

**EFFECT OF COMMUNITY BASED MANAGEMENT ON SUSTAINABILITY OF
WATER PROJECTS IN MACHAKOS COUNTY**

BY

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DECLARATION

I declare that this dissertation is my own original work and has not been previously published or submitted elsewhere for the award of the degree of Masters of Business Administration (Corporate Management)

I also declare that this contains no material written or published by other people except where due reference is made and author duly acknowledged.

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ABSTRACT

Sustainability of community based and managed water projects in Kenya remain a challenge. In spite of concerted efforts to transfer the ownership of water Projects to beneficiary communities and increasing participation of the communities in the operation and maintenance of these facilities, more than a third of all water projects fail within three years of development. The purpose of this research was to investigate the effect of community based management on sustainability of water projects in Machakos County. Descriptive survey was used as the research design and the target population was 1120 people. The Sampling Procedure used was a multistage sampling where 31 out of 104 projects were sampled which represented 30% of the total number of water projects in the county. From the sample size of the 31 projects, 1 project manager, 2 community leaders and 2 water project committee members were randomly picked. The sample size therefore consisted of 155 respondents sampled from the target population. This represented 14% of the population and was chosen because the population was homogenous and therefore needless of a big sample size. In addition, a multivariate regression model was applied to determine the relative importance of each of the four variables with respect to Sustainability of Community Based Water Projects. Data was analyzed using descriptive and inferential statistics. Every questionnaire was checked to ensure completeness and that it was correctly filled. All questionnaires were coded so that all data could be analyzed with the aid of the Statistical Package for Social Scientists (SPSS) computer programme. The results of the study will contribute towards policy formulation and management in the Water Sector in guiding on best practices for sustainable water Projects. The study found out that water projects' sustainability is influenced by factors like community participation, financial management, provision of technical support and attitude. The study concludes that project financial management and technical support affects sustainability of water projects in Machakos County. It also concludes that Community participation and attitude of the community which is expressed by their willingness to conserve the projects affects sustainability of water projects in Machakos County. The study recommends that county governments in Kenya should put in place proper governance as this increases the sustainability, County governments and the general management of water projects in Kenya should ensure continuous upgrading and training of the technical skills as this enhances sustainability, all county governments and the general management of water projects should ensure maximum community participation and support for this increases project efficiency.

Keywords: Sustainability, Community Based Management

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ACRONYMS AND ABBREVIATIONS

ANOVA	:	Analysis of Variance
CBM	:	Community Based management
CWU	:	Community Water User
CWP	:	Community Water Project
CM	:	Constraints Management
IWRM	:	Integrated Water Resources Management
MCIDP	:	Machakos County Integrated Development Plan
MDGs	:	Millennium Development Goals
MSP	:	Machakos Strategic Plan
MWI	:	Ministry of Water and Irrigation
NGO	:	Non –Governmental Organization
NWP	:	National Water Policy
OPT	:	Optimized Production Technology
O & M	:	Operations & Maintenance
SPSS	:	Statistical Package for Social Sciences
TANATHI	:	Tana and Athi Rivers Water Services Board
TARDA	:	Tana and Athi Rivers Development Authority
UNDP-WSP	:	United Nations Development Program –Water and Sanitation Program
WRMA	:	Water Resource Management Authority

DEFINITION OF TERMS

Sustainability: Sustainability of a project is the fact that the project lasts much longer after its completion and commissioning; the project continues to bear its benefits to the users for a long period of time (Nokes & Kelly, 2007).

Community Based Management: A management system that enables a community to take charge and ownership of their water supply and sanitation systems using community's own human, material and financial resources, in partnership with other supporting agencies, especially government but including NGOS and private sector (Taylor, 2009).

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Water is an essential ingredient for sustaining of human life and that is why this research tries to explore the factors influencing sustainability of water resource projects using the community to manage it. If the community members are given the chance to lead it will influence the sustainability of water resource projects as noted by Binder (2008), that meaningful management of water projects by community through having water committees that manage and run the water resources, its development and usage. As the community members are involved it leads to designing effective new solutions to water problems, helping the governments avoid poor investments that costs them expensively through mistakes and in that it will make the community water projects more sustainable. With communities managing their water projects it will ensure that infrastructure development yields the maximum social and economic returns (Binder, 2008).

As pointed out by WRMA (2009), water scarcity in Machakos Sub-County has been accelerated by increasing demand in the domestic and agricultural sectors. This is associated with rapid population growth and unregulated use of water, especially in the rural areas, which has caused over-exploitation and degradation of water resources. Catchment degradation and extraction of riverine resources such as sand, ballast, building stones and vegetation has led to drying of rivers and shallow boreholes in the Sub-county. This is being done in contravention of the extraction guidelines issued by NEMA (2008) which stipulate participatory approach in rehabilitating rivers involving the District Environment Committees (DEC), TSHC, RRMAs, sand traders and local leaders. Some water resources such as rivers, shallow boreholes and streams have been polluted by industrial effluent, commercial wastewater; agro-chemicals and

domestic waste (TANATHI, 2009). These problems exacerbate water scarcity in the County of Machakos.

According to Harvey and Reed (2007), water is a basic human need and it is therefore important for human survival. Water is scarce and therefore not all people live next to water sources creating a need to bring the water closer to their places of habitation. This leads to formation of community water projects since individuals cannot afford. This therefore means that communities need to be provided with adequate water for their usage. The County Government of Machakos has commissioned several water projects in its locality to serve its population. Sustainability of water supply projects is concerned with maintaining an acceptable level of services throughout the design life of the water supply. It is posited that identifying the underscoring factors resulting in the failure of water projects and/or schemes would be essential not only for sustainable management of existing projects, but more so, in establishing new development projects system. Sustainability of water supplies has been a major challenge in many parts of Kenya and is indeed in a crisis. It is reported that the government of Kenya is committed to the on-going water sector reforms, especially, the requirement that water schemes need achieve both technical and financial viability.

1.1.1 Sustainability of Community Water Projects

Projects are designed and implemented to meet specific goals and achieve desired change. Nokes and Kelly (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 are 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 Binder (2008) 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 (United Nations Development Program – Water and Sanitation Program -UNDP-WSP, 2006).

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 (Kanyanya, (2014). 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 Community Water Users (CWUs) as well as the leaders were employed with the highest percentage in self-employment thus able to contribute towards repair and maintenance of Community Water Projects (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%).

1.1.2 Machakos County

Machakos County is an administrative County in the eastern part of Kenya. The County has 8constituencies which are; Machakos Town, Masinga, Yatta, Kangundo, Matungulu, Kathiani,

Mavoko and Mwala. The County covers 6,208 square Kms and has a population of 1,098,584 as per 2009 census (Male –49 %,Female – 51 %); with an age distribution of 0 to 14 years at 39%, 15 to 64 years 56% and 5% above 65 years-break down this age distribution more (0-14,15-29, 30-64 and over 64). Its population annual Growth Rate is 1.7 % with a current estimate of 264,500 households of which only 17% accessing electricity. Its capital town Machakos is cosmopolitan and is located 64 kilometers southeast of Nairobi. The prevailing local climate is semi-arid and the landscape is hilly, rising from an altitude of 1,000 to 1,600 meters above sea level. (Machakos County Integrated Development Plan-MCIDP, 2015).

Most of the existing water and sanitation facilities are old and dilapidated and require rehabilitation and augmentation in order to meet the present and future demands of the fast growing population of Machakos Town. The adequacy, equity and reliability of government rural water supply projects in the County have deteriorated due to inadequate budgetary provision, facilities have not been upgraded to cope with increasing demand, and technical performance has declined with increasing age of equipment and inadequate maintenance. Uncontrolled sand harvesting has led to severe environment degradation leading to change in the regime of some of the river sand loss of retention capacities of some of the seasonal rivers. Mwanja and Mania River which are the major sources of water for Machakos town have also been affected. This concern arose from the fact that Machakos Sub-County falls in Athi Catchment Area with the country's lowest per capita water availability of 356m³ with flood water incorporated and 162m³ without flood water. This is far below the 1000m³ global benchmark (Republic of Kenya, 2012).

The current state of water and sanitation in the County as at the 2009 census is 51.8 % of households had improved water infrastructure and 97.0 % of households had improved

sanitation. Water scarcity affects women and girls both in the rural and urban areas of the county since they are charged with the responsibility of ensuring the household needs for water are met. In the process, they are denied the opportunity to engage in other economic activities and schooling (Machakos Strategic Plan-MSP, 2013).

The county is majorly dry as it is categorized as a semi-arid region which sometimes experiences long spells of droughts and water scarcity is a major concern for many residents. Several organizations have come in to help alleviate the issue of drought and lack of water by constructing water projects for the residents. These organizations are either non-governmental, donor –funded ones, through the national or county government. Sometimes it is through church-funded projects or charity by individual or local companies. There are established water supply schemes in every sub-County of the County. There are three water supply schemes in the County, Kayata in Matungulu, Yatta and Kabaa in Mwala. There are various community management committees in various water catchments areas in the County. They help in protection of water catchments areas (MCIDP, 2015).

1.1.3 Community-Based Management (CBM) Concept

CBM is a management system that enables a community to take charge and ownership of their water supply and sanitation systems using community's own human, material and financial resources in partnership with other supporting agencies, especially government but including NGOS and private sector. The process encourages demand responsive approach, mass sensitization, motivation and mobilization, formation of management structures (committees), involvement of community members, community-focused variety of capacity building and gender equality activities.

The common stages of CBM would include, first the initial mobilization and planning, sensitization, ownership agreement, advisory committee and management approach. Secondly, full mobilization and implementation which will take care of community level facilitation & water point construction, formation and training of committees, caretakers, area mechanics, local operators or repair teams and thirdly consolidation- beginning of O&M by communities and mentoring process, hiring staff for scheme operation and maintenance paid from the scheme collections, work towards legal status registration. These stages will create locally autonomous water systems with limited degree of responsibility of government but high degree of ownership by the locals.

1.2 Statement of the Problem

Water is a basic need for all human life and the fact that Machakos County is a semi-arid region means that water is scarce. In spite of the improved policy, legislative and funding environment, access to safe water for populations in rural Kenya remains low translating to poor social indicators-46 percent below the poverty line, high infant mortality and morbidity and high incidence of water borne diseases among these populations.

According to an IRC Triple-S 2010 study, despite relative success in the provision of new rural water infrastructure in the last two to three decades, studies in many countries show between 30 to 40 percent of facilities either do not function or are operating below capacity. In Kenya, about 25 to 30 per cent of the recently completed community managed rural water supply facilities will become dysfunctional in the first three years following completion. For instance, in Siaya district from eighty water projects constructed by various development agencies in the last decade, 90% were non-functional by the year 2006 (LVSWWSB Inventory Report, No.25 (Oraro, 2012)).

Similarly, in the neighbouring Nyando District, UNICEF rehabilitated more than 100 failed water projects in 2009 before initiating new ones. A common denominator in these failed projects is, all are operated and managed by communities.

It therefore bores more significance that any water project meant for the community has to be well maintained in an effort of making the communal water projects sustainable. This will afford the residents water for their daily use at the present time and in future. Although the need for water is a great basic need and also owing to the fact that Machakos County under the current leadership is targeting to establish 1000 water projects in the county by 2022, the sustainability of the existing water projects in the area remain a challenge. This therefore leaves unanswered question as to whether sustainability of the same projects is guaranteed for future use by the community members. Even with the need the water projects do not last for long periods, some even collapse immediately the donor hands over the project to the community.

This concern arose from the fact that Machakos County falls in Athi Catchment Area with the country's lowest per capita water availability of 356m³ with flood water incorporated and 162m³ without flood water. This is far below the 1000m³ global bench mark (Republic of Kenya, 2012). In such situation therefore, the available sources of water in the county need to be well managed and maintained so as to address the Arid & Semi-Arid nature of the County and therefore the water situation as well. Several studies have been conducted on the sustainability of water projects. For instance, Mwangi and Daniel, (2015) conducted an assessment of factors affecting sustainability of rural water supply schemes in Nyandarua County, Kenya using a case of Kangui Water Scheme. The findings showed that there exists a strong but negative correlation between unaccounted for water and sustainability of the water supply scheme.

Water and Sanitation Programme-Africa Region (2002) identified several factors affecting sustainability of community managed water supplies as including: Institutional factors comprising national, regional, community organizations and private sector entities, and Development processes which include design, participation, operation and maintenance and monitoring and evaluation. Githua and Wanyoike (2015) in their study on the factors influencing performance of community water projects in Njoro Sub-County; identified Community participation, technology selection, site selection, demand responsiveness; construction quality, population and training as some of the pre-implementation factors affecting sustainability of water projects in Njoro Sub-County. Post implementation factors included technical support, community satisfaction, institutional and financial management, training and willingness to sustain the water project.

1.3 Objectives of the Study

The general objective of the study was to determine the effect of community based management on sustainability of water projects in Machakos County. The specific objectives included the following:-

- i. To establish the effect of water project financial management on sustainability of water projects in Machakos County.
- ii. To determine the effect of provision of technical support on sustainability of water projects in Machakos County.
- iii. To establish the effect of Community participation on sustainability of water projects in Machakos County.

- iv. To determine the effect of community attitude on the sustainability of water projects in Machakos County.

1.4 Research Questions

- i. How does project financial management affect the sustainability of water projects in Machakos County?
- ii. How does the technical support provision influence sustainability of water projects in Machakos County?
- iii. What is the effect of Community participation on sustainability of water projects in Machakos County?
- iv. How does the community attitude affect the sustainability of water projects in Machakos County?

1.5 Significance of the Study

The study would be important to the relevant government authorities and the ministry of water who formulate policies to guide in water provision and distribution to all people in the country. It shall be beneficial to the managers and project consultants of water projects in Machakos County who would benefit from the findings of this study and adopt some of the factors applicable in their situation and enhance sustainability of water projects in the county since Machakos is a dry area. The study would be of benefit to other stakeholders including individuals or entities like donors and non-governmental organizations interested in knowing the factors that affect sustainability of water projects. And also the general public would also understand better on the sustainability of water projects and what their contribution is.

Furthermore, to the researchers the study would contribute on the literature on sustainability of water projects. It would provide valuable factual information and data that can form basis for

study by academicians and scholars who may be interested in furthering research on sustainability of water projects in different locations in the country.

1.6 Scope of the Study

This study would determine the effect of community based management on sustainability of water projects in Machakos County. The study would be carried out in Machakos County in the month of June, 2016. The study would be restricted to the following areas: project financial management; technical support provision; community participation and the attitude of the community.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature reviews studies on the effect of community based management on sustainability of water projects in Machakos County. The chapter will cover theoretical framework, empirical framework, and conceptual framework and research gaps.

2.2 Theoretical Framework

There are a number of theories that have been used to explain the effect of sustainability of water projects. A review of some of these theories is provided in the section below.

2.2.1 Stakeholders Theory

Stakeholder theory is a theory of organizational management and business ethics that addresses morals and values in managing an organization. It was originally detailed by (Freeman, 1984) and identifies and models the groups which are stakeholders of a corporation and both describes and recommends methods by which management can give due regard to the interests of those groups. In the traditional view of the firm, the stakeholders of a company as the owners of the company, and the firm has a binding fiduciary to put their needs first, to increase value for them. However, stakeholder theory argues that there are other parties involved, including governmental bodies, political groups, trade associations, trade unions, communities, financiers, suppliers, employees, and customers. Sometimes even competitors are counted as stakeholders - their status being derived from their capacity to affect the firm and its other morally legitimate stakeholders (Gesteland, 2005).

According to the stakeholder theory, corporate governance is primarily concerned with how effective different governance systems are in promoting long term investment and commitment amongst the various stakeholders, (Williamson, 1985). Kester (1992), for example,

states that “the central problem of governance is to devise specialized systems of incentives, safeguards, and dispute resolution processes that will promote the continuity of business relationships that are efficient in the presence of self-interested opportunism”. Blair (1995) also argued that corporate governance should be regarded as the set of institutional arrangements for governing the relationships among all of the stakeholders that contribute firm specific assets. Companies stakeholders argue that, companies owe a duty to all those affected by their behavior. This calls for even directors to be accountable and responsible to a wide range of stakeholders far beyond companies’ current company law responsibility to shareholders.

This theory is application to this study since it looks at avenues of corporate governance of projects in an effort of ensuring the benefits are spread to all people and they can enjoy the projects’ benefits for a long time. Thus in this case water projects should be well governed by the stakeholders who include: the investors, donors, NGOs, governmental agencies and individual and the communities; this will ensure satisfaction in the water use and eventually their sustainable of the water projects.

2.2.2 Constraints Management Theory

The roots of Constraints Management (CM) can be traced to the development of a production scheduling software package known as Optimized Production Technology (OPT) in the late 1970s. Since then, Constraints Management (CM) has evolved from a manufacturing scheduling method to a management philosophy that can be used to understand and improve the performance of complex systems. Eliyahu Goldratt, the founder of CM, claimed that it is a theory of managing manufacturing organizations (Fellows & Liu, 2008). Love (2005) argues that the scientific methods of Constraints Management (CM) have provided a theory to communicate and enhance organizational performance.

Although aspects of the theory of Constraints Management (CM) have been made explicit (Tsou, 2013), underlying constructs of CM have not been identified. Tsou, (2013) further argued that if Constraints Management (CM) is to be accepted as a general theory, then the theory must be empirically developed and tested. In essence, the theory says that the higher the degree of throughput orientation, the greater organizational performance will be. The three dimensions of throughput orientation are organizational mindset, performance measurement systems, and decision making.

Companies that are high on all three dimensions would be expected to have better performance than companies that are low on one or more of the dimensions. This theory reflects the objectives of the study on need for well management water projects by the use of community participation from the initial stages of the water project; starting at identification all the well to use and sustainability of the project for future use. The resources of the project need to be well managed in an effort to ensure a well functional and operational water project.

2.2.3 The Resource Based View Theory

The resource-based view Theory was first discussed by (Barney, 1991). The theory posits that organizational internal resources have a significant influence on the sustained competitive advantage of a firm. Internally owned assets determine the level of sustainability of a firm or any projects that have been done by the firm (Barney, 1991). The ownership of valuable, inimitable, rare and non-substitutable resources ensures optimal productivity of firms compared to rival competition. The usage of resources that are knowledge based, non-substitutable, potentially value-creating and imitate, ensures overall firm sustainability and consequently firm productivity.

This theory therefore posits that organizations will therefore perform based on the degree of engaged resources. These resources could be the finances, participation of the community in terms of their time and concern and using their knowledge and skills in an effort to ensure that the installed water projects are sustainable in the long run and eventually they continue affording the Machakos residence the benefits of water to themselves, their animals and any economic activity they wish to engage in like agriculture.

2.3 Empirical Framework

This section looks at studies and other researches done by other authors in similar fields. The section shall look at the four objectives of the study.

2.3.1 Factors Likely to Affect Community and Sustainability of Projects

Report for 2012 has reported that Kenya is already not on course for achieving the MDG goals for water and sanitation. According to the draft National Water Policy (NWP) 2012, “most of the rural water services systems are still not sustainable because of inadequate operation by communities leading to breakdown of facilities and low access rate, poor water quality and increased disputes”(NWP 2012, P.10). Disparities in access to safe water are even more severe in the ASAL areas where there is insufficient densification of water points (NWP 2012).

Parameswaran (1999) argues that a range of characteristics such as technology used to implement project activities can be effective to Community Projects (CP). The more complex is the technology, the less the participation. The question of technology has direct link with sustainability of project services especially when operational and maintenance costs are to be met by the beneficiary communities. Another factor according to Parameswaran is on human and financial resources, as they are vital when it comes to meeting operational and maintenance costs.

For this matter community members will actively participate if benefits are clearly articulated and obtained immediately at the beginning of the project design. For the case of the water project, people expect to see domestic water points installed or boreholes drilled and in operation. Moreover, administration structure is equally important. Thus, if projects allow users' contribution and if they are flexible, well-coordinated and well managed at the local level, with free flow of information then people will automatically participate. Women's involvement in project activities and capacity building are also essential to sustain project-initiated services. This is because in water projects women are the main stakeholders. Therefore, women participation and leadership positions in WC are inevitable for sustainable water projects (Mbugua et al, 1993: 14).

Kitur (2015) in factors influencing sustainability of water resource projects by women in Sotik Sub-County, Bomet County, Kenya. The demand for water as a natural resource is high and need to be sustaining so that the current generation can use and can still meet the need of the future generation. From the study it was noted that good leadership influence sustainability of water projects. Majority of the respondents are illiterate and this affects the sustainability of water projects. Further in order to achieve sustainable water women should be involved during conception, design, implementation, operation and maintenance of the projects. Also the study found out that funds are not adequate and the mode of disbursement is not reliable, transparent and fast and this hinder management of the water projects. When funds are enough and the affected communities contribute the available resource the project will be sustained and funds distribution should made clear.

2.3.2 Project Financial Management and Sustainability of Community Based Projects

Financial management is a very important link in project sustainability. It entails settings of tariffs and managing the money in the operation and maintenance costs. According to W S P-AF (2002) in Kenya, the schemes have proportionately more household connections and higher user charges, which the users can afford because the water is used for agriculture as well as domestic consumption the users also set their own tariffs annually, based on their knowledge of the systems financial position provided they are well managed the schemes are likely to achieve sustainability. Sound financial management is exemplified by the use of metering and sanctions against consumers who do not pay.

In agricultural water management and poverty linkages survey, Namara, Hanjra, Castillo, Ravnborg, Smith and Van Koppen (2010) found that every year millions of dollars are invested by international community, national government, donor agencies, non-governmental organizations and local county government alike in project implementation and despite, ever increasing attempts to tackle the problem, many projects still fail to maintain the flow of expected benefit over their intended lifetime of 15 or even 20 years. Financial management is very important as far as operation and maintenance of donor projects is concerned. The aspect of financial management also entails setting of water tariffs. Many donor projects fail to be sustainable for a long period due to high tariffs introduced by management committee or poor financial management skills that deems the project unsustainable in the long run (Namara, et al., 2010)

According to Binder (2008), the financing process involves raising and maintaining adequate funding for water facilities as a critical importance for sustainability of the water project. Insufficient financing is a major factor for poor maintenance, which is often cited as the

main reason for failures of the many water projects. Whenever there is a failure in addressing financial issues then that would be the main obstacle to achieving water supply and sanitation goals in many countries according to the millennium development goals (MDGs) set by the United Nations (UN) convention. There is usually a significant underfunding even for basic costs of operating and repairing facilities in operation. This situation is largely great especially in the rural areas/interior areas, where the cost of water supply services is higher while affordability is lower as tariffs rarely cover operation costs.

The County Government of Machakos was established by the new Constitution of Kenya which was promulgated in 2010, under article 176 of the Kenyan constitution... ion, maintenance, repair and replacement, and attracting and maintain small-scale private sector investment is often a very difficult thing. Additionally, cost estimates do not always accurately reflect all capital maintenance expenditures, on-going support costs and indirect support costs. So that the original water project budget is most of the time lower than the actual costs that will and should be incurred during the water supply.

External funding does not promote long-term solutions as donor funds focus on new projects or those that have completely collapsed, as it is easier to show resultant impacts from the provision of new infrastructure; thus other factors have to be put in place in an effort to ensure the project is sustainable in the longhand furthermore, small projects need to find innovative financial solutions to sustain their operation and those solutions need to be reliable, if sustainability is to be achieved. Uhrendahl, et al., (2011) also mentions that however, lack of exposure to 'project finance' and 'water sector' leads to high transaction costs that prevent microfinance institutions from coming to the sector to do the funding of the water project. But

more important if sustainability is to be achieved then a phase-out strategy should be incorporated in the original design document and described as part of the sustainability strategy.

2.3.3 Technical Support Provision and Sustainability of Community Based Project

Allouche (2011) in the study- the sustainability and resilience of global water and food systems: Political analysis of the interplay between security, resource scarcity, political systems and global trade; noted that technical skills while imparted during project implementation, is again another factor like leadership skill, which require continuous upgrading and training as the globe keeps changing coming up with new tools every day. As regards monitoring, regular monitoring by responsible government authorities or other partners on maintenance of facilities, ensuring that water quality testing is done and it is done a regular basis. He further noted that the inability of communities to meet the cost of spare parts majorly due to poverty or lack of cohesion, the technical area staff not living within communities for purposes of noting when the water system is destroyed and planning for repairs, lack of tools for carrying out repairs, lack of spare parts, lack of technical skills to handle major repairs were considered as factors that have made the arrangement put in place for repairing water supply facilities not effective. Leading to the community lacking water at regular times leading to their dissatisfaction with the water supply (Allouche, 2011).

Kipkeny (2014) in his study to determine the factors affecting sustainability of hand pump operated shallow wells in Garissa Sub-County. The study found out that trained artisans are not available as reported by 77.04%. In conclusion hand pump operated shallow wells can be effectively and efficiently managed by the community established structures with increased functionality and sustainability with adequate capacity building of community institutions,

technical support and effective financial management with minimal external supported from the government and other external actors. There is need to strengthen the capacity of the management committees through training on management, operation and maintenance of the shallow wells and established effective networks and supply chains for the spare parts. Furthermore the National and County Government should develop policy for rural water supply and development to ensure clear systems are place to support the water supply systems and rural water supply.

The Study by Ghaffour, Missimer and Amy (2013) in their study on technical review and evaluation of the economics of water desalination: current and future challenges for better water supply sustainability. They noted that the majority of water supply agencies have introduced a two-tier management system. This has limited success because communities lack support from the district level to carry out major repairs. The technology that water supply agencies are promoting was considered to be appropriate as it is easy to handle by rural communities. Communities are able to operate and maintain India Mark II hand pump because it is simple to handle; and spare parts are readily available. However, all communities did not have a say in the technology they are using because it was predetermined at national level.

The proliferation of different technologies, some without a backup of spare parts, led to the government and other stakeholders to standardize India Mark II hand pump as the most appropriate technology for rural areas. All communities have not been prepared for the discontinuation of heavy subsidization of spare parts because of high poverty level in rural communities. The study found out that communities are having problems meeting the cost of subsidized spare parts, let alone unsubsidized spare parts.(Ghaffour, et al.,2013) concludes that the type of water supply system influences communities 'ability to sustain it because rural

communities can only handle less complex water supply systems. Some water supply systems are complex and require specialized technical capacity to handle meaning that in case of any destruction in the water system then the community will go without water for a long time as they try to seek for experts to come and do repairs. In any case most of the technicians do not come from the local village/community and have to be sourced from far (Ghaffour, et al., 2013).

WSP (2002) noted that technical sustainability depends upon the members maintaining their level of interest from the construction stage through to the operation and maintenance stage. This causes problems in gravity-flow schemes, whose members tend to carry out emergency repairs as needed rather than preventive maintenance. Pumped schemes, on the other hand, require care of the pumps and purchasing of energy. The members establish basic maintenance systems, set tariffs and arrange mechanisms for collecting the income and buying the power. It further recommends that the local residents who are community members should be trained so that minor repairs can be done by them whenever there is a problem with the water system. This will ensure that water supply to the community members is guaranteed and will be so done in the future.

2.3.4 Community Participation and Sustainability of Community Based Projects

Several researches have been done on sustainability and participation by community members in the identification, design, implementation and management stages of projects. This can be understood in terms of the need and motivation of the community, as well as an indicator of community structure and cohesion. Various models of how communities participate in development projects are described by, Faunt, Longuevergne, Reedy, Alley, McGuire and McMahon (2012) while looking at groundwater depletion and sustainability of irrigation in the US High Plains and Central Valley, some of these models include the full range and depth of

community participation which could be 100%, from simple consultation by the community elite to the full and active participation of a representative of a cross-section of a village or set of villages (Faunt, et al., 2012).

Harvey and Reed (2007) define community participation as a process by which communities are empowered to make effective decisions towards projects that affect their livelihoods. Participation involves sectors like educating the community members/citizens to learn their competences in managing and contributing to the well-being of the project; another area where community participation touches on citizens is acting in response to public concerns, voicing their opinions about decisions that affect them and taking responsibility for changes in their community. Faunt et al., (2012) also noted that involvement of the community is crucial for sustainability of water supply projects. Furthermore community participation and support increases project efficiency; therefore it is recommended that there should be consultation with the community during all stages of the project planning starting from identification until the project is complete and used by the community members or beneficiary. Involvement in the management of project implementation or cooperation ensures sustainability of the project (Harvey & Reed, 2007).

Engaging the community in its own development ensures that the proposed development will better target people's needs as per what would really suit them, incorporate local knowledge of the project, create grassroots capacity to undertake other projects and maintain facilities, distribute benefits equitably and help lower costs of the project. According US-AID (2009), if the operation and maintenance program of water project is designed by the community, the program will function much better than when it is designed by outsiders. This is majorly because the community members form an attachment to the project and feel they own the project. And

once they own the project, then community members will better take care of the water project so that it continues to offer them service even in the long term. Empowerment of community in management of donor funded water projects will lead to positive participation in the sustainability and also during the stages of planning, implementation, development and maintenance of projects. This situation is supported by Mutonga (2015) in the factors influencing sustainability of donor funded community water projects: a case of Kitui central constituency, Kitui County, Kenya. The study established that most of the community members were not involved in the implementation of the community projects in all the phases and that there was a strong positive correlation between community participation and sustainability of donor funded community projects.

Secondly, the community capacity building was not fully undertaken prior to the implementation of the water projects and as a result the community lacked appropriate skills for management, lacked information of policy guidelines on the management of water projects and there was poor planning by the management team. There is a strong positive correlation between community management and sustainability of donor funded community projects. There is also a strong positive correlation between community financial management and sustainability of donor funded community projects. The Government should train the community leaders on the management of community water projects before implementation. The management should frequently audit the books of accounts for the community projects. Furthermore, water projects are demand driven, responsive to the degree that the beneficiaries make choices and carry out resources in support of the choices that they make in an effort to ensure success and sustainability of the project and that the community member's should be given a chance to make

their contribution towards the water project, their contribution may take the form of money, labor, materials, equipment or participation in project related decision making and meetings.

According to Taylor (2009) while doing a study on addressing the sustainability Crisis: lessons from research on managing rural water projects in Dares Salaam found out that the frequent failure of water supply projects have been attributed to number of flaws in the projects among them lack of participation by the community members or their participation isn't fully incorporated in the water project. However the participation process must have a time limit since beneficiaries too at times grow impatient with endless discussions without any forthcoming results. Essentially there has to be a balance between the project process and the resulting product. Both the financier including donors must have a clear view of what the project entails and enlighten members of a community on various skills in order to boost sustainability of water project during and after exit of the donor and other financiers (Taylor, 2009).

2.3.5 Attitude of the Community and Sustainability of Community Based Projects

Attitudes can be described as postures or positions adopted by an individual, a group of people or a community/organization towards an event or a project. It is also viewed as the expression of views or thoughts that have an effect on behavior, ideas, or emotions. The community behavior towards the community water projects services in terms of participation, support, cooperation either positively or negatively is directly related to how the community is feeling and thinking of the project. Their attitudes are interlocked in their cultures, belief system, norms and the religious background of the community (Liu & Yang 2012).

Liu and Yang (2012) further mentions that in neglecting the community participation and involvement in the public service sector and projects that touch on the everyday lives of the community members is a sure way of seeing the project collapse without realizing its true

potential and rendering the community the benefits it so needs. Community attitudes towards these services can be measured and known in order not only to optimize sector efficiency and performance but also to illuminate possible future developments. Furthermore the communities must indicate a willingness to conserve substantially in their water use and also to contribute towards maintenance of their water sources so that it would continue to service them even in future times.

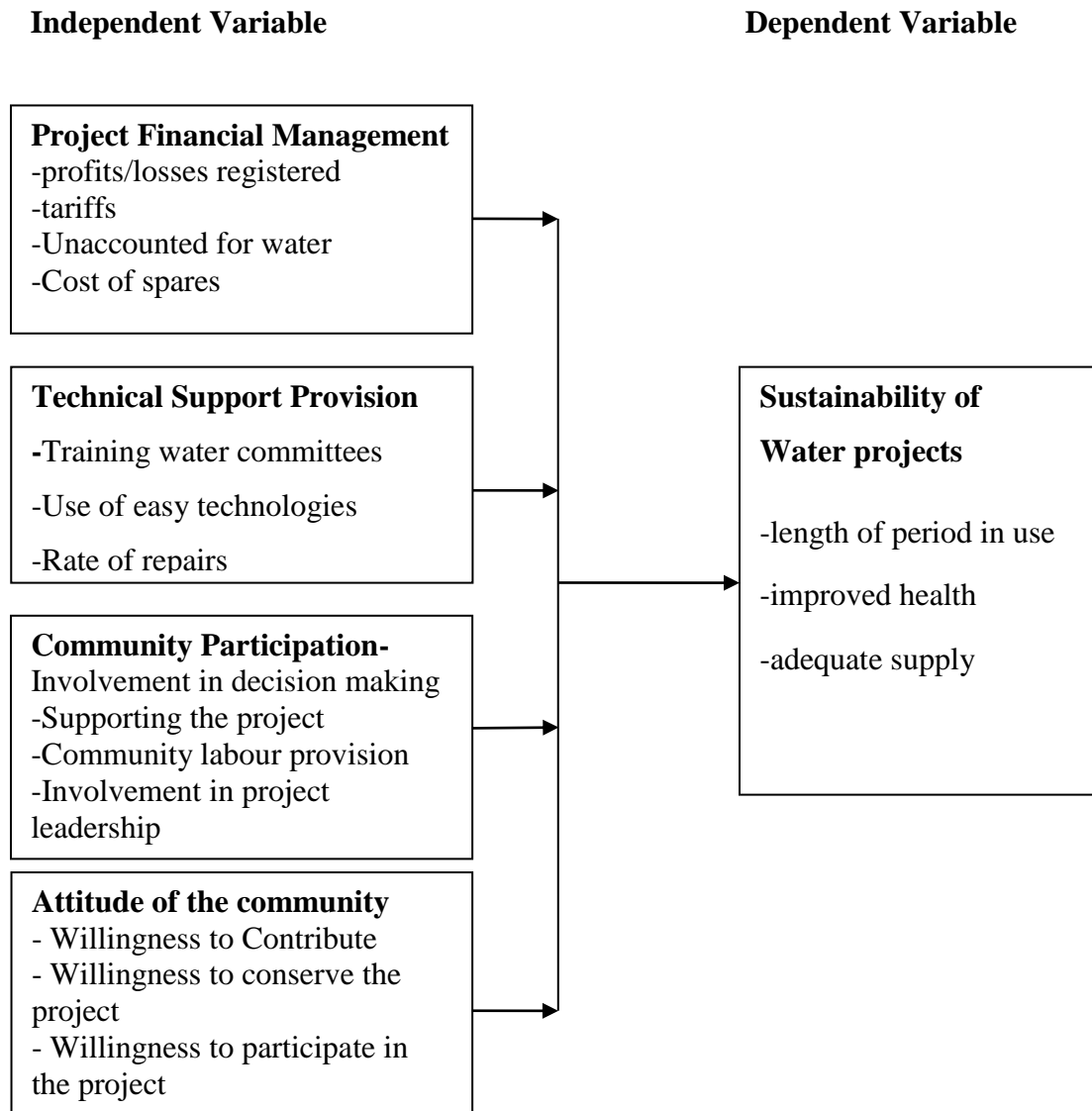
Schweitzer (2009) in his study on Community managed rural water supply systems in the Dominican Republic points that economic growth in the past twenty years has not yielded due to inconsistencies in water supply. Uhrendahl, Salian, Casarotto and Doetsch (2011) on good water governance and IWRM in Zambia: challenges and chances aims to the study water efficiency implementation plan in an effort to achieve sustainable development in water projects which would result in wealth creation, socio-economic development and environmental management. It also found the challenges that affected the water projects as relevant to management and governance and which affected the sustainability of the water project. The study further found that the attitude of the community members whose water projects was supposed to benefit were affected by the political stands of their leaders. This is true as mentioned by Dagdeviren (2008) in a study carried out in Zambia where he says the attitudes and beliefs of the people must be incorporated in the planning and running of the water project if it is going to be sustainable in the long run.

He further demonstrated that among the important factors affecting public beliefs, socialization, and values is access to environmental, social, and cultural resources as well as public education and training. Sufficient improvement in access to drinking water services, especially in rural areas where 1.5 million people do not have access to an improved water

source. The results concluded that only 23% of sample water systems are likely to be sustainable in the long term, 59% are possibly sustainable, and for 18% it is unlikely that the community will be able to overcome any significant challenge. Communities which were scored as unlikely sustainable perform poorly in participation, financial durability, and governance while the highest scores were for system function and repair service. This was majorly because the communities were not involved in it, thus their attitudes, desires and suggestions were not factored into the scenario when thinking about sustainability of the water projects.

2.4 Conceptual Framework

FIGURE 1
Conceptual Framework



Source: Author (2016)

2.5 Operationalization of Variables

TABLE1

Operationalization of Variables

Objective	Variable Type	Indicators	Type of data analysis
To establish the effects of water project financial management on sustainability of water projects in Machakos County.	Independent	Profits/Losses registered Water tariffs Unaccounted for water Cost of spare parts	Descriptive Regression
To determine the effect of technical support provision on sustainability of water projects in Machakos County.	Independent	Trainings of water committees Rate of repairs Use of easy technologies	Descriptive Regression
To establish the effects of Community participation on sustainability of water projects in Machakos County.	Independent	Involvement in decision making Supporting the project Community labour provision Involvement in project leadership	Descriptive Regression
To determine the effect of attitude on the sustainability of water projects in Machakos County	Independent	Willingness to Neglect of community involvement Willingness to participate in the project	Descriptive Regression

Source: Author (2016)

2.6 Research Hypothesis

In order to ascertain the effect of community Based Management on Sustainability of the Water Projects in Machakos County, the following hypothesis were tested:

H₀₁: *Community project financial management does not affect sustainability of water projects in Machakos County*

H₀₂: *Provision of technical support to Community Based Project Management does not affect sustainability of water projects in Machakos County.*

H₀₃: *Community participation on Community Based Project Management does not affect sustainability of water projects in Machakos County.*

H₀₄: *Community attitude on Community Based Project Management does not affect the sustainability of water projects in Machakos County.*

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

In this chapter the researcher presents the research design and methodology that was used to carry out the research. Specifically it includes the following subsections; research design, population and sample, data collection as well as data analysis.

3.2 Research Design

This study adopted a descriptive research design. A descriptive study is one in which information is collected without changing the environment. It should answer five basic questions: who, what, why, when and where (Creswell 2009). The design was deemed appropriate because of the observational nature of data that was collected from respondents in Machakos County. Descriptive research portrays an accurate profile of people, events or situations therefore the study employed a descriptive research design where the respondents were the staff at the ministry of water at Machakos County government and the Communities in which water projects have been initiated. This design collected demographic data as well as information on the position held by the respondent, the level of their participation in the projects and their general perception about the projects among others. It was structured in a way that answered the given objectives.

3.2 Target Population

A target population is the researcher's population of interest. The population of the study was 1120 stakeholders who included the Project Managers, community leaders and the beneficiaries' residing and benefiting in the communities where the 104 water projects are under study in Machakos County.

TABLE 2
Target Population

Target Group	Target Population
Project managers	104
Community Leaders	80
Water committee members	936
Total	1120

Source: Department of Water & Irrigation, Machakos County (2015).

3.3 Sample Size and Sampling Procedure

A sample size is a part of the total persons that is involved on the basis which judgment is made. The Sampling Procedure used was a multistage sample where 31 projects were sampled which represents 30% of the total number of water projects in the county. From the sample size of the 31 projects, 1 project manager, 2 community leaders and 2 water project committee members were picked at random. The sample size therefore consisted of 155 people sampled from the target population. This was 14% of the population and they were chosen because the population is homogenous therefore no need of a big sample size. The researcher used simple random sampling method, where everyone has an equal chance of being picked, to select the participants of the study from the five water projects chosen randomly selected.

TABLE 3
Sample Size

Category	Target population drawn from Total no. of Projects	Sample size drawn from 30% of the Total no. of Projects	Rate of Sample
Project managers	104	31	1 per project
Community Leaders	40	62	2 per Project
Water committee members	936	62	2 per Project
Total	1120	155	5 per Project

Source: Author (2016)

3.4 Research Instruments

The study used structured questionnaire to collect the primary data from the respondents. Mugenda and Mugenda (2003), aver that questionnaires are among the commonly used

instrument in social science research. The questionnaires comprised of open ended questions that adopted a five point Likert scale ranging from 1 to 5 that gave the respondents an opportunity to express their feelings and behavior in relation to the research questions. Use of questionnaires was expected to ease the process of data collection as all the selected respondents were reached in time. The questionnaire was divided into five areas covering demographic information and the four independent variables as per the objectives of the study (project financial management, technical support provision, community participation and attitude of the community).

3.5 Data Analysis and Presentation

Collected data was compiled, sorted, edited, coded and analyzed using Statistical Package for Social Sciences (SPSS) Version 21 computer program to address the research objectives. The study used mean, frequencies and percentages in the analysis. Results were presented in tables and figures using percentages and frequencies to facilitate comparisons and further analysis.

Regression analysis was used to test for the relationship between the independent variable (project financial management, technical support provision, community participation and attitude of the community) and the dependent variable (sustainability of water projects)

The Regression model is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where Y= Sustainability of Water projects

β_0 = Constant

$\beta_1, \beta_2, \beta_3$ and β_4 are Coefficients of the effect of community based management on sustainability of water projects in Machakos County.

ε = error term

X_1 = Project Financial Management

X_2 = Technical Support Provision

X_3 =Community Participation

X_4 = Attitude of the community

3.6 Ethical Considerations

The researcher sought permission from the relevant authorities before conducting the research. Utmost caution was exercised while administering questionnaires so as to avoid any mistrust between the respondents and the researcher. Assurance was given to the respondents that the study findings would be used for academic purposes only and that their responses would be treated with utmost confidentiality and anonymity.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter presents the results of data analysis and the interpretation of the findings in line with the study objectives. Statistical Package for Social Sciences (SPSS), Version 21 aided in the analysis of the data of the study on the effect of community based management on sustainability of water projects in Machakos County.

4.1.1 Response Rate

The study intended to use a sample size of 155 stakeholders who included the Project Managers, community leaders and the beneficiaries' residing and benefiting in the communities in Machakos County. Out of the 155 questionnaires issued out to the respondents, 118 questionnaires were dully filled and returned to the researcher. This transpired to a response rate of 76%. This response was good enough and representative of the population and conforms to Mugenda (2008) stipulation that a response rate of 70% and above is excellent.

4.2 Background Information on the questionnaire

The study sought to assess the demographic information of the respondents so as to establish the level of their knowledge and suitability in undertaking the study on the effect of community based management on sustainability of water projects in Machakos County. The findings are summarized in subsequent sections.

4.2.1 Respondents' Gender

The study sought to determine the gender of the respondents as a way of assessing a balance in between males and females. The findings are presented in Table 4 below.

TABLE 4
Respondents' Gender

Gender	Male	Female
Male	44	37.3
Female	74	62.7
Total	118	100.0

Source: Author (2016)

The findings in Table 4.1 indicate that 37.3% of the respondents were male while 62.7% of the respondents were female. These findings imply that majority of the respondents were female and therefore, more females than males are actively involved in water projects in Machakos County.

4.2.2 Highest Education

Various levels of education were established and respondents were requested to indicate their highest education achieved. The findings are presented in Table 5 below.

TABLE5
Highest Education

Highest Education	Frequency	Percentage
No Education	15	12.7
Certificate	31	26.3
Diploma	48	40.7
Bachelor's Degree	16	13.6
Masters	8	6.8
PhD	0	0
Total	118	100

Source: Author (2016)

From the findings on the highest level of education held by the respondents, the study established that 12.7% of the respondents had no education, 26.3% had certificates, 40.7% had diplomas education, 13.6% had bachelor's degree, 6.8% had master's education and none of the respondents had PhD education. These findings typically characterize a rural setting where the study was conducted.

4.2.3 Duration Worked in Water Project

The study sought to determine the period that respondents had worked at the water project in terms of years and the findings are presented in Table 6 below.

TABLE6
Duration Worked in Water Project

Duration Worked	Frequency	Percentage
Below 1 year	4	3.4
1-2 years	19	16.1
2-3 years	26	22.0
3 years and above	69	58.5
Total	118	100.0

Source: Author (2016)

The findings of the study in respect to the period that respondents had worked with Water projects in Machakos County revealed that 3.4% of the respondents had worked with Water project for less than one year, 16.1% for 1-2 years, 22% for 2-3 years and 58.5% for above 3 years. These findings imply that majority of the respondents had worked with water boards for a period long enough as to understand the inherent factors affecting sustainability of water projects.

4.2.4 Position Held in Water Project

The study sought to establish the level of position held by the respondents at the water projects. The findings are clearly presented in Table 7 below.

TABLE7
Position Held in Water Project

Position Held	Frequency	Percentage
Project manager	31	26.3
Community leader	51	43.2
Water committee member	36	19.5
Total	118	100

Source: Author (2016)

From the findings in Table 4.4, 26.3% of the respondents were project managers at the water board, 43.2% were community leaders and 19.5% were water committee members. These findings indicate that the study involved a number of stakeholders and therefore diverse information on the effect of community based management on sustainability of water projects in Machakos County was sought.

4.3 Project Financial Management

Several statements on project financial management and its effect on sustainability of water projects in Machakos County were carefully identified and respondents were requested to indicate the extent to which they agreed or disagreed with these statements. A Likert scale of 1-5 where 1= strongly disagree, 2= Disagree, 3= Neither Agree nor Disagree, 4=Agree and 5=Strongly Agree was used. The findings are clearly illustrated in Table 8 below.

TABLE 8
Project Financial Management

Project Financial Management	Mean	Std.Dev
Water projects sustainability is influenced by monitoring and evaluation	3.084	.6740
Unaccounted water affects sustainability of the water Project	3.457	0.7354
Financial management is very important as far as operation and maintenance of water projects is concerned.	3.593	.8395
The government, NGOs, investors and the international community should not be expected to finance all expenditures required in the life of the water system.	2.364	.8234
The level of transparency and accountability affects the sustainability of the water project	2.288	1.1405

Source: Author (2016)

On whether water projects sustainability is influenced by monitoring and evaluation had a mean of 3.084 and standard deviation of 0.6740. This implies that respondents were neutral on the statement. On whether unaccounted for water affects sustainability of the water project had a mean of 3.457 and standard deviation of 0.7354. On whether financial management is very

important as far as operation and maintenance of donor projects is concerned had a mean of 3.593 and standard deviation of 0.8395. The finding is consistent with Namara et al., (2010) who held that financial management is very important as far as operation and maintenance of donor projects is concerned. The aspect of financial management also entails setting of water tariffs. Many donor projects fail to be sustainable for a long period due to high tariffs introduced by management committee or poor financial management skills that deems the project unsustainable in the long run.

This implies that respondents agreed with the statement. On whether the government, NGOs, investors and the international community should not be expected to finance all expenditures required in the life of the water system had a mean of 2.364 and standard deviation of 0.8234. The finding is consistent with Uhlen Dahl, et al., (2011) who held that external funding does not promote long-term solutions as donor funds focus on new projects or those that have completely collapsed, as it is easier to show resultant impacts from the provision of new infrastructure; thus other factors have to be put in place in an effort to ensure the project is sustainable in the longhand furthermore, small projects need to find innovative financial solutions to sustain their operations and those solutions need to be reliable, if sustainability is to be achieved. On whether the level of transparency and accountability affects sustainability had a mean of 2.288 and standard deviation of 1.1405.

4.4 Technical Support Provision

Several statements on technical support provision and its effect on sustainability of water projects in Machakos County were carefully identified against which respondents were requested to indicate the extent to which they agreed or disagreed with these statements. A Likert scale of 1-5 where 1= strongly disagree, 2= Disagree, 3=Neither Agree nor Disagree,

4=Agree and 5=Strongly Agree was used and the findings are clearly presented in Table 9 below.

TABLE 9
Technical Support Provision

Technical Support Provision	Mean	Std.Dev
Technical skills imparted during project implementation, requires continuous upgrading and training	4.711	.5562
There is need for regular monitoring by responsible government authorities or other partners on maintenance of facilities	3.669	.9157
There is need for ensuring that water quality testing is done and it is done on regular basis.	4.644	.7223
The community members cannot meet the cost of spare parts majorly due to poverty.	3.720	1.1612
The type of water supply system is less complex for Community to Manage	3.550	1.0985
Community established structures increases functionality and sustainability of projects	4.728	.7472
Minimal external support from the government and other external actors increased the sustainability of the community projects	3.347	1.2151
The technology of modern meters that water supply agencies are promoting is considered to be appropriate as it is easy to handle by rural communities	2.466	.8836
Most of the breakdowns are fixed on time by the local technicians	3.330	1.2813
Most of the technicians don't come from locals but sourced from far	3.372	1.2929

Source: Author (2016)

On whether technical skills imparted during project implementation, requires continuous upgrading and training the mean was 4.711 and a standard deviation of 0.5562. This implies that respondents strongly agreed with the statement. On whether there is need for regular monitoring by responsible government authorities or other partners on maintenance of facilities, the mean was 3.669 and a standard deviation of 0.9157. The finding suggests that respondents agreed with the statement. On whether there is need for ensuring that water quality testing is done and it is done on regular basis the mean was 4.644 and a standard deviation of 0.7223. This suggests that respondents strongly agreed with the statement. On whether the community members could not

meet the cost of spare parts majorly due to poverty the mean was 3.720 and a standard deviation of 1.1612.

The finding concurs with Allouche (2011) who noted that the inability of communities to meet the cost of spare parts is majorly due to poverty or lack of cohesion, the technical area staff not living within communities for purposes of noting when the water system is destroyed and planning for repairs, lack of tools for carrying out repairs, lack of spare parts, lack of technical skills to handle major repairs were considered as factors that have made the arrangement put in place for repairing water supply facilities not effective. This leads to the community lacking water at regular times which results to their dissatisfaction with the water supply. On whether the type of water supply system is less complex for Community to manage the mean was 3.550 and a standard deviation of 1.0985.

On whether Community established structures increases functionality and sustainability of projects the mean was 4.728 and a standard deviation of 0.7472. This implies that respondents strongly agreed with the statement. On whether minimal external support from the government and other external actors increased the sustainability of the community projects the mean was 3.347 and a standard deviation of 1.2151. On whether the technology of modern meters that water supply agencies are promoting is considered to be appropriate as it is easy to handle by rural communities the mean was 2.466 and a standard deviation of 0.8836. On whether most of the breakdowns are fixed on time by the local technicians the mean was 3.330 and a standard deviation of 1.2813. On whether most of the technicians do not come from the local village/community and have to be sourced from far the mean was 3.372 and standard deviation of 1.2929. This is consistent with Kipkeny (2014) who in his study to determine the factors

affecting sustainability of hand pump operated shallow wells in Garissa Sub-County. The study found out that trained artisans are not available as reported by 77.04%.

4.5 Community Participation

Several statements on community participation and its effect on sustainability of water projects in Machakos County were identified and respondents were requested to indicate the extent to which they agreed or disagreed with these statements using Likert scale of 1-5 where 1= strongly disagree, 2= Disagree, 3=Neither Agree nor Disagree, 4=Agree and 5=Strongly Agree. The findings are clearly illustrated by Table 10 below.

TABLE10
Community Participation

Community Participation	Mean	Std.Dev
Community members are involved in Project site identification	2.228	.4788
Community members are involved in Project implementation	3.415	1.3795
Community members are involved in Project Management	2.000	.6405
Community participation and support increases project efficiency	3.678	1.2186
Community members participate in water sale rates determination	4.661	.7305
Community member's participation in cost sharing enables the community to contribute to the project sustainability.	3.161	1.3648

Source: Author (2016)

On whether Community members are involved in Project site identification the mean was 2.228 and a standard deviation of 0.4788. The finding implies that respondents disagreed with the statement. On whether Community members are involved in Project implementation, the mean was 3.415 and a standard deviation of 1.3795. The finding is consistent with Faunt, Longuevergne, Reedy, Alley, McGuire and McMahan (2012) who opined that several authors have been done on sustainability and participation by community members in the identification,

design, implementation and especially management stages can be understood in terms of the need and motivation of the community, as well as an indicator of community structure and cohesion.

On whether community members are involved in project management the mean was 2.000 and a standard deviation of 0.6405. On community participation and support increasing project efficiency the mean was 3.678 and a standard deviation of 1.2186. The finding is consistent with Harvey and Reed (2007) who established that community participation and support increases project efficiency; therefore it is recommended that there should be consultation with the community during all stages of the project planning starting from identification until the project is complete and used by the community members or beneficiary involvement in the management of project implementation or cooperation to ensure sustainability. This implies that respondents agreed with the statement. On whether community members participate in water sale rates determination the mean was 4.661 and a standard deviation of 0.7305. This implies that respondents strongly agreed with the statement. On whether Community member's participation in cost sharing enables the community to contribute to the project sustainability the mean was 3.161 and a standard deviation of 1.3648.

4.6 Attitude of the Community

A number of statements on attitude of the community and its effect on sustainability of water projects in Machakos County were identified and respondents were requested to indicate the extent to which they agreed or disagreed with these statements. A Likert scale of 1-5 where 1= strongly disagree, 2= Disagree, 3=Neither Agree nor Disagree, 4=Agree and 5=Strongly Agree was used and the findings are presented in Table 11 below.

TABLE11
Attitude of the Community

Attitude of the Community	Mean	Std.Dev
The community members have the willingness to conserve the project area.	4.415	.7660
Community members willingly substantially contribute towards the maintenance of their water sources	2.228	.5296
Community members encourage the sharing of the water project.	3.262	1.3614
Community members can willingly keep the project area clean.	3.084	1.4237
Community members willingly provide suggestions and opinions to better the project	3.593	1.2419

Source: Author (2016)

On whether the community members have the willingness to conserve the project area the mean was 4.415 and a standard deviation of 0.7660. This suggests that respondents agreed with the statement. On whether Community members willingly substantially contribute towards the maintenance of their water sources the mean was 2.228 and standard deviation of 0.5296. On whether community members encourage sharing of the water project the mean was 3.262 and standard deviation of 1.3614.

On whether community members can willingly keep the project clean the mean was 3.084 and a standard deviation of 1.4237. This implies that respondents were neutral on the statement. On whether community members willingly provide suggestions and opinions to better the project the mean was 3.593 and a standard deviation of 1.2419. This implies that respondents agreed with the statement. The finding concurs with Harvey and Reed (2007) who defined community participation is a process by which communities are empowered to make effective decisions towards projects that affect their livelihoods.

4.7 Sustainability of Water Projects

Several statements on sustainability of water projects were identified and respondents were requested to indicate the extent to which they have seen them being applied in the water project.

A Likert scale of 1-5 where 1= strongly disagree, 2= Disagree, 3=Neither Agree nor Disagree, 4=Agree and 5=Strongly Agree was used. The findings are presented in Table 12 below.

TABLE 12
Sustainability of Water Projects

Sustainability of Water Projects	Mean	Std.Dev
Local community members should be trained to do minor repairs	4.389	.8576
Sustainability would increase with the investment in institution and capacity building to operate and maintain the system	2.364	.6224
To achieve sustainability, community members should be involved during conception, design, implementation, operation and maintenance of the projects.	3.618	1.2259
The locals who are beneficiaries should be encouraged and allowed to participate in the funding of the water project.	3.584	1.1271

Source: Author (2016)

On whether local community members should be trained to do minor repairs the mean was 4.389 and a standard deviation of 0.8576. This implies that respondents agreed with the statement. On whether sustainability would increase with the investment in institution and capacity building to operate and maintain the system the mean was 2.364 and a standard deviation of 0.6224. This implies that respondents disagreed with the statement. On whether to achieve sustainable community members should be involved during conception, design, implementation, operation and maintenance of the projects the mean was 3.618 and a standard deviation of 1.2259. This indicates that respondents agreed with the statement. On whether the locals who are beneficiaries should be encouraged and allowed to participate in the funding of the water project the mean was 3.584 and a standard deviation of 1.1271. This implies that respondents agreed with the statement.

4.8 Regression Analysis

A Multiple regression analysis was conducted to test for the relationship between the independent variable (project financial management, technical support provision, community participation and attitude of the community) and the dependent variable (sustainability of water projects). The findings are summarized in subsequent sections.

TABLE 13
Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.963	.927	.869	.67525

Source: Author (2016)

The findings in Table 4.10 indicate that the value of R is 0.963, the value of R squared is 0.927 and the value of adjusted R square is 0.869. From these findings therefore, 92.7% variation in the sustainability of water projects in Machakos is explained by the four independent variables of the study (project financial management, technical support provision, community participation and attitude of the community).

TABLE14
ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	29.044	4	7.261	15.925	.005
Residual	2.280	5	.456		
Total	31.324	9			

Source: Author (2016)

The ANOVA statistics of the processed data at 5% level of significance indicate that the value of F calculated is 15.925 while F critical is 5.19. Since F calculated is greater than F critical (15.925>5.19), this indicates that the overall model was significant and therefore reliable in

predicting the relationship between independent variable (project financial management, technical support provision, community participation and attitude of the community) and the dependent variable (sustainability of water projects).

TABLE15
Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	-0.583	1.336		-.436	.681
Project Financial Management	1.033	.292	.971	3.540	.017
Technical Support Provision	.187	.396	.074	.473	.656
Community Participation	-.893	.225	-.863	-3.965	.011
Attitude of the Community	.605	.198	.593	3.057	.028

Source: Author (2016)

The established equation becomes:

$$Y = -0.583 + 1.033X_1 + 0.187X_2 - 0.893X_3 + 0.605X_4 + \varepsilon$$

Where X₁, X₂, X₃ and X₄ represent the independent variables (project financial management, technical support provision, community participation and attitude of the community) respectively and Y is the sustainability of water projects in Machakos County.

Holding all the independent variables constant, sustainability of water projects would be at -0.583. A unit increase in project financial management while holding other variables constant would increase sustainability of water projects by 1.033. A unit increase in technical support holding other variables constant would increase sustainability of water projects by 0.187. A unit increase in community participation holding other variables constant would decrease sustainability of water projects by 0.893. A unit increase in attitude of the community holding

other variables constant would increase sustainability of water projects by 0.605. There was a statistically significant association between Project financial management, community participation, attitude of the community and sustainability of the water projects for the p values 0.017, 0.011 and 0.028 are less than 0.05 at 5% level of significance. The findings therefore indicate that the four independent variables (project financial management, technical support provision, community participation and attitude of the community) all affect sustainability of water projects in Machakos County.

CHAPTER FIVE

SUMMARY, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter clearly presents a summary of the research findings, discussion of the findings, conclusion, recommendation for the study and further research in line with the objectives of the study.

5.2 Summary of the Findings

This subsection presents a summary of the research findings based on the variables of the study.

5.2.1 Project Financial Management

The study sought to determine the effect of financial management on sustainability of the water projects In Machakos County and from the findings, on whether water projects sustainability is influenced by governance had a mean of 4.389 and standard deviation of 0.8168. On whether financial management is very important as far as operation and maintenance of water projects is concerned had a mean of 3.593 and standard deviation of 0.8395.

However, according to W S P-AF (2002) in Kenya, water schemes have proportionately more household connections and higher user charges, which the users can afford because the water is used for agriculture as well as domestic consumption where the users set their own tariffs annually, based on their knowledge of financial position provided they are well managed the schemes are likely to achieve sustainability. This therefore means that as the management sets out proper financial management systems for the water projects and reasonable tariffs for the users, the users must also plan to use the water for activities which are economically viable so as to be able to meet their bills. This would ensure that adequate funds are consistently collected and hence sustainability of the projects.

5.2.2 Technical Support

The study sought to establish the effect of technical support on sustainability of water projects in Machakos County and from the findings, on whether technical skills imparted during project implementation, requires continuous upgrading and training had a mean of 4.711 and standard deviation of 0.5562. On whether there is need for ensuring that water quality testing is done and it is done on regular basis had a mean of 4.644 and standard deviation of 0.7223. On whether the community members cannot meet the cost of spare parts majorly due to poverty had a mean of 3.720 and standard deviation of 1.1612. On whether Community established structures increases functionality and sustainability of projects had a mean of 4.728 and standard deviation of 0.7472.

Kipkeny (2014) in his study to determine the factors affecting sustainability of hand pump operated shallow wells in Garissa Sub-County found out that trained artisans are not available as reported by 77.04% of the respondents, hence the delays in correcting repairs in time. In conclusion hand pump operated shallow wells could be effectively and efficiently managed by the community established structures with increased functionality and sustainability with adequate capacity building of community institutions. This therefore affirms the need to train locals on maintenance and to align themselves with the change in technology in handling the water systems.

5.2.3 Community Participation

The study also sought to assess the effect of community participation on sustainability of water projects and from the findings, on whether Community members are involved in Project implementation had a mean of 3.415 and standard deviation of 1.3795. On community participation and support increasing project efficiency had a mean of 3.678 and standard

deviation of 1.2186. On whether community members participate in water sale rates determination had a mean of 4.661 and standard deviation of 0.7305.

According to Taylor (2009) while doing a study on addressing the sustainability Crisis: lessons from research on managing rural water projects in Dares Salaam found out that the frequent failure of water supply projects have been attributed to number of flaws in the projects among them lack of participation by the community members or their participation being not fully incorporated in the water projects. This also confirms the need to involve community in the project identification, project selection, design and installation which helps achieve an increased sense of ownership on the part of the community and hence sustainability.

5.2.4 Attitude of the Community

The study sought to find out the effect of the attitude of the community on sustainability of the water projects and from the findings, on whether the community members have the willingness to conserve the project area had a mean of 4.415 and standard deviation of 0.7660. On whether community members encourage sharing of the water project had a mean of 3.262 and a standard deviation of 1.3614. On whether community members willingly provide suggestions and opinions to better the project had a mean of 3.593 and a standard deviation of 1.2419.

Liu and Yang (2012) argues that Community attitudes towards water project services can be measured and known in order not only to optimize sector efficiency and performance but also to illuminate possible future developments. According to Liu & Yang, the communities must indicate a willingness to conserve substantially in their water use and also to contribute towards maintenance of their water sources so that it would continue to service them even in future times. The community's feelings and perception toward the project will greatly influence how members care for the project and how much support they would be willing to offer to the project. This in

turn would also influence the management towards giving back to the community to reciprocate the support hence guaranteed sustainability.

5.2.5 Sustainability of the Water Projects

The study sought to establish the how water projects in Machakos County is sustained and from the findings, on whether local community members should be trained to do minor repairs had a mean of 4.389 and standard deviation of 0.8576. On whether to achieve sustainable community members should be involved during conception, design, implementation, operation and maintenance of the projects had a mean of 3.618 and standard deviation of 1.2259. On whether the locals who are beneficiaries should be encouraged and allowed to participate in the funding of the water project had a mean of 3.584 and standard deviation of 1.1271. The findings of the regression analysis indicate that 92.7% variation in the sustainability of water projects is explained by the four independent variables (project financial management, technical support provision, community participation and attitude of the community).

The study further established that while holding all the independent variables constant, sustainability of water projects would be at -0.583. A unit increase in project financial management while holding other variables constant would increase sustainability of water projects by 1.033. A unit increase in technical support holding other variables constant would increase sustainability of water projects by 0.187. A unit increase in community participation holding other variables constant would decrease sustainability of water projects by 0.893. A unit increase in attitude of the community holding other variables constant would increase sustainability of water projects by 0.605. There was a statistically significant association between Project financial management, community participation, attitude of the community and

sustainability of the water projects for the p values 0.017, 0.011 and 0.028 are less than 0.05 at 5% level of significance.

5.3 Discussion

The study established that water projects sustainability is influenced by governance. The finding is consistent with the study of Namara, et al., (2010) who found out that financial management is very important as far as operation and maintenance of donor projects is concerned. The aspect of financial management also entails setting of water tariffs. Many donor projects fail to be sustainable for a long period due to high tariffs introduced by management committee or poor financial management skills that deems the project unsustainable in the long run.

The study also established that financial management is very important as far as operation and maintenance of donor projects is concerned. The finding concurs with Namara, Hanjra, Castillo, Ravnborg, Smith and Van Koppen (2010) who found that every year millions of dollars are invested by international community, national government, donor agencies, non-governmental organizations and local county government alike in project implementation and despite, ever increasing attempts to tackle the problem, many projects still fail to maintain the flow of expected benefit over their intended lifetime of 15 or even 20 years. The study found out that water projects sustainability is influenced by community participation.

The study found out that community established structures increases functionality and sustainability of projects. The findings of the study also established that technical skills imparted during project implementation, requires continuous upgrading and training. The finding is consistent with Allouche (2011) who in the study- the sustainability and resilience of global water and food systems: Political analysis of the interplay between security, resource scarcity, political systems and global trade; noted that technical skills while imparted during project

implementation, is again another factor like leadership skill, which require continuous upgrading and training as the globe keeps changing coming up with new tools every day. The study also found out that there is need for ensuring that water quality testing is done and it is done on regular basis.

The findings of the study established that community members are involved in Project implementation. The study further established that community participation and support increases project efficiency. The finding concurs with Harvey and Reed (2007) who held that community participation and support increases project efficiency; therefore it is recommended that there should be consultation with the community during all stages of the project planning starting from identification until the project is complete and used by the community members or beneficiary involvement in the management of project implementation or cooperation to ensure sustainability. The study found out further that community members participate in water sales rate determination.

The findings of the study established that community members have the willingness to conserve the project area. The findings concurs with Liu and Yang (2012) who found out that the communities must indicate a willingness to conserve substantially in their water use and also to contribute towards their maintenance of their water sources so that it would continue to service them even in future times. The study found out further that community members encourage sharing of the water project. The study also established that community members willingly provide suggestions and opinions to better the project. The finding concurs with Schweitzer (2009) who established that communities were not involved in it, thus their attitudes, desires and suggestions were not factored into the scenario when thinking about sustainability of the water projects

The study established further that local community members should be trained to do minor repairs. The finding is consistent with Taylor (2009) who opined that both the financier including donors must have a clear view of what the project entails and enlighten members of a community on various skills in order to boost sustainability of water project during and after exit of the donor and other financiers. The study found out that to achieve sustainable community members should be involved during conception, design, implementation, operation and maintenance of the projects. The study found out further that the locals who are beneficiaries should be encouraged and allowed to participate in the funding of the water project.

The study further established that all the independent variables, (project financial management, technical support provision, community participation and attitude of the community) affect sustainability of water projects. Project financial management was found to have a greatest effect followed by attitude of the community, then technical support and lastly community participation. These findings concurs with the study of Kanyanya (2014) whose findings indicated that 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%).

5.4 Conclusion

Based on the findings, the study concludes that project financial management affects sustainability of water projects in Machakos County. It also concludes that water projects sustainability is influenced by governance. The study also concludes that financial management is very important as far as operation and maintenance of donor projects is concerned.

The study concludes that provision of technical support affects sustainability of water projects in Machakos County and concludes further that technical skills imparted during project implementation, requires continuous upgrading and training. There is need for ensuring that water quality testing is done and it is done on regular basis. Community established structures increases functionality and sustainability of projects.

The study comes to a conclusion that community participation affects sustainability of water projects in Machakos County. The study concludes further that community participation and support increases project efficiency. The study also concludes that community members participate in water sales rate determination. The study also concludes that the attitude of the community affects sustainability of water projects in Machakos County. The study further concludes that the community members have the willingness to conserve the project area and that they willingly also provide suggestions and opinions to better the project. The study concludes that sustainability of the water projects in Machakos County is affected by the four independent variables (project financial management, technical support provision, community participation and attitude of the community).

5.5 Recommendation for the Study

In relation to the findings, this study makes the following recommendations:

- i. The study recommends that county governments in Kenya should put in place proper governance as this increases the sustainability. There is need for proper maintenance of donor projects as this shall enhance sustainability. This maintenance extent beyond accountability and transparency.

- ii. County governments and the general management of water projects in Kenya should ensure continuous upgrading and training of the technical skills as this enhances sustainability. Water quality testing should be put in place on a regular basis.
- iii. The study further recommends that all county governments and the general management of water projects should ensure maximum community participation and support for this increases project efficiency. Community members should be involved in the determination of the water sale rates.
- iv. The study recommends that community members should willingly conserve the project area. County governments and the general management of water projects in Kenya should also involve community members in raising suggestions and opinions to better the project.
- v. County governments and the general management of the water projects in Kenya should ensure that the local community members are trained to do minor repairs. Management of water projects and the county governments in general should also involve community members during conception, design, implementation, operation and maintenance of the projects.

5.6 Further Research

This study on the effect of community based management on sustainability of water projects was carried out in Machakos County. The study restricted itself to project financial management; technical support provision; community participation and attitude of the community. Similar studies can therefore be carried out to include a larger study area, other projects other than water as well as other factors affecting project sustainability.

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APPENDICES

Appendix I: Questionnaire

Please fill out the questionnaire on: EFFECT OF COMMUNITY BASED MANAGEMENT ON SUSTAINABILITY OF WATER PROJECTS IN MACHAKOS COUNTY.

Section A: Background Information

1. What is your gender?

Male [] Female []

2. What is your highest level of education attained?

No education []

Certificate []

Diploma []

Bachelors Degree []

Masters []

PhD []

3. Indicate the duration you have taken in the water projects in Machakos County?

Below 1 year [] 1-2 years []

2-3 years [] Above 3 years []

4. Indicate the position you hold in the Water project.

Project managers []

Community Leaders []

Water committee members []

Section B: Project Financial Management

5. Below are several statements on project financial management and its effect on sustainability of water projects in Machakos County. Kindly indicate the extent to which you agree or disagree with these statements. Use a scale of 1-5 where 1= strongly disagree, 2= Disagree, 3=Neither Agree nor Disagree, 4=Agree and 5=Strongly Agree.

Project Financial Management	1	2	3	4	5
Water projects sustainability are influenced by monitoring and evaluation					
Unaccounted water affects sustainability of the water Project					
Financial management is very important as far as operation and maintenance of donor projects is concerned					
The government, NGOs, investors and the international community should not be expected to finance all expenditures required in the life of the water system					
The level of transparency and accountability affects the sustainability of the water project					
In general terms, to what extent has project financial management affected the sustainability of water projects in Machakos County?					

Section C: Technical Support Provision

6. Below are several statements on technical support provision and its effect on sustainability of water projects in Machakos County. Kindly indicate the extent to which you agree or disagree with these statements. Use a scale of 1-5 where 1= strongly disagree, 2= Disagree, 3=Neither Agree nor Disagree, 4=Agree and 5=Strongly Agree.

Technical Support Provision	1	2	3	4	5
Technical skills imparted during project implementation, requires continuous upgrading and training					
There is need for regular monitoring by responsible government authorities or other partners on maintenance of facilities.					
There is need for ensuring that water quality testing is done and it is done on regular basis.					
The community members cannot meet the cost of spare parts majorly due to poverty.					

The type of water supply system is less complex for Community to Manage					
Community established structures increases functionality and sustainability of projects					
Minimal external support from the government and other external actors increased the sustainability of the community projects					
The technology of modern meters that water supply agencies are promoting is considered to be appropriate as it is easy to handle by rural communities					
Most of the breakdowns are fixed on time by the local technicians					
Most of the technicians do not come from the local village/community and have to be sourced from far					
In general terms, to what extent has technical support provision influenced the sustainability of water projects in Machakos County?					

Section D: Community Participation

7. Below are several statements on community participation and its effect on sustainability of water projects in Machakos County. Kindly indicate the extent to which you agree or disagree with these statements. Use a scale of 1-5 where 1= strongly disagree, 2= Disagree, 3=Neither Agree nor Disagree, 4=Agree and 5=Strongly Agree.

Community Participation	1	2	3	4	5
Community members are involved in Project site identification					
Community members are involved in Project implementation					
Community members are involved in Project Management					
Community participation and support increases project efficiency					
Community members participate in water sale rates determination					
Community member's participation in cost sharing enables the community to contribute to the project sustainability.					
In general terms, to what extent has community participation affected sustainability of water projects in Machakos County?					

Section E: Attitude of the Community

8. Below are several statements on attitude of the community and its effect on sustainability of water projects in Machakos County. Kindly indicate the extent to which you agree or disagree with these statements. Use a scale of 1-5 where 1= strongly disagree, 2= Disagree, 3=Neither Agree nor Disagree, 4=Agree and 5=Strongly Agree.

Attitude of the Community	1	2	3	4	5
The community members have the willingness to conserve the project area.					
Community members willingly substantially contribute towards the maintenance of their water sources					
Community members encourage the sharing of the water project.					
Community members can willingly keep the project area clean.					
Community members willingly provide suggestions and opinions to better the project					
In general terms, to what extent has the attitude of the community affected sustainability of water projects in Machakos County?					

Section F: Sustainability of Water Projects

9. Below are statements on sustainability of water projects. Kindly indicate the extent to which you have seen them applied in the water project. Use a scale of 1-5 where 1= strongly disagree, 2= Disagree, 3=Neither Agree nor Disagree, 4=Agree and 5=Strongly Agree.

Sustainability of Water Projects	1	2	3	4	5
Local community members should be trained to do minor repairs					
Sustainability would increase with the investment in institution and capacity building to operate and maintain the system					
To achieve sustainable community members should be involved during conception, design, implementation, operation and maintenance of the projects.					
The locals who are beneficiaries should be encouraged and allowed to participate in the funding of the water project.					