Collaboration with various stakeholders (local government, local leaders, politicians and target communities); Application of appropriate technologies, Gender considerations that empower women to handle community projects; Capacity building and sensitivity to social-cultural factors in the communities.

However the situation in the region still possess question of sustainability as most of the projects do not operate to full potential and some have broken down and not rehabilitated. It's due to this scenario that this study intends to assess the factors influencing sustainability of water projects in the region after external support is withdrawn.

## **1.2 Statement of the Problem**

(Sutton, 2004) in his survey carried out in 11 countries in sub-Saharan Africa, observed that The United Nation's Millennium Development Goals (MDG's) that aim at halving from 1990 figures, the proportion of people without access to water and sanitation by the year 2015 have been important in

galvanizing global attention and support for water and sanitation. However such efforts that focus on expansion of new services run the risk of undermining the functional sustainability by encouraging rapid construction of infrastructure rather than long term, critically needed investments in operation and maintenance. What is urgently needed to stem the trend of disrepair and accelerate the progress in achieving MDGs, is a coherent focus on sustainability (Montgomery and Elimelech, 2009).

Studies have been conducted on water project sustainability which includes: a study by (Ngetich, 2009) who observed that most water projects did not function to full capacity and recommended for more study to be done on the influence of project location on sustainability of water projects, a study by (Kainda, 2012) who observed that community contribution and awareness were paramount to water projects sustainability but recommended for further studies in other parts of the country on factors influencing water projects sustainability in order to bring a generalization of the findings and a study by (Habtamu Addis, 2012) who observed that most water project decline in performance shortly after external support is withdrawn and recommended that further study be done on factors that influence sustainability of such projects in other rural parts of other countries in Africa in order to bring a generalization of the findings.

These studies; (Rimbera, 2012), (Ali Jatan, 2012), (Mbajiwe, 2009) and (Airo, 2009) point out lack of project sustainability due to low level of community awareness, approaches used by developers and lack of proper feasibility study but these; (Lengaplani, 2010) and (Wawire, 2007) point out community participation, project location, training on technology used and community capital contribution as factors leading to lack of sustainability. There being water projects that are not functioning and others that need rehabilitation shortly after establishment in Shianda Division, the researcher believes that this study will be of value in addressing the influence that community

participation, education and training on technology used and capital contribution as well as project location have on the sustainability of water projects in Shianda Division.

### **1.3 Purpose of the Study.**

The purpose of this study was to examine the influence of various factors on the sustainability of community water projects in Shianda Division of Kakamega County.

### **1.4 Objectives of the Study.**

1. To establish the extent to which community participation influence sustainability of community water projects.
2. To investigate the influence that community training on water technology used has on sustainability of community water projects.
3. To assess the extent to which project location influence sustainability of community water projects.
4. To determine the influence that community capital contribution has on the sustainability of Community water projects.

### **1.5 Research Questions.**

- 1 To what extent does community participation influence sustainability of community water projects in Shianda Division?
- 2 How is sustainability of community water projects in Shianda Division influenced by community training on water technology used?
- 3 To what extent is the sustainability of community water projects influenced by their location in Shianda Division?
- 4 How is sustainability of community water projects in Shianda Division influenced by community capital contribution?

### **1.6 Justification of the Study**

(Ngetich, 2009) observed that most water projects did not function to full capacity which show that most of them are not sustainable and recommended for more study to be done on project location as a factor influencing sustainability. (Kainda, 2012) observed that community contribution & awareness and feasibility study were paramount to water projects sustainability and recommended that more study be conducted on factors influencing community water projects sustainability in other parts of the nation in order to establish a generalized report. From these, the researcher knows that a study on the factors influencing sustainability of water projects in Shianda Division will seek to fill these gaps.

### **1.7 Significance of the Study**

This research study may be of great benefit to the development committees of Shianda division as it will provide them with information on the influence that community participation, training on technology used in these projects, community capital contribution and water projects location have on water projects sustainability. The findings of this study may provide information that could be used by government in the formulation of policies that will promote initiatives (water projects) that are more sustainable. This study may also be important to academic researchers, scholars and research organizations who may wish to carry out further studies in this area as it may provide them with the information that may serve as a basis for their studies. It may also be useful to individual researchers as it may facilitate them to identify gaps for further studies.

### **1.8 Basic Assumptions of the Study**

This research was based on the following assumptions: The respondents (community water users and key informers) in the Division understood and answered the questions in the questionnaire correctly and truthfully and willingly returned the filled questionnaires and within the postulated timeframe without any external negative influence.

### **1.9 Limitations of the Study**

The researcher postulated the following limitations; the key informers would not be willing to disclose all the necessary information due to conflict of interest but this was overcome by the researcher visiting and explaining the rationale of the study to all respondents prior to data collection which enabled her get all information required from them. Personal administration of the questionnaire by the researcher also helped overcome the limitation of low literacy level of most community water users as the researcher was able to explain to them the questions as they gave answers.

Time had been postulated to be a limitation but prior to data collection, the researcher attended the D.O's "Baraza" where the D.O. was meeting all the Chiefs and was given a chance to explain the rationale of the study to the D.O. and Chiefs and this helped save on time as they [Chiefs] explained the same to community water users and arranged for the specific days when the researcher had to meet the community water users in their respective locations. Besides saving on time it also helped save on the costs incurred thus making financial constraint not to be a limitation.

### **1.10 Delimitations of the Study**

This study was narrowed to Shianda Division of Kakamega County, because the division has many water projects that do not operate to their full potential. This was also considered an appropriate area of study because of the existence of key informers such as Local Leaders and the fact that most of the community water users are natives in the eight locations (Shianda, Eluche, Malaha, Makunga, Khaunga, East wanga, Isongo and Lubinu) of Shianda Division who are well versed with their areas as well as the initiatives/projects therein.

### **1.11 Definition of Significant Terms**

As per this study, the following terms adopted these definitions:

**Community:** A group of people with common socio-cultural attributes living in the same environmental setting and who have a common interest in a given initiative (project).

**Community water users:** People from the same community drawing water from a given water project.

**Community Participation:** Taking part of community members in the activities of community water projects from the beginning to the end.

**Local Leaders:** Members of the community who have been elected and given authority to judge all matters of a given part of the community.

**Key Informers:** Influential Community members leading either youth, women or men groups within the community.

**Project:** An undertaking that has an objective of meeting human needs and aspirations and with specific scope, budget and timeframe.

**Sustainability:** Ability of a water project to continuously provide water to the community water users both in the current and future generations.

**Sustainable project:** A project that has the ability to satisfy the consumption needs of the present without compromising the ability of the future generations to meet their needs.

**Project Location:** The place where the water project is and the distance between it and the community water users.

**Community Capital Contribution:** The financial contribution by community water users given towards implementation and maintenance of the water project.

**Community Training:** The equipping of community water users with the necessary skills and knowledge essential for the operation, repair and maintenance of water projects.

### **1.12 Organization of the Study**

Project sustainability in this study is noted to be of paramount importance as it enables the beneficiaries (community water users) to enjoy the outcomes of the project over time, the aspect on which most water projects fail. The study intended to elaborate the factors influencing sustainability of water projects with a specific focus on community water projects in Shianda Division. The study is therefore organized in chapters each elaborating a different topic.

Chapter one gives the introductory part of the study, elaborating the existence of the problem of community water projects sustainability globally, regionally and locally. It gives the objectives, purpose and significance of the study, its limitations and delimitations as well as the assumptions under which the study was conducted and definition of significant terms as was adopted by this study. Chapter two looks at literature review. In this, literature related to the purpose of study was reviewed under five themes: project sustainability; community participation, community education and training on technology used in construction of water projects, project location and community capital contribution. It also gives a summary of the literature reviewed and the conceptual framework of the study. Chapter three elaborates the research methodology the researcher used in conducting this study. It explains the research design, target population, sample size and sampling techniques used, the research instrument; its validity and reliability and the data collection and analysis tools that were used in the study.

Chapter four looked at data analysis, presentation and interpretation. Data was analyzed and summarized in line with the purpose and objectives of the study and presented in form of frequency

tables and percentages. Chapter five outlines the findings of this study and their relationship with the relevant objectives of the study and describes how the factors identified influence sustainability of community water projects. It gives the recommendations of the researcher in regard to the findings as well as the conclusion and contributions that this study can make to determine future research directions are also highlighted.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter examined literature related to factors influencing sustainability of community water projects in Shianda Division. The literature reviewed was drawn from books, academic journals, Government publications, documents, reports and works that have a bearing wholly or partially on the field of rural development and sustainability. Literature for this study was reviewed under four themes; community participation, community education and training on technology used in water projects, location of water projects and capital contribution of the community as factors influencing sustainability of community water projects.

#### **2.2 Project Sustainability**

Sustainability is a problem which faces almost all development, in industrialized countries as well as in the developing ones. In recent years the debate took on new urgency through the adoption of Agenda 21 at the Earth Summit conference in Rio de Janeiro in June 1992. In the global debate sustainability was considered primarily in terms of continuing to improve human well-being, whilst not undermining the natural resource base on which future generations will have to depend (Len Abrams, 2003).

Sustainability as a concept in development projects is dated to 1980s and defining development and sustainability has been difficult. Brundtland Commission (1987) however defined sustainable development as “one that meets the needs of the present without compromising the ability of future generations to meet their own needs”. This means that a sustainable project must meet the present as well as the future human needs and aspirations. It must be one whose outputs and services are

maintained continuously over time and keeps that focus with its original goals and objectives. Projects are designed and implemented to achieve certain set goals. Some projects require that their activities be sustained over time to ensure continued flow of set outputs hence achieve desired change that could be social, cultural or economic. Water projects are implemented to ease accessibility of the community members to clean water and hence improve their well-being (quality of life). Implementation of these projects is always successful but their sustainability poses a challenge.

Mulwa (2004), points out that sustainability concerns around projects at community level encompasses different dimensions that include; social (ability of a project to restore peoples sense of worth, dignity and self-belief), economic (ability of the local people to identify, procure and use available resources-whether human or material and have no or limited dependency on external), environmental (sustainable use of resources and preservation of the environment-useful in water projects as people will conserve water catchment areas), structural and organizational (an effort of dominant institutions managing projects to become more responsive and sensitive to local needs and aspirations) as well as technological (an effort to develop appropriate technology and promote the use of indigenous knowledge) sustainability. A sustainable project should be able to address all these dimensions.

### **2.3 Community Participation and sustainability of CWPs**

According to (Kulgan, 1994) as cited by (Mwangi, 2007) community participation refers to taking part in the formation, implementation and management of initiatives by community members. It is the presence of process by which community members' opinions and views affects decision making at community level, (Grishvilli 2003). Participation is either directly or through a legitimate intermediate institution or representatives. Good participation needs to be informed and organized. Participation of

community members in development initiatives creates awareness, motivates, organizes actors and helps draw out priorities to help build long term capacities to manage and negotiate, improve accountability by bringing different actors in a good relationship.

It is the yarn that binds together all actors in a project. According to (Mwangi, 2006) communities hardly have adequate, complete and reliable information to support objective rational decisions. He notes that such decisions when made have to be followed and accepted by communities and that this affects implementation effectiveness mainly because a balance has to be maintained between quality and acceptability. Participation by communities in project management is reported to depend on policies, rules, norms and perceptions in addition to endowments and attributes of those affected. Low community participation is said to lead to reduced project effectiveness and thus low impact (Mwangi, 2008). He adds that reduced participation may result from inadequate community involvement by partners at a point of planning.

By involving the community from the onset of project initiatives and addressing the local situation and socio-economic needs of the community, project activities could be effectively planned and even implemented. It is important to focus on both community needs and assets to ensure positivism in both project and community (Mancini, 2003). Diverse activities and practices can be labeled as community participation but each is likely to require a different degree of involvement and provoke a distinct outcome (Beyene et al, (2006). According to (Govinda and Diwan, 2003), participation is an experience felt differently by different people in different circumstances even in similar situations because the benefit that flow from it may not be the same for all.

Beyene et al, (2006) observes that community participation can be categorized into aspects and these included; Time/interest where individuals participation in project work could range from participating

largely as an observer (as an audience member or source of moral support) to contributing skills and leading community participation efforts. These can range from attending community meetings and even voting for committee members on the low side and on the higher side a person can serve as a committee member. The second aspect is labour where a community member can choose to donate manual/physical labour, be a committee member or even offer skills to give services to the community members.

Third aspect of CP as noted by (Beyene et al, 2006) is physical resources: This is generally associated with community members providing material resources for the project to be implemented e.g. providing material for construction like bricks, hay, trees or construction tools like spades. Lastly Beyene observed that CP could also be in monetary resources/donations which is generally most demanded by development initiatives and is considered by many to be a less active form of community participation because relatively little time is involved. Depending on the level of poverty of a community, if there is proper mobilization community members can participate in community initiatives through monetary support. None of these forms of CP can be assigned priority over the other, though it is evident that each form of participation can yield a varying degree of quality and impact on the project implemented.

As community members increase their quality and quantity of participation in projects, communities transit from relatively passive to more proactive state. Community participation in activities such as; collection and analysis of information; definition of priorities and setting of goals; assessing of available resources; deciding on and planning programs and designing strategies to implement such programs and defining responsibilities among participants; managing and monitoring programs and evaluating results and impact involve high level of CP. Active involvement of the community in need

assessment facilitates proper problem/need diagnosis hence clear definition of the problem in many ways. The community should as well participate in the project planning process where objectives, pre-requisites inputs, output organization, participant clearances are defined, costs and earnings calculated, financial plan prepared, expected results analyzed, socio-economic and environmental impacts estimated and provisional as well as final project document prepared.

Community Based Planning (CBP) is important as it attempts to make planning and resource allocation systems more responsive to local people's needs. This improves quality of services while deepening democracy through promotion of community action and involvement in planning and managing local development as it leaves the community empowered. Active CP improves the match between community needs and what the community obtains from a project. According to the International Association of Public Participation (IAPP), of all the empowerment principles, active participation is the most important as it leads to higher rates of resource acquisition and yield better results, higher levels of volunteerism and a brighter community spirit.

Active CP also enhances and leads to actualization, maintenance and sustainability of their projects. Through CP, community members gain ownership and skills for a collective action that enhances sustainability of projects (Olukotun, 2008). The researcher concur with (World bank 1981), (Olukotun 2008), (Mbajiwe 2009), (Rimbera 2012) and others that CP enhances skill development and sense of ownership that leads effective implementation and sustainability of projects.

## **2.4 Community Training**

Human capacity development through specialized training of project managers, staff, community members and the whole project team has been noted to be important for project success and sustainability. (Campo, 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, visual etc., argues that training on issues like operation and maintenance empower the communities to look after water supply systems thus aiding sustainability. Lack of community training is cited as one of the factors which could lead to breakdown and non-sustainability of water supply projects in developing countries (Ademiluyi and Odugbesan, 2008). They further point out that even where full community participation or management is planned from the start, community-level committees and care takers 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 for sustained and 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 with time. This agrees with observations by (Campo 2008) who argued that training on issues like operation and maintenance empower communities to look after water supply systems thus aiding sustainability. Community members must be equipped with the necessary knowledge on how to operate, repair and maintain the water supply system as this will enhance sustainability of the project.

#### **2.4.1 Community Training on Water Technology used**

Water technology that fails to fulfill the needs of its users, which is poorly installed or which is difficult to maintain or repair, possess significant challenges for sustainability. Water Aid's recent sustainability study in Zambia highlighted, for example, the rapid corrosion of hand pump rising mains as a constraint to sustainable community water supplies (Len Abrams, 2003). There is no such thing as a maintenance-free technology yet even gravity water supply schemes, which were expected to provide sustainable services, have failed to live up to that promise.

Hardware (including pumps, pipes, and spare parts) is sourced and procured by international agencies, governments, private providers and NGOs. The questions around who buys, what is procured and how quality of hardware is assured are all important for sustainability. In particular the links between the community and the suppliers of spare parts are crucial. The community need to be trained on how to use the taps, springs, hand pumps among others and it should also be trained on how to maintain the facilities because the external institutions will not always be available in case of breakdowns. Most of the community water projects are either hand pumps or taps (which have underground pipes) or springs and all these must be properly maintained to enhance their sustainability.

Proasne, (2005). Argues that for water projects to give sustainable results, Project Managers should ensure that there will be funding to support identified solutions to the problems in long term, and for this to happen it is necessary that the technologies used be cost effective and CMs receive instructions on the new techniques as well as training on how to maintain and repair the equipment. Cost effective technologies will give CMs a humble time in terms of repair and maintenance, and this will enhance sustainability of the project. Njonjo and Lane emphasizes that without official policy to restrict the range of hand pumps in East African region, a large number of hand pump manufacturers will

continue to flood this region with obsolete machines. They add that this will continue to increase operational costs and hence further aggravate the problem.

### **2.5 Project Location and sustainability of CWPs.**

Site identification for any project is a paramount factor to consider especially for water projects. The location of the project will determine how the water system will be handled, looked after and even maintained. Poor location of water projects may cause lack of ownership of the project by CMs which may affect sustainability of such projects. (Habtmu, 2012), notes that poor location of water projects in Nigeria has led to lack of ownership of projects by CMs rendering such projects non-functional and lowering their sustainability.

He cites location of water projects near market places and roads as poor locations as people passing by crowd over the water causing the community water users to wait for long hours and this may cause them to reduce their frequency of fetching water as a way of avoiding long waiting hours. Some CWPs are located depended of influential families/people in the communities and this can also affect the sustainability of such projects. He further says that poor location of water projects may affect the protection of water projects in terms of the fences around them and this may affect the functioning of the project as animals can even breakdown the pumps as well as the spring walls. When water projects in form of springs are used for multiple purposes such as domestic use, livestock watering, irrigation and tanker supply, care should be taken to prevent contamination of water used for human consumption especially for wells and unprotected springs due to poor location (Muthusi et.al, 2007).

### **2.6 Community Capital Contribution and sustainability of CWPs**

In rural community water supply most national policies require a capital contribution from the users, either in-kind (labor and local materials) or, if in cash, in the region of five percent of the capital cost. This is rarely recovered however, and so improved services are by default a gift (albeit often with some community participation in construction) from the government or NGO to the community.

There is disagreement among practitioners about whether user cash contributions to capital costs help to cement community ownership of rural water supply systems and so contribute to sustainability.

However, there are cases in which a cash contribution to capital cost is raised but then ring-fenced for the water supply, for instance by putting it into an operation and maintenance account on behalf of the community. In this way it is of direct benefit to the users. The only approach to rural water supply in which the users pay the full capital costs of new or upgraded water points is 'self-supply'. Rockstorm, (2003) notes that operation and maintenance water services worldwide costs money but insufficient funds limits the purchase and spare parts. He argues that External Agencies have been reluctant to finance operation and maintenance activities while Governments often accord it less priority yet the service users (community water users) who are the potential source of finance on the same, do not typically see water as a commodity for sale and so many a times they are unwilling to pay for it. Community capital contributions could take the form of community levies-where individuals or households in the community agree to contribute a given fee toward running and maintenance of the water system.

The contributions could also take the forms of: donations from CMs during harvest and fines paid by community members who break community rules. The community capital contributions collection could be affected or hampered by the methods used for the same. The researchers' observation is that most local communities are informal in nature and this makes most of the community projects lack basic procedures and processes of fund collection as they rely on mostly on voluntary labour of elected officials who operate in homes without official facilities. Such systems get low returns and

this turns out to be threat to committees that carryout this exercise as some of them are insulted or dehumanized.

These systems also do not have clear accountability records and this may make CMs doubt such systems making them draw back in contributions. Once a project cannot generate enough revenue from beneficiaries, its sustainability will be threatened as repairs and maintenance cannot be provided for when need arise. Misappropriation of funds collected as a result low or lack of professionalism may also contribute to poor CCCs leading to poor maintenance and thus lack of sustainability.

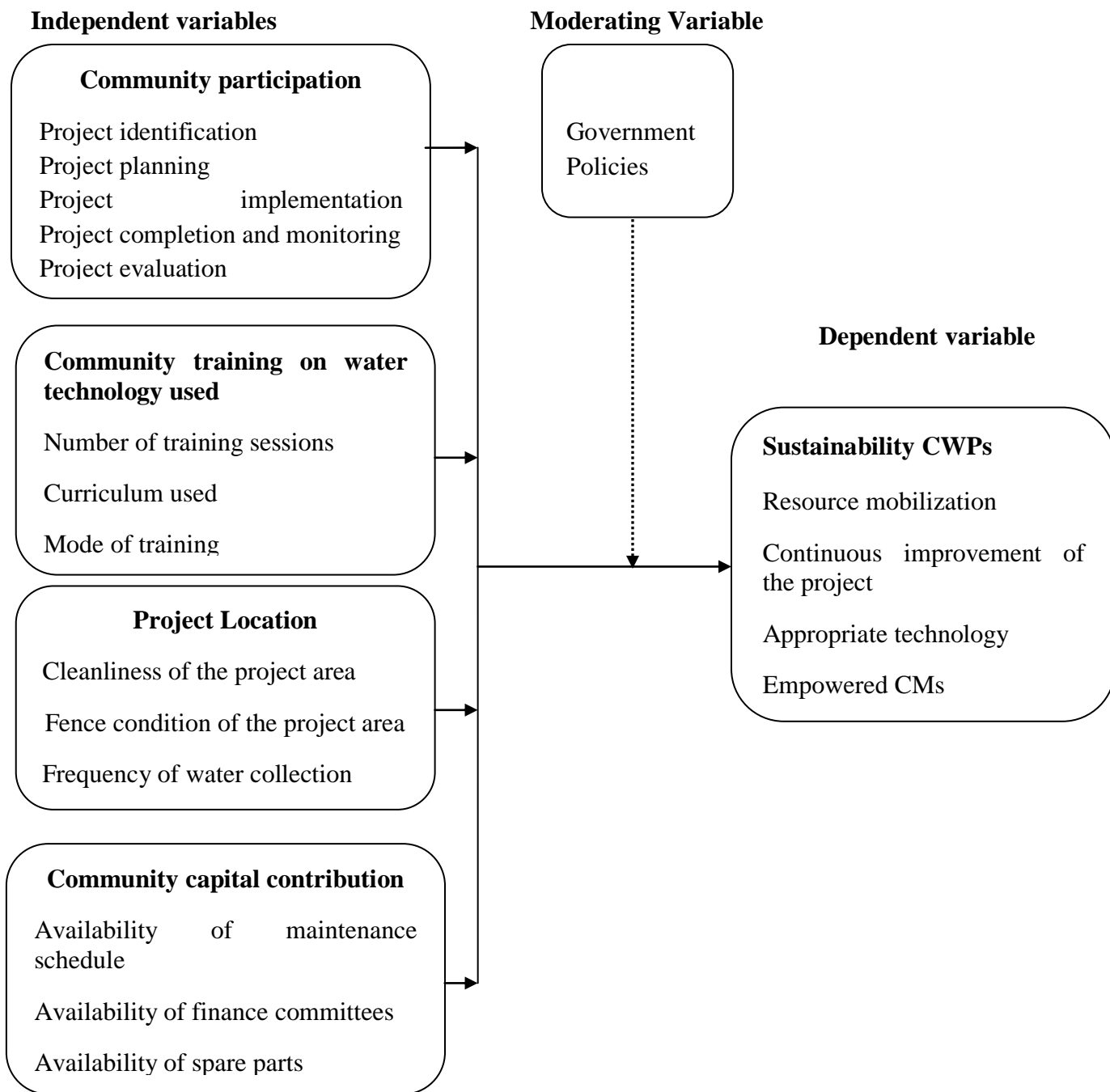
## **2.7 Summary of Literature Review**

Baker, (2000) asserts that despite the billions of dollars spent on development assistance year after year, there is very little known about the actual impact of projects on the poor and this implies that sustainability of such development is still a great challenge. External support on CWPs often does not consider post impact evaluation of the projects. The literature reviewed reveal that in spite of what is known about the value of enhancing sustainability and what has been instituted by different institutions, there are still indicators of poor and even no sustainability of CWPs. This means that further studies can unearth some of the factors that contribute to this.

It emerges from the reviewed literature that CWPs are established to provide beneficial effects (access to clean water) to the target communities. However there is little that has been done regarding influence of community participation, community education and training on technology used, project location and community capital contribution on project sustainability. Literature reviewed reveals the need for further studies on the factors that influence sustainability in order to achieve generalization of results.

## **2.8 Conceptual Framework**

This provides the structural narrative description of the relationship between the variables forming the concepts of the study on sustainability. This framework illustrates the possible underlying factors that influence sustainability of community water projects. It shows project sustainability as the dependent variable, which the study tries to explain how it is influenced by independent variables.



**Figure 1: Conceptual framework**

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter describes the research methodology the researcher used in order to answer the research questions. According to (Mugenda and Mugenda 1999), research methodology outlines the techniques, methods and tools used in data analysis and how to arrive at sample size. It covers research design, target population, sample size and sampling techniques, research instrument, its validity and reliability; data collection procedures, data analysis and presentation methods.

#### **3.2 Research Design**

Research design ensures that the research is relevant to the problem and is an economical procedure for acquiring information (Coopers and Schindler, 2003). Descriptive research design was used in this study. Descriptive research was considered most appropriate because subjects are normally observed in their natural set up and can result in accurate and reliable information (Britt, 2006). The descriptive survey research aims at describing phenomena or narrating how various behaviors and events occur and the researcher has no control over the variables but can only report what is happening or what has already happened.

#### **3.3 Target Population**

A population is defined as the total collection for elements about which we wish to make some inferences (Cooper and Schindler, 2003). The total target population is 44,325 people residing in the division as provided by the Statistic office of the Division and 77 water projects in the 8 locations of Shianda division.

#### **3.4 Sample Size and Sampling Technique**

According to (Malhotra 2004), sample size refers to the numbers of elements to be included in the study. From the mentioned population, a sample size was determined using the Morgan and Krejcie

1970 approach (Amin, 2005) and sample table for large values of N. A sample of 196 people was determined using the formulae below.

Where the population is infinite  $N = (Z/d)^2 P (1-P)$ , P- estimated value for the proportion of a sample that will respond in a given way to a survey (.5 for 50%)

q- Alternative population

Z- Standard variant at a given confidence level (95% CI, Z is 1.96)

d- Margin error ( $\pm 7\%$  is 0.07)

$$N = (1.96/.07)^2 .5(1-.5) = 784(.25) = 196$$

Sample selection was based on stratified proportionate sampling technique to ensure representation of the different strata (locations) of the population. According to (Sekaran 2003), stratified random sampling as its name implies, involves a process of stratification or segregation, followed by random selection of subjects from each stratum.

It is most efficient, and a good choice when differentiated information is needed regarding various strata within the population, which are also known to differ in their parameters. It also ensures inclusion into the sample the subgroups which would otherwise be entirely omitted by other sampling techniques due their [subgroups] small numbers in population. From the eight [8] locations the researcher randomly selected, 30% of the water projects and this gave a sample of 23 water projects. A sample of 30% of the population is sufficient for a study, according to (Corchran, 1977).

**Table 3.1: Sampling procedure for water projects.**

<b>Location</b>	<b>No. of Projects</b>	<b>Sample (30%)</b>
East wanga	10	3
Shianda	10	3
Lusheya	8	2
Lubinu	12	4
Makunga	10	3
Esongo	8	2
Khaunga	9	3
Malaha	10	3
<b>Total</b>	<b>77</b>	<b>23</b>

The researcher randomly selected six [6] community water users from each of the selected water projects and four key informers from the division, giving a total of 142. The researcher also used Purposive sampling. Purposive sampling is used when the information required can only be obtained from a specific source Mugenda and Mugenda, (2003). Kombo and Tromp, (2006) supports this by saying that purposive sampling ensures selection of information rich cases for in-depth analysis related to central issues in the study.

To get appropriate information on sustainability of water projects in the division, 2 project leaders from each of the sampled projects were purposively picked as respondents since they were better placed in understanding the running of their projects and this gave a total of 46 respondents. The researcher also purposively selected one local leader from each of the eight locations in the division.

### **3.5 Data Collection Instrument**

Questionnaires were used as the data collection instrument. (Glasser and Strauss, 2007) explains that questionnaires are an important instrument for research; a tool for data collection. The use of

questionnaires was justified because they are an effective way of collecting information from a large sample in a short span of time and at a reduced cost than other methods. Further, questionnaires facilitate easier coding and analysis of data collected. The researcher administered the questionnaires both in person and through the help of field assistants by visiting the respondents. This was intended in order to offer assistance especially to those with low literacy levels and this helped increase response rate.

### **3.5.1 Validity of Data Collection Instrument**

Instrument validity refers to the accuracy and meaningfulness of inferences which are based on research results obtained from analysis of data that actually represent the phenomena under study. It therefore refers to how accurately the data obtained in the study represents variables of the study (Kombo and Troop, 2002). The researcher conducted a pilot study by administering a questionnaire to one of the respondents from each of the three categories of respondents who were randomly selected in three of the eight locations namely; Lubinu, Lusheya and Makunga. After analyzing pilot results, irrelevant and baseless items were discarded and replaced with more relevant and logical ones that elicited required responses.

### **3.5.2 Reliability of Data Collection Instrument**

According to (Mugenda and Mugenda, (1999) reliability is the measure of the degree to which a data collection instrument yields consistent results or data after repeated trials. A reliable data collection instrument is one that produces consistent results when used more than once to collect data from a sample randomly selected from the sample population.

The researcher used split half method to test reliability of the research instrument. The questionnaires were tested in three randomly selected locations (Lubinu, Lusheya and Makunga) in the division.

Pearson Moment Product Coefficient was determined and the results used to determine Correlation Coefficient that was found to be 0.879 which was above the recommendent one of 0.7, (Bobbie, 2002).

### **3.6 Data Analysis**

According to (Tabachinck and Fidell, 1983) suggest that data abnormalities may lead to an inaccurate analysis and caution in scrutinizing data for these abnormalities is a prerequisite for mature analysis. Thus, problems of missing data, outliers, multi-co linearity and violations of statistical assumptions were diagnosed and corrected before applying statistical procedures. Data collected through the questionnaires was edited, coded and descriptively analyzed using the Statistical Package for Social Sciences (SPSS) and presented in as percentages and frequency tables.

In addition, a multivariate regression model was applied to determine the relative importance of each of the four variables with respect to Sustainability CWPs. Multiple regressions is a flexible method of data analysis that may be appropriate whenever quantitative variables (the dependent) is to be examined in relationship to any other factors (expressed as independent or predictor variable). The regression model was as follows:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$$

Where:

Y = Sustainability CWPs

$\beta_0$  = Constant Term

$\beta_1, \beta_2$  and  $\beta_3$ , = Beta coefficients

$X_1$ = Community participation

$X_2$ = Community education & training on technology

$X_3$ = Project Location

$X_4$ = Community capital contribution

$\varepsilon$  = Error term

### **3.7 Ethical considerations**

Ethics has been defined as that branch of philosophy which deals with one's conduct and serves as a guide to one's behaviour (Mugenda and Mugenda, 1999). In conducting this research, the researcher followed ethical guidelines to ensure that there was no physical or emotional harm to the respondents. Plagiarism was avoided by ensuring that the work done by others was fully acknowledged by referencing it. Lastly data integrity was a priority and this was done by ensuring honesty in gathering and analysing of data and interpretation of the findings.

### **3.8 Operational definition of variables**

This is a set of procedures that describes a set of procedures a researcher can follow in order to establish the existence of the phenomenon described by a concept (Nachmias and Nachmias, 1996). This assigns meaning to a construct or a variable by specifying the activities or 'operations' necessary to measure it. It is a sort of manual of instructions to the investigator.

**Table 3.3 Operationalization of variables**

<b>Objective</b>	<b>Variable</b>	<b>Indicator</b>	<b>Measurement</b>	<b>Scale</b>	<b>Data collection tool</b>	<b>Data Analysis Tool</b>
	Project Sustainability		Rate of repair, maintenance and rehabilitation	Nominal	Questionnaire	Descriptive statistics
To assess the extent to which community participation influence sustainability of CWP	Community participation	Project identification, Planning, Implementation, completion, monitoring & evaluation	Rate of sustainability of community water project	Five point Likert	Questionnaire	Descriptive statistics
To explain how CE&T on technology used in CWP influence their sustainability	Community education and training on technology used	User acceptability Level of literacy Ease of repair & maintenance	Rate of sustainability of community water project	Ordinal	Questionnaire	Descriptive statistics
To assess the extent to which project location influence sustainability of CWP	Project location	Cleanliness of the area Fencing condition	Rate of sustainability of community water project	Nominal	Questionnaire and observation	Descriptive statistics
To determine the influence that CCC has on the sustainability of CWP	Community capital contribution	Availability of maintenance schedule, finance committee and spare parts	Rate of sustainability of community water project	Nominal	Questionnaire	Descriptive statistics

## **CHAPTER FOUR**

### **DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION**

#### **4.1 Introduction**

Data analyzed was summarized in line with the research objectives and appropriate frequency tables inserted for presentation. The analysis was conducted in order to assess how various factors influenced sustainability of community water projects in Shianda Division. The analysis begins with a description of the demographic profile of the respondents, which gives the reader an insight into demographic trends typical of any representative sampling of community members and their leaders and presented in form of percentages and frequency tables.

#### **4.2 Questionnaire Return Rate**

Bobbie, 2002 refers to questionnaire return rate as the proportion of the questionnaires returned after they are issued and filled by the respondents. He further states that a questionnaire return rate of 50% and above is sufficient for analysis. In this study the questionnaire return rate was 100% as all the questionnaires issued to the respondents in all the three categories [local leaders, project leaders and CWU's] were all returned.

#### **4.3 Demographic profile of Respondents**

The demographic profile of respondents was grouped into the demographic data of Local leaders, Community Project Leaders and CWUs. This was based on their gender and level of education and to establish their gender they were asked to indicate on the questionnaire and results presented in Table 4.1.

Table 4. 1: Respondents by Gender

Category	Local leaders		Project leaders		CWUs	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Male	7	88	16	35	60	44
Female	1	13	30	65	82	56
<b>Total</b>	<b>8</b>	<b>100</b>	<b>46</b>	<b>100</b>	<b>142</b>	<b>100</b>

Data revealed that the number of women who participated in the study was higher 58% compared to that of men 42%. It also showed that while most of the locations (88%) were led by men, most of the community water projects in the division were led by women 65% and this showed that both genders are involved in leadership.

Respondents were also asked to indicate the highest level of education attained and results presented in Table 4.2.

Table 4. 2: Respondents by Education level

Category	Local leaders		Project leaders		CWUs	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
College	8	100	7	15	8	6
Secondary	0	0	18	39	50	35
Primary	0	0	21	46	81	57
None	0	0	0	0	3	2
<b>Total</b>	<b>8</b>	<b>100</b>	<b>46</b>	<b>100</b>	<b>142</b>	<b>100</b>

Data indicated that all [100%] local leaders had attained tertiary education and thus competent enough to lead their people. Of the project leaders and community water users who participated in this study,

a great percentage only had the basic primary education, (46% and 57% respectively). There was a small percentage (2%) of the CWUs that had not attained any form of formal education

The project leaders and community water users were also asked to indicate the type of their employment and results presented in Table 4.3.

**Table 4. 3: Respondents by Employment Type**

Category	Project leaders		CWUs	
	Frequency	Percent	Frequency	Percent
Hired	18	39	45	30
Self	28	61	94	68
None	0	0	3	2
<b>Total</b>	<b>46</b>	<b>100</b>	<b>142</b>	<b>100</b>

Data showed that most of the project leaders and CWUs were employed with a great number of them [61% and 68% respectively] self-employed and only 2% of the CWUs were not in any form of employment. This meant that almost all the CWUs as well as the project leaders had the potential to contribute towards maintenance and repair of the CWP in terms of money.

#### **4.4 Factors Influencing Community Water Projects in Shianda Division**

This study sought to examine the influence that various factors had on the sustainability of community water projects in Shianda Division. All the respondents in the three categories of local leaders, project leaders and CWUs were asked to indicate the influence of these factors on sustainability.

#### 4.4.1 Influence of Community Participation on Sustainability of CWPs.

The study sought to establish the extent to which CP influences sustainability of CWPs in Shianda Division.

**Table 4. 4: The extent to which CP influences sustainability of CWPs.**

Level of influence	Frequency	Percent
Very great extent	108	55
Great extent	39	20
Moderate extent	29	15
Less extent	20	10
<b>Total</b>	<b>196</b>	<b>100</b>

The study deduced that community participation was of paramount importance in the sustainability of community water projects and this was evident in how the respondents rated this factor. 55% said community participation influenced sustainability of CWPs to a very great extent, 20% indicated that CP influenced sustainability of CWPs to a great extent, 15% of the respondents indicated that CP influenced sustainability of CWPs to a moderate extent, while 10% of the respondents indicated that CP influenced sustainability of CWPs to a less extent. These findings reveal that CP influence sustainability of CWPs to a very great extent.

**Table 4. 5: Aspects of CP that influence sustainability of CWPs.**

Aspects of CP	Frequency	Percent
a) Project identification	70	36
b) Project planning	40	20
c) Project implementation	50	26
d) Project completion and	24	12
e) Project monitoring & evaluation	12	06
<b>Total</b>	<b>196</b>	<b>100</b>

Results of how aspects of community participation influence sustainability of CWPs revealed that of the five aspects of CP, sustainability was influenced by project identification to a very great extent as 36% of respondents agreed, 26% of respondents agreed that project implementation influenced sustainability to a great extent, 20% of the respondents agreed that sustainability was influenced by project planning to a moderate extent, project completion influences sustainability to a low extent as 12% of the respondents agreed and that sustainability was influenced to a very low extent by project evaluation and monitoring.

The findings revealed that CP influenced sustainability of CWPs in Shianda division to very great extent. The findings concur with the findings of Rimbera (2012), Mbajiwe P. (2009) and Vincent R. (2012) who found out that CP is a very paramount factor in community water projects if they are to be sustainable. The findings also revealed that project facets at which CP greatly influence CWPs sustainability were; project initiation, implementation and monitoring & evaluation. This implies that CMs need to be involved in CWPs at all levels of the project in order to enhance their sustainability and this agrees with the findings of Ibrahim (2011) which revealed that CP at all stages of the project is one of the major factor that influence implementation of sustainable CWPs in Kenya. Kumar (2002) asserted that CP is a key instrument in creating self-reliant and empowered communities and this enhance ownership of community initiatives hence their sustainability.

#### **4.4.2 Influence of CT on Water Technology Used on the sustainability of CWPs.**

The study sought to explain how sustainability of CWPs in Shianda Division was influenced by community education and training on technology used.

**Table 4. 6: How CT on water Technology used Influence Sustainability of CWPs**

<b>Level of influence</b>	<b>Frequency</b>	<b>Percent</b>
Very great extent	108	55
Great extent	39	20
Moderate extent	29	15
Less extent	20	10
<b>Total</b>	<b>196</b>	<b>100</b>

The study deduced that CE&T on technology used was quite important in the sustainability of community water projects and this was evident in how respondents rated this factor. 55% said CE&T on technology used influenced sustainability of CWPs to a very great extent, 20% indicated that influenced sustainability of CWPs to a great extent, 15% of the respondents indicated that CE&T on technology used influenced sustainability of CWPs to a moderate extent, while 10% of the respondents indicated that CE&T on technology used influenced sustainability of CWPs to a less extent. These findings reveal that CE&T on technology used influence sustainability of CWPs to a very great extent.

**Table 4. 7: Aspects of CT on water technology used**

<b>Aspect</b>	<b>Frequency</b>	<b>Percent</b>
Number of training sessions	102	52
Frequency of training	25	20
Mode of delivery	39	28
<b>Total</b>	<b>196</b>	<b>100</b>

Results of how the aspects of CE&T on technology used influence sustainability of CWPs revealed that of the three aspects of CE&T on technology used, sustainability of CWPs was influenced by number of training sessions to a very great extent as 52% of respondents agreed, 20% of respondents agreed that frequency of training influenced sustainability to a moderate extent, 28% of the respondents agreed that sustainability was influenced by mode of delivery to a great extent.

The findings of the study revealed that CT had a great influence on the sustainability of CWPs but was limited by level of education of community water users, language used in training and frequency of the trainings. These findings concur with those of (Steve and Khan, 2004) who argues that community mobilization through education and training is a key to achieving ownership of CWPs and building capacity necessary for operations and maintenance. Training on the water technology used in CWPs is very relevant in ensuring proper handling, use and maintenance of the facility. The findings of the study further revealed that CT on water technology used in Shianda division influenced

sustainability of CWPs to a very great extent as some of the water projects were not operating after breakdown.

Reynolds (1992) argued that use of the appropriate technologies and their relevant training are integral to the concept of village level operation and maintenance that emerged in the water decade (1981-1990). The study also established that the aspects of technology used such as cost and availability of spares parts, ease to operate and maintain as well as user acceptability were paramount in CT influencing sustainability of CWPs.

#### **4.4.3 Influence of Project Location on the Sustainability of CWPs**

The study also sought to assess the extent to which sustainability of CWPs in Shianda Division was influenced by project location.

**Table 4. 8: Influence of Project Location on Sustainability of CWPs.**

<b>Level of influence</b>	<b>Frequency</b>	<b>Percent</b>
Very great extent	29	15
Great extent	39	20
Moderate extent	108	55
Less extent	20	10
<b>Total</b>	<b>196</b>	<b>100</b>

The study deduced that project location was important in sustainability of community water projects but the extent of its influence in Shianda division as evident in how respondents rated this factor was moderate as 55% of the respondents agreed, 20% indicated that location of project influenced sustainability of CWPs to a great extent, 15% of the respondents indicated that project location influenced sustainability of CWPs to a very great extent, while 10% of the respondents indicated that project location influenced sustainability of CWPs to a less extent. These findings reveal that project location influence sustainability of CWPs to a moderate extent.

**Table 4. 9: Aspects of Project Location that influence sustainability of CWPs.**

<b>Aspect</b>	<b>Frequency</b>	<b>Percent</b>
Frequency of water collection	45	22
Cleanliness of the project area	52	27
Fencing condition	99	51
<b>Total</b>	<b>196</b>	<b>100</b>

Results of how the aspects of project location influenced sustainability of CWPs revealed that of the three aspects of project location, sustainability of CWPs was influenced in terms of maintenance of the fence around the project as 51% of respondents agreed, 27% of respondents agreed that sustainability of CWPs was influenced in terms of cleanliness of the area and 20% of the respondents agreed that sustainability was influenced. This reveals that a CWP that is not located in a convenient point for CWUs, its sustainability will be influenced more than that conveniently located.

The findings of the study revealed that location of water projects in Shianda division influenced sustainability of CWPs to a moderate extent. The assessment of the findings on how location of projects influenced sustainability of CWPs revealed that frequency to water points that were further away to the users was less as compared to the frequency to water points that were so much near to the users. The findings also revealed that aspects of project location like cleanliness, fencing condition, maintenance and security of the water point was affected to a moderate extent. The findings concur with findings of (Habtamu, 2012), who noted that poor location of water projects in Nigeria led to lack of ownership of projects by CMs rendering such projects non-functional and lowering their sustainability. He cites location of water projects near market places and roads as poor locations as people passing by crowd over the water causing the community water users to wait for long hours and this may cause them to reduce their frequency of fetching water as a way of avoiding long waiting hours. Some CWPs are located depended of influential families/people in the communities and this can also affect the sustainability of such projects. He further argues that poor location of water projects may affect the protection of water projects in terms of the fences around them and this may affect the functioning of the project as animals can even breakdown the pumps as well as the spring walls

#### 4.4.4 Influence of Community Capital Contribution on sustainability of CWPs

The study also sought to determine the influence that CCC had on sustainability of CWPs in Shianda Division.

**Table 4. 10: Influence of CCC on sustainability of CWPs.**

<b>Level of influence</b>	<b>Frequency</b>	<b>Percent</b>
Very great extent	120	61
Great extent	29	15
Moderate extent	47	24
<b>Total</b>	<b>196</b>	<b>100</b>

The study deduced that CCC was quite important in sustainability of community water projects and the extent of its influence in Shianda division as evident in how respondents rated it was very great as 61% of the respondents agreed, 15% indicated that CCC influenced sustainability of CWPs to a great extent, 24% of the respondents indicated that CCC influenced sustainability of CWPs to a moderate extent. These findings reveal that CCC play a major role in the sustainability of CWPs as its influence was to a very great extent.

**Table 4. 11: Aspects of CCC that influence sustainability of CWPs.**

<b>Aspect</b>	<b>Frequency</b>	<b>Percent</b>
Availability of spares	170	87
Availability of maintenance schedule	16	08
Availability of finance committees	10	05
<b>Total</b>	<b>196</b>	<b>100</b>

Results of how the aspects of CCC influenced sustainability of CWPs revealed that of the three aspects of CCC, sustainability of CWPs was influenced in relation to availability of spare parts as 87% of respondents agreed, 8% of respondents agreed that sustainability of CWPs was influenced in

relation to availability of maintenance schedule and 5% of the respondents agreed that sustainability was influenced in relation to availability of finance committees. This reveals that a CWP for which the CWUs do not contribute financially towards the operation and maintenance its sustainability will be influenced more than that for which CWUs contribute towards its operations and maintenance.

The findings revealed that CCCs influenced sustainability of CWPs in Shianda division to a very great extent in terms of maintenance. From the analysis of the demographic factors of the respondents, the study revealed that only 2% of the respondents were not employed and this meant that the respondents were able to contribute towards the maintenance of CWPs yet a number of the projects (5) had long stopped operating after breakdown for lack of funds to purchase spares or hire an experienced artisan. The findings also revealed that the willingness of the CMs in making monetary contributions towards maintenance and operations of CWPs had a very great influence of the sustainability of such projects since some CMs saw this as a levy fee yet they considered water to be a natural resource that needed not to be paid for.

The regression findings show that taking all other independent variables at zero, a unit increase in community participation would lead to a 0.806 increase in sustainability CWPs and a unit increase in community education and training on technology would lead to a 0.648 increase in the sustainability CWPs. Further, the findings shows that units increase in project location would lead to a 0.413 increase in sustainability CWPs. In addition, the findings show that a unit increase in community capital contribution would lead to a 0.716 increase in sustainability CWPs. All the variables were significant as their P-values were less than 0.05. In terms of magnitude, the findings indicated that community participation had the highest influence on sustainability CWPs, followed by community capital contribution, then community education and training on technology while project location had the least influence on sustainability CWPs.

#### 4.5 Project Sustainability

**Table 4. 12: Trend of various aspects of Project Sustainability in community water projects in Shianda division for the last five years**

Aspects	Mean	Std Deviation
Rate of repair	4.0357	.60194
Rate of maintenance	4.0714	.59870
Rate of vandalization	3.8571	.69879

The study also sought to determine the trend of various aspects of Project Sustainability in community water projects in Shianda Division for the last five years. From the findings, majority of the respondents were of the view that the rate of maintenance, repair and vandalization of community water projects in Shianda Division had improved as shown by a mean score of 4.0714, 4.0357 and 3.8571 respectively.

##### 4.5.1 Regression Analysis

In this study, a multiple regression analysis was conducted to test the influence among predictor variables. The research used statistical package for social sciences (SPSS V 21.0) to code, enter and compute the measurements of the multiple regressions

##### 4.5.2 Goodness of Fit of the Model

**Table 4.13: Model Summary**

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.903	0.815	0.616	0.97120

Table 4.8 is a model fit which establish how fit the model equation fits the data. The adjusted  $R^2$  was used to establish the predictive power of the study model and it was found to be 0.616 implying that

61.6% of the variations in sustainability CWPs are explained by community participation, Community education and training on technology, project location and community capital contribution leaving 38.4% percent unexplained. Therefore, further studies should be done to establish the other factors (38.4%) affecting sustainability CWPs.

### 4.5.3 Analysis of Variance

Table 4.14: Summary of One-Way ANOVA results of the regression analysis between sustainability CWPs and predictor variables

<b>Model</b>		<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
1	Regression	6.62	4.000	1.655	4.720	0.002
	Residual	32.61	191.000	0.351		
	Total	39.230	195.000			

From the ANOVA table, the regression model predicting the relationship between the dependent and independent variables is significant at  $F= 4.720$  and  $P = 0.002$ .

#### 4.5.4 Regression Coefficients

**Table 4. 15: Coefficients of Regression Equation**

		Unstandardized		Standardized	t	Sig.
		Coefficients		Coefficients		
		B	Std. Error	Beta		
(Constant)		1.193	0.432		2.762	0.015
Community participation	X <sub>1</sub>	0.806	0.108	0.146	7.463	0.013
Community education and training on technology	X <sub>2</sub>	0.648	0.141	0.126	3.887	0.029
Project location	X <sub>3</sub>	0.413	0.125	0.145	4.904	0.022
Community capital contribution	X <sub>4</sub>	0.716	0.124	0.112	2.556	0.037

Dependent Variable: Sustainability CWPs

The established model for the study was:

$$Y = 1.193 + 0.806 X_1 + 0.648 X_2 + 0.413 X_3 + 0.716 X_4$$

The regression equation above has established that taking all factors into account (community participation, community education and training on technology, project location and community capital contribution) constant at zero sustainability CWPs will be 1.193. The findings presented also show that taking all other independent variables at zero, a unit increase in community participation would lead to a 0.806 increase in sustainability CWPs and a unit increase in community education and training on technology would lead to a 0.648 increase in the sustainability CWPs.

Further, the findings shows that units increase in project location would lead to a 0.413 increase in sustainability CWPs. In addition, the findings show that a unit increase in community capital contribution would lead to a 0.716 increase in sustainability CWPs. All the variables were significant as their P-values were less than 0.05. In terms of magnitude, the findings indicated that community participation had the highest influence on sustainability CWPs, followed by community capital contribution, then community education and training on technology while project location had the least influence on sustainability CWPs.

## **CHAPTER FIVE**

### **SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter gives a summary of the findings of this study, discusses the findings, and gives the conclusion on the factors that influence sustainability of community water projects in Shianda Division. It also outlines the recommendations for improved community water projects sustainability in the Division and recommendations for further research.

#### **5.2 Summary of the Findings**

This study sought to examine the factors that influence sustainability of community water projects, so as to propose alternative strategies for enhancing sustainability in the division and rural areas at large.

##### **5.2.1 Project Sustainability**

There is inconsistency in supply of water by CWPs attributed to lack of training on technology used (breakdown and vandalism of the equipment), leadership challenges, location of the project and embezzlement of funds collected for maintenance. This agrees with the statement of the problem that CWPs in Shianda Division portray both intermittency and continuity is sometimes be-felled by embezzlement of water funds, low capacities and lack of ownership

##### **5.2.2 Influence of Community Participation on sustainability of Community Water Projects**

Community Participation enhances ownership of the project by CMs which promotes effective contributions by CMs hence sustainability. Community participation forms the basis for community empowerment as observed by Mazibuko, (2007). Community participation leads to higher rates of resource acquisition and yields better results, higher levels of volunteerism and a brighter community spirit that motivates CMs to own the CWP and this enhances its sustainability.

##### **5.2.3 Influence of Community Training on water technology used on sustainability of CWPs**

Appropriateness of design and technology in water projects is quite important and so is the knowledge of how to operate and maintain it if the project is to be sustainable. Lack of community education and training on technology used is one of the factors which could lead to breakdown and non-

sustainability of water supply projects in developing countries as observed by (Ademiluyi and Odugbesan, 2008).

#### **5.2.4 Influence of project location on sustainability of CWPs**

Location of CWPs is crucial for its sustainability as this will determine ownership of the project in terms of cleanliness of the area and fencing condition as well as protection from vandalism of equipment where hand pumps are used.

#### **5.2.5 Influence of CCCs on sustainability of CWPs**

Operations and maintenance of CWPs costs money and must be done to enhance sustainability. Community capital contribution becomes crucial for this to be achieved and this therefore calls for CMs cooperation and willingness to do so.

### **5.3 Conclusions**

The study sought to assess the influence that CP, CT on technology used, project location and CCCs had on the sustainability of CWPs in Shianda division. The findings of the study deduced that all these factors influenced sustainability of CWPs but the extent of influence varied from one factor to another and CP had the greatest influence (80.6%) while project location had the least influence (41.3%). Project initiators must therefore involve CMs at all levels of the project cycle as this will build ownership of the project, CMs must be trained and educated on how to operate and maintain the water facility so that its continuity is not affected by breakdown, CMs must contribute towards the choice of the site for the water point and CMs need to be advised on the need for them to contribute money towards operation and maintenance of CWPs as this encourages ownership and assures continuity.

#### **5.4 Recommendations**

Project sustainability is of paramount importance for any project and especially for CWPs and for that matter, CMs should be made aware of the need of water projects to serve not only their generation, but also future generations, hence take the necessary measures to ensure this. Most of the hand pumps in the division are either no longer operating (45%) or have been stolen as a result of not operating due to lack of capacity to maintain after breakdown (50%). Implementation of springs, lockable boreholes or piped water systems would work well for the division.

Community participation has for long been identified as a tool of helping rural as well as urban dwellers to focus their energy and mobilize resources in order to solve their own problems. When community members identify, plan and share tasks involved in projects with professionals, and are involved in decision making on the activities that affect their lives, projects initiated are more likely to achieve their objectives. CP make projects gain a great support and ownership from CMs and this assures sustainability of projects and should be encouraged in all community water projects.

Capacity building in project sustainability is very crucial. Community members need to be trained on water technology used in CWPs and more so on how to operate and maintain the system. Water technology that CMs cannot operate or maintain, on breakdown renders the water project dysfunctional and not able to meet its objectives hence not sustainable. Community training and education on technology used must be done for any CWP if it is to be sustainable. These trainings need to be frequent and an analysis on the education level of the CMs should first be made in order to establish the most suitable language mode of training to use so as to assure effective transfer of knowledge from the trainer to the trainee.

Project location is equally important and CMs should be involved in identification of the site for the project in order to encourage ownership in terms of protection and cleanliness of the site. Operation and maintenance of any water project need money and the community water users should be encouraged to contribute towards the same in order to avoid rendering the project dysfunctional or unsustainable on breakdown as they wait on well-wishers who may not be available.

#### **5.4.1 Suggestions for Further Studies**

Further research should be done on the same topic of sustainability on the following:

1. How gender influences sustainability of CWPs
2. The influence that community member' disputes have on the sustainability of CWPs
3. Influence of project management team on sustainability of CWPs.

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## **APPENDICES**

### **Appendix 1: Letter of Introduction.**

University of Nairobi  
School of Continuing and Distance Education  
Department of Extramural Studies,  
Nairobi Centre.

The Chief/Project leaders  
Shianda Division.

Dear Sir/Madam,

#### **RE: ACADEMIC RESEARCH**

I am a student of the University of Nairobi pursuing a Master of Arts degree in Project Planning and Management. I am undertaking an academic research on factors influencing sustainability of community water projects in Shianda division and water projects in your location have been selected for this study. Attached is a copy of the questionnaire intend to use to collect data and I hereby humbly request you to kindly fill it as accurate as possible. The questionnaire focuses on four factors; Community participation; Community education and training on technology used; Project location and Community capital contributions. Thank you in advance.

Yours sincerely,

Kanyanya Loice Ongwen.

**Appendix 2: Questionnaire**

**Instruction 1.**

Please answer the questions below to the best of your knowledge by writing your responses in the spaces provided. Tick (✓) where appropriate.

**Background Information**

1. Gender

Male [ ]                      Female [ ]

2. What is your highest education level?

a) Primary [ ]    b) Secondary [ ]    c) Middle level college [ ]    d) University [ ]

3. What type of employment are you in?

a) Self [ ]                      b) Hired [ ]                      c) Both [ ]                      d) None [ ]

**Instruction 2**

In relation to sustainability of Shianda community water projects in Kakamega County, to **what extent do you agree** with the following? Use a scale of 1-5 where 1= very great extent, 2=great extent, 3=Moderate extent, 4=minimal extent and 5= Not at all

	1	2	3	4	5
<b>PROJECT LOCATION</b>					
The project is located in a clean environment that is free from contamination					
The water project is well fenced to protect it from damages by both human and animals					
The water project is located in an appropriate place for the users, accessible for maintenance purposes and secure environment					

<b>COMMUNITY PARTICIPATION</b>					
I participated in identifying the activities needed to initiate and complete the project including definition of priorities and setting of goals, collecting and analysing information on need assessment					
I participated in project planning activities including designing the project objectives, pre-requisites inputs and output organization, social and environmental assessment, final documents preparation, drawings, work plans, log frame					
I participated in the implementation of the water project in various activities including provision of labour, attending community meetings where clearance was done, monetary provision, participated in procurement of materials and equipment, implementation of work schedule, progress and budget					
I participated in the project Monitoring and Evaluation from the initiation, planning, implementation and review stages which included designing and managing monitoring and evaluation systems, regular site visits, involvement in review of achievements against set objectives, Identifying corrective actions to address issues and risks properly					
<b>COMMUNITY EDUCATION AND TRAINING</b>					
I was / I know a person in the community was trained on maintenance of the equipment					
The equipment's spare parts are locally available					
There are adequate trained personnel to manage the project					
The equipment was properly installed for easy maintenance					
Is the technology used acceptable by users and is it easy to operate and maintain?					
Community members were trained on how to operate the equipment including taps					
The procured equipment's spare parts are available at an affordable price					

<b>COMMUNITY CAPITAL CONTRIBUTION</b>					
I have a steady income in form of formal employment or self-employment to support the water project					
I am willing to make monetary contributions towards maintenance and operations of the project					
I agree to contribute a given fee toward running and maintenance of the water system.					
<b>PROJECT SUSTAINABILITY</b>					
The local community is able to identify, procure and use available resources both human and material to run the project without external aid					
The local community is empowered through education and training to run the project effectively and efficiently					
The local community is able to preserve the water catchment area for the continuous supply of water					
The project leadership is well structured and organized to operate and maintain the project					
The technology used is appropriate and the spare parts are available locally at an affordable price					