FACTORS INFLUENCING THE SUSTAINABILITY OF COMMUNITY WATER PROJECTS RUN BY GRUNDFOS LIFELINK-KENYA: A CASE OF KATITIKA WATER PROJECT, EASTERN PROVINCE- KENYA

BY

JANE KASIVA MBATHA

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2011
DECLARATION

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

Signature: ........................................ Date: 24/08/2011

Jane Kasiva Mbatha
L50/76896/09

This research project has been submitted for examination with my approval as university supervisor.

Signature: ........................................ Date: 24/08/2011

Mr. Chandi J. Rugendo
Lecturer.
School of Continuing and Distance Education
Department of ExtraMural Studies
University of Nairobi
DEDICATION
This project report is dedicated to my family: my husband Charles, and my children Maxwell Mwendwa, Letitia Mwelu and Warren Mbatha for their love, support and patience throughout my study.
ACKNOWLEDGEMENT

I am greatly indebted to all the people who assisted in developing this research project. In particular, I appreciate my supervisor Mr. Chandi J. Rungendo for his selfless efforts, patience and guidance to make this work a success.

I am also grateful to Dr. Wanyonyi S. Luketero S. for assisting me to correct and refine this project report.

I also extend my gratitude to all the lecturers who taught me throughout the course.

Thanks too to Mr. Tirimba O.M. for reading through my work, correcting and refining it.

I wholeheartedly thank my parents Francis and Stella, my sisters and brothers for the special family moral support and encouragement they accorded me throughout my study.
ABBREVIATIONS

KFWWSP - Kenya Finland Western Water Supply Program
TARDA - Tana Athi River Development Authority
AMREF - African Medical and Research Foundation
MKEPP - Mount Kenya East Pilot Project-for Natural Resource Management
JICA - Japanese International Corporation Agency
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ABSTRACT

Community water projects have improved the lives of people especially women and children who are mainly expected to fetch water. The most important one is the reduction in time and energy spent while drawing water. Communities invest heavily in water projects and when a project collapses it's a major loss of resources. There is however gap between the level of investment by communities in water projects and the sustainability of the same projects. This study investigated the factors that influence the sustainability of water projects run by Gundfos lifelink –Kenya, a case of Katitika community water project. Specifically, the study investigated how independent variables such as financial status of the community, management services, maintenance services and technology and innovation had an influence on sustainability of the water projects. A descriptive survey design was used with a sample size of 96 drawn from the project members, committee members and opinion leaders selected using the Yamane formulae. Questionnaires with both closed and open ended questions were used to collect data. Observation was also used. The findings have shown that most members are comfortable with the new technology and the innovation which reduces their expenditure and ensures accountability since there is no exchange of hard cash which contributed towards sustainability. The study too revealed that the community members saw the new technology as a means of saving time and energy for other economic activities. The study recommends that at least the company should ensure that one of the community members is trained on maintenance of the project. The study concludes that with technology, innovation and accountability most community water projects would be sustainable.
CHAPTER ONE

1.1 Background
Water is a natural resource which should be conserved and sustained for the future generations. According to Nagel Garret (2003) the management of all water resources and water environment sustainability is crucial. This is because the human kind, animals and plants cannot survive without sustainable water sources. Mitche Bruce (1997) argues that there are several principles that should be followed to ensure sustainability of the water projects. These principles include: to practice integrated resource management, to encourage water conservation and protection of water quality and always resolve water management issues. Adamko, (1998) observes that of the 3000 wells, developed in Ghana in 1970’s, almost all had collapsed due to lack of sustained community financing. The study will therefore look into the sustainability of water projects run by Grundfos lifelink-Kenya: a case of Katikika water project at Katulani district in Eastern province- Kenya.

1.1.1 The water policy in Kenya
The water policy in Kenya is in accordance with the millennium development goal which states that there will be provision of clean and safe water to all by 2015. Kenya has taken a step to detach the state from direct provision of water and has set up water boards that govern the provision of water to the citizens. According to K’Akum (2006) policy makers and analyst advocate the abdication of the state in favour of private participation. This will bring a host of benefits to all the stakeholders concerned.
1.1.2 Grundfos LIFELINK

Grundfos lifelink-Kenya (GLK) is a private company incorporated in 2008 in a joint venture between the global pump manufacturer Grundfos based in Denmark and the industrialization fund for developing countries. Grundfos has more than 60 years of experience in developing sustainable pump solutions for water projects worldwide. The average annual production of water pumps stands at an annual average of 16 million pumps. Grundfos is one of the world's leading manufacturers of pumps, and has a distribution network for their products which spans over 45 countries.

They also engage in the equipping, maintaining, servicing and installation of their machines. Based on these core competencies, Grundfos developed the 'lifelink' system as a solution for the more than 1 billion people in the world who do not have access to safe water.

The mission of Grundfos 'lifelink' is to improve the living conditions of the population in Kenya and beyond by providing solutions for sustainable water supply for rural and peri-urban communities through development, implementation and ongoing maintenance of the community water projects.

The company mainly equips already sank boreholes, introducing new technology to the communities and working together with them to ensure sustainable and reliable water supply. According to Kalan J. (Jan 7 th 2011) the greatest challenge to communities once the projects are handed over is maintenance and funds for repair without which projects fail.

The Grundfos lifelink has developed a system which is about as high tech as rural water solution can get. The system is a single-point water supply system with a submersible pump that is powered entirely by solar energy; the water is pumped to an elevated storage tank then led by gravity to a tap unit in a small, secure concrete housing structure. The tap unit also serves as an automatic payment facility, utilizing an electronic money transfer service that uses mobile
phones. The phone is loaded with money at the agents of safaricom Telecommunications Company. Then the members load their prepaid fob key (with radio frequency identification technology).

The whole system contains a computer-based communication and surveillance module, relaying real-time usage, water table health, and operational information.

Grundfos is responsible for providing maintenance, repair and replacement. In its contract with the community, the consumers agree to pay a 2 or 3 ksh filling fee (depending on location) and Grundfos guarantees that they will fix or replace any parts of the system that may break down. Notably so the new technology saves on energy and time which can be spend for better economic gains.

1.1.3 M-PESA

M-PESA is an electronic money transfer service that makes use of mobile phones. The company has appointed sales agents for their money transfer services. It is this sales agent through whom money is deposited by members of the community. Any registered member of M-pesa can top up the key fob from anywhere provided they have the code which is specific and unique to individual member.

Mobile money transfer’s great success in Kenya cannot be matched anywhere else. Currently it has over 13million Kenyans registered. (Plyler, Haass ands Nagarajan, 2010)

M-PESA allows users to store money on their mobile phones in an e-account and deposit or withdraw money in form of hard currency at any of M-PESA’s numerous agent locations. It has gained acceptance as mode of settlement of bills. And this is the service utilized by Grundfos lifelink – Kenya.
Safaricom Telecommunications Company is in a partnership arrangement with the pump manufacturer Grundfos lifelink that enables the community to pay for water through the M-PESA electronic money transfer service.

The unique partnership was officially launched in Kititika, Kitui county. It uses M-PESA’s pay bill functionality which transfers a subscriber’s M-PESA balance to a smart card which is then used to draw water at subsidized rates from specially calibrated pumps constructed by Grundfos lifelink.

This is one of the Safaricom’s commitment to supporting worthy causes within communities and deploying appropriate technologies to answer society’s challenges.

The partnership is said to offer a new and sustainable solution for small rural communities. The use of a smart card implies financial sustainability and good governance is ensured and the exchange of hard cash is avoided thus reducing the chances of corruption and mismanagement.

Each user is provided with a smart card fitted with a micro-chip. The user is able to buy water by depositing money from their M-PESA account into a Grundfos M-PESA business account under the pay bill functionality.

The money is then loaded to the user’s smart card. Each time the user needs to buy water, the smart card is inserted into a slot on the tapping point and water automatically starts running, when the card is removed the amount tapped is deducted from the card.

The project is claimed to have several inbuilt features to ensure sustainability. Through M-PESA the beneficiaries contribute to a community trust that pays for the solar powered water pump from Grundfos. The money also caters for the maintenance of the pump. The community acquires the water pumping system on credit and at affordable rates. The system has a business model that enables the communities to acquire the pumps while paying for the investment.
gradually through utility fees. However some of the projects are sponsored through different organization such as Red Cross.

The model also includes a local service organization for regular maintenance of the system and service calls courtesy of safaricom infrastructure, the units performance is monitored real-time via the internet and failure messages automatically relayed to Grundfos lifelink.

For environmental sustainability, the water system is run entirely on solar energy. This eliminates problems and expenses traditionally associated with diesel driven or hand driven pumps.

1.1.4 Katitika water project

The project is located in Mangina village, Mangina sub location in Itolika division of Katulani district in Kitui county, Eastern province- Kenya. It serves a population 1800 in 300 households.

The bore hole was sunk by JIKA in 2006. It was installed with a hand pump which the community used to draw water. The Grundfos lifelink installed the automated water system in 2009. The project is run by community project committee. The project serves four villages that is Mangina, Katitika, Itulu and Mwaani. The project serves 300 households.

1.2 Statement of the Problem

All world over literature review conclusively points that sustainability is a problem which faces all forms of development in both developed and developing countries (Len Abram.2000). Mukhwana and Hukka (1995) in their project evaluation report found out that out of the 14 completed projects, constructed by the Kenya Finland western water supply program (KFWWSP) in western Kenya, nearly all of them had serious problem of sustainability which could be classified as financial, managerial, and technical. In comparison with other community water projects, for example in terms of innovation Malivani water project in Makueni district use
diesel as a source of energy to pump water from the borehole whereas in Katitika the project utilizes solar energy.

The mode of payment differs. For instance in Mwingi district water projects run by TARDA members pay cash to an employee of the project in order to draw water. While at Katitika water project money is transferred from the Mobile money transfer service (m-pesa) to the key fob to enable them draw water at the water point.

Maintenance of these water projects is left in the hands of the water board. while in Katitika water project maintenance is the responsibility of the company, Grundfos life link.

A project such as Musingini water project in Masinga district members use hand pumps to draw water. The exercise is both tiring and time consuming. In Katitika water project all the members require is to load their key fob with money to draw water fast and effortless.

The research therefore seeks to investigate the sustainability of the water projects run by Grundfos lifelink Kenya with specific reference to Katitika water project in Katulani district – Kenya: with a view to providing insights in the management of water projects and at the same time enrich the available information and creating basis for further research.

1.3 Purpose of the Study
The purpose of the study was to assess the factors that influence the sustainability of water projects run by Grundfos lifelink-Kenya: a case study of Katitika, Kitui county of Eastern province-Kenya water project.

1.4 Objectives of the Study
The study was guided by the following objectives:

1. To assess the level to which management services of the project influences the sustainability of water projects.
2. To establish the extent to which technology and innovation influence the sustainability of water projects.

3. To investigate how the financial status of the community influences the sustainability of water projects.

4. To determine the level to which maintenance services of the project by the company influence the sustainability of water projects.

1.5 Research questions
The study set out to answer the following questions.

1. How do the management services of the project influence the sustainability of water projects?

2. How does technology and innovation influence the sustainability of community water projects?

3. How does the financial status of the community influence the sustainability of community water projects?

4. How do the maintenance services of the project by the company influence the sustainability of community water projects?

1.6 Significance of the study
Development of community water projects costs the Government, community, companies and NGO'S a lot of money. This study will contribute to the understanding of the factors influencing the sustainability of water projects run by Grundfos Lifelink Company.

The company will gain through learning their strengths and weaknesses in running of their projects. While other communities will learn skills necessary for creating an environment for sustainability of community water projects.
1.7 Limitations
There were a number of notable limitations regarding this study. First, a descriptive survey
approach was used with a self-report questionnaire administered to collect data. A major
limitation was that respondents did not have the opportunity to request clarification and people
may not have disclosed details they did not wish to. Second, only one project of the many run by
Grundfos lifelink company was studied, this limits the generalization of the results. Third, the
use of convenient target population was a weakness to this study.

1.8 Delimitations
The study was delimited by the scope of the research which was reduced to dealing with one
water project from the many run by Grundfos lifelink. This was mainly to save on time and
resources.

1.9 Assumption of the study
This study assumes that all respondents will provide reliable and valid data that can be used to
make important conclusions on the study.
The study assumed all variables would remain constant.
1.10 Operational Definition of terms

Challenges-these are the bottlenecks that hinder the smooth running of the community water projects.

Community committee – these are the representatives of the community members who oversee the daily running of the water projects.

Community empowerment-this term is used to imply the ability of the company to enable the communities to take charge of their own development according to their own needs and encouraging innovativeness and the discovery of potential.

Community- is used to refer to the group of people who live in the same geographical environment sharing the same resources in this case the water project.

Community participation- this is the role taken by the primary beneficiaries of the project in running and managing their water project.

Ground water- this is the water that is found underground and it can only accessed through digging wells or drilling boreholes.

Key fob-it is a device that makes use of radio frequency identification technology. It is used by members of the water project to assess water. It is usually re-loaded through the M-pesa money transfer.

Management services- is used to mean the responsibility of the project committee to the project members and the water project.

M-pesa- this is an electronic money transfer service within safaricom Telecommunications Company that utilizes mobile phones.

Project beneficiaries-these are the persons that directly benefit from the project. That is use the water from the water projects.
Stakeholders - the term is used to refer to all the persons who are interested in the community water projects. This ranges from the community members, Grundfos lifelink company, safaricom company, the government of Kenya and any donors who may have funded the projects.

Sustainability - This word in the study is used to mean the ability of a water project to develop a strategy of growth and development that continues to function and serve its intended target population now and in the future.

Technology is used to refer to the use of the information technology to aid in collecting money and use of modern equipments to monitor and relay information about the project to the company.
1.11 Organization of the study

The study is organized into five chapters.

Chapter one contains the introduction including the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions of the study, statement of the problem, purpose of the study, limitations of the study and definition of significant terms.

Chapter two represents the relevant literature of the study on the factors influencing sustainability of water projects, a conceptual framework and a summary.

Chapter three consists of detailed description of the research methodology that was used in the study. This includes the research design, target population, sample size and sampling techniques, research instrument, instrument validity and reliability, data collection procedure and data analysis techniques.

Chapter four represents the data analysis, presentation, and interpretation of the data while chapter five consists of the summary of the findings, discussion, conclusion and recommendations.
CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction
This chapter aims identifying what other researchers had done in the area of sustainability of community water projects. The finding of the review would help the researcher to note the gaps in knowledge and create an entry point to the study. It also enriched the conceptual frame work of the research by assessing other factor that influences sustainability. The chapter looks extensively at technology and innovation and maintenance service as one strong area exploited by the company to enhance the sustainability of the community water projects.

2.2. Theoretical issues on sustainability
Sustainability is a term being used in a number of sectors of development. Sustainable development is a main challenge for managers of water supply and sanitation institutions and projects, as well as for the communities involved. According to a newsletter of ‘Netwas international’ of may 1996, large amounts of projects have been made in the water supply and sanitation sectors in the past but a greater number of projects have reported deficiencies and systems which are not functioning. The benefits and credibility of the investment made is questionable. There is need for a new approach to development which should include going beyond physical results. It should aim for provision of water systems which are keen on generating appropriate benefits over time.

There is growing empirical evidence that social capital contributes significantly to sustainable development, (Isham and Kahkonen, 1999). Sustainability is to leave future generations as many, or more, opportunities as we ourselves have had. Growing opportunity requires an expanding stock of capital. The traditional composition of natural capital, physical or produced capital, and human capital needs to be broadened to include social capital. Social capital refers to the internal
social and cultural coherence of society, the norms and values that govern interactions among people and the institutions in which they are embedded. Social capital is the glue that holds societies together and without which there can be no economic growth or human well-being. Without social capital, society at large will collapse, and today’s world presents some very sad examples of this. It is this same social capital that will help enhance sustainability through the use of the mobile money transfer.

There are numerous risks that threaten the sustainability of the water projects and communities often get into problems after the implementing partner has left. Most of this challenges range from problems related to the technical maintenance of the systems management, cost recovery, planning, transparency of decision making and communication between community committees and the community beneficiaries,(Oenga and Ikumi,1997)

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stock of capital. The traditional composition of natural capital, physical or produced capital, and human capital needs to be broadened to include social capital. Social capital refers to the internal social and cultural coherence of society, the norms and values that govern interactions among people and the institutions in which they are embedded. Social capital is the glue that holds societies together and without which there can be no economic growth or human well-being. Without social capital, society at large will collapse, and today’s world presents some very sad examples of this. It is this same social capital that will help enhance sustainability through the use of the mobile money transfer.

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The same observation is reinforced by Okfar (2008) who argues that if things begin to go wrong with the management of the system, distrust in the community will grow and will finally bring the project to its knees. He also says that there are other threats that are too complicated for communities to handle, such as the project outstretching their limits may be because of illegal users, population growth and technicological services.

The above review is evidence that sustainability requires the efforts of all stakeholders. The study therefore seeks to find out if Grundfos lifelink-kenya has better chances of attaining sustainability of its water projects which will provide a breakthrough.
2.2.1 Project managerial skills
Sustainable water management includes two important concepts: sustainability and Management of resources. (Harvey, 2006) argues that over the past two decades, community management has become the prevalent model for management of Rural water supplies throughout sub-Saharan Africa. Despite its widespread popularity among donors and implementing agencies, low water supply sustainability levels throughout the sub-continent indicate that it is not panacea it is often presented to be. There is a strong need to distinguish between ‘community participation’ which is a prerequisite for sustainability and community management which is not. If community management system is to be sustainable, they require ongoing support from an overseeing institution to provide encouragement and motivation, monitoring, participatory planning, capacity building and specialized technical assistance. If such support is not available, alternatives such as household water supplies and private sector service delivery should be considered.

Community water projects, support needs to cover both the scheme development and the post implantation phases.

For an organization to function, it requires having a center of power where authority is seen to flow in the water project, elected members form a committee that runs the projects. However, most committee lacks the power to exercise authority and enforce the set by laws. Most of the elected leaders lack managerial skills as well and are of low formal levels of education.

As observed by Mathur (1996) most of the community water projects have problems of decision making, resource utilization and accounting for the same which usually forms the major causes of project break up due to lack of community training on how projects are managed.
2.2.2 Method of collecting money
Due to their informal nature, community water projects lack formal procedures and processes and the know how to conduct business.

This brings about so many difficulties in collecting the funds. The payment of the members depends on their good will. The committee also lacks the power to enforce the set by laws. They may also fail to keep records of the transaction carried due to lack of knowledge, ignorance or even laxity.

The project as well relies on the good will and volunteer work from the committee members. Because of this the members have no moral authority to question the committee members.

2.2.3 Empowering through training
Nyong and Kanoroglou(2001) notes that areas where implementer do not promote the participation of beneficiary communities and the roles of each stakeholder is not clearly defined, it leads to uncertainty and confrontation around the respective roles to be played by all those involved. A community water project will require a community water committee to effectively oversee operation and maintenance services and collect revenue to cover the cost of the services. Relevant, practical and well-tailor made training will have a great impact towards sustainability. This enables communities with limited formal education to operate and maintain relatively complex water supply schemes. From the website AMREF (2010) has developed over 40 water projects and its stronghold is information and capacity development of community committees.

In Makueni County, Nyakundi (2005) notes most of the water projects collapsed due to managerial problems after the projects were handed over to the community. Members did not pay arguing that water is God given gift one should not pay for. Where the payments were made poor records were kept amounting to mismanagement.
2.2.4 Financial status of the community
The community water projects are meant to benefit all members equally and so they tend to be based on equality. Members are expected to contribute equally despite their different economic endowment. This implies that the very poor are likely to be locked out of the project.

Hemson (2003) observes that, in water delivery, as in many other programs of social nature there can be ‘inverse equity’ where by the poorest in the community are always the last in the queue.

Currently, most water projects use the approach of community water management where by community members contribute to the development of their own project and the sustainability of the same. In Kenya for instance, each community contributes 30% of the total project cost in their hands (MKEPP Appraisal report, vol.1,2003) communities may pay as individual or households, a membership fee, and pay also as they fetch the water. The aim is to make the communities responsible towards the project and cultivate a sense of ownership is cultivated.

2.2.5 Technology and Innovation
The level of training needed for empowerment is dependent on the level of sophistication in the technology employed.

Technology sets women and children free as Carte et al(1999) argues that women and children spend so much time and energy getting water for domestic use. Automated projects will relief them and the projects should therefore be sustained for them to continue enjoying the relief.

Proasne (2005) explains that in order for a project to produce sustainable results, the project managers have to ensure that funding is available and will be available to support the running of the project.

2.3 The mobile money transfer service (M-pesa)
Plyer M,(2010) defines M-pesa as a agent-assisted, mobile phone-based, person-to-person payment and money transfer system. It was launched in Kenya in 2007 by the safaricom
telecommunications company. Since its inception, M-pesa has picked up quickly, covering the majority of geographical areas of the country. It aimed to attract 250,000 customers in its first year and reached that milestone in only four months. Data from the company indicate that by the end of the year 1 million customers had registered with M-pesa. Currently it has over 13 million registered customers.

In her findings she argues that M-pesa affects the economic outcomes of community members, both as users and non-users of M-pesa.

The study also identifies a number of economic effects within the broad categories of local economic expansion, security, and capital accumulation.

M-pesa allows users to store money on their mobile phones in an e-account and deposit or withdraw money in the form of hard currency at one of the M-pesa’s numerous agent locations. M-pesa has affected Kenyan households and communities at social-economic levels. These effects at community level include: local economic expansion, security, capital accumulation, and business environment. Thus, M-pesa has had a very important role in supporting economic activities in the community.

M-pesa has a number of functions. These include sending money, withdrawing money, paying bills. It is this function which is utilized by the partnership between Grundfos lifelink-kenya and safaricom Telecommunications Company. M-pesa allows members pay for water which is accessed from the automated water system.

As an extension the communities improve their health because they will have fewer water borne diseases and increased ability to practice good hygiene.

It is therefore clear that (Kenya economic update, December, 2010) among many ways cell phones have been used in Kenya, the most innovative is the mobile money transfer. This global
innovation has the potential to become an additional engine of Kenya’s growth and an important tool for poverty reduction. That is why all the other telecommunication company’s have also introduced their own money transfer services.

Though still used by the rich members of the society, mobile money transfer is common with the poor and unbanked members of the society. The money flows in the semi-formal financial system and also helps with macroeconomic policy making because it increases information about liquidity in the financial system. Safaricom Telecommunications Company has established more partnerships with other organization but this study will only focus on its partnership with grundfos lifelink.

2.4 Grundfos lifelink
This is a private company incorporated in 2008 in a joint venture between the global pump manufacture Grundfos and the industrial fund of for developing countries. The company has over 60 years of experience in developing sustainable pump solutions. The company is about as high tech as rural water solutions can get. The system is a single-point water supply system with a submersible pump that is powered entirely by solar energy. The water is pumped to an elevated storage tank, then flows though gravity to a tap unit in a small, secure concrete housing structure. The tap unit (the big black box) also serves as an automatic payment facility, utilizing a unique mobile payment system (M-pesa) and a pre-paid FOB key (with radio frequency identification technology), which can be reloaded and paid by customers through a simple text message.

The whole system contains a computer -based communication and surveillance module, relaying real-time usage, water table, health and operational information. The company is responsible for providing maintenance, repairs, and replacements. The community members buy the water at an agreed amount and the company guarantees fixing or replacing any part of the system that may
break down. The company operates in a business manner and the community members pay for all services through installments.

2.5 The water policy in Kenya
The water policy in Kenya is in accordance with the millennium development goal which state provision of clean and safe water to all by 2015. Kenya has taken a step to detach the state from direct provision of water and has set up water boards that govern the provision of water to the citizens. According to K’Akum(2006) policy makers and analyst advocate the abdication of the state in favour of private participation. This will bring a host of benefits to all the stakeholders concerned.
2.6 Conceptual Framework

Conceptual framework of the factors that influence the sustainability of community water projects run by Grundfos lifeLink -Kenya is as shown in figure 1.

**Independent variables**

- **Management services**
  - Training of project members
  - Record of minutes

- **Technology and innovation**
  - Solar energy
  - Automated water point

- **Financial status of the community**
  - Mobile phones
  - Records of bank account

- **Maintenance services**
  - Agreement
  - Number of breakdowns
  - Record of response rate

**Dependent variable**

- **Sustainability of water projects**
  - Drawing of water.
  - Smart cards
  - M-pesa Agents.

**Moderating variable**

- Quality of network

Figure 1: Conceptual Framework
2.7 Relationship among variables
The conceptual framework illustrates how the four independent variables which include management services, technology and innovation, financial status of the community and maintenance services are interrelated to influence the sustainability of water projects. The sustainability of water projects in this case is the dependent variable which is determined by the independent variable. Any of the four independent variables is thought to influence the sustainability of community water projects. It is also perceived that the independent variables do not work alone. The quality of network which is the moderating variable affects the transactions at the water point thus influencing the sustainability of the water projects.

2.8 Summary of literature review
In this chapter the research findings have given an over view of community water project and the role of the stated variables in relation to what other scholars have said. The study also studies in detail the factors that influence sustainability of water projects run by Grundfos lifelink –Kenya. The chapter also gives the conceptual framework of the study.
CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction
This chapter includes the method used to collect the data for the study. This includes a description of the research design, target population, sampling design, data collection instruments, data collection procedure and data analysis procedure.

3.2 Research design
The study adopted the descriptive design to investigate the sustainability of the community water projects run by Grundfos lifelink -kenya. This allowed the study to gather information, summarize, present and interpret for the purpose of clarification (Orodho, 2002). The design was also preferred because it was concerned with answering questions such as who, how, what, which when and how much, Cooper and Schindler (2001).
Kothari (2003) too recommends descriptive design because it allows a researcher to describe record, analyze and report what exist.
The chosen design allowed the study to generate both numerical and descriptive data that could be used in measuring correlation between variables. The descriptive research was intended to produce statistical information about aspects of sustainability of water project run by Grundfos lifelink: a case of Katitika water project, Kitui county eastern province-Kenya.

3.3 Target population
Kombo and Tromp(2006) define a population as a group of individuals, objects or items from which samples are taken for measurement. This study was carried out in Katitika water project in Kitui county. The target population was 300 households drawn from four different villages served
by Katitika water project, 15 committee members of Katitika water project and 10 opinion leaders.

### Table 3.1 The Target Population

<table>
<thead>
<tr>
<th>Category</th>
<th>Target population</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community members</td>
<td>78 households</td>
<td>Katitika village</td>
</tr>
<tr>
<td>Community members</td>
<td>74 households</td>
<td>Mangina village</td>
</tr>
<tr>
<td>Community members</td>
<td>72 households</td>
<td>Mwaanl village</td>
</tr>
<tr>
<td>Community members</td>
<td>76 households</td>
<td>Itulu village</td>
</tr>
<tr>
<td>Total community members</td>
<td>300 households</td>
<td>Katitika water project</td>
</tr>
<tr>
<td>Project committee members</td>
<td>15</td>
<td>Katitika project committee</td>
</tr>
<tr>
<td>Opinion leaders</td>
<td>10</td>
<td>Opinion leaders</td>
</tr>
</tbody>
</table>

**Source:** Grundfos lifelink

### 3.4 Sampling and Sampling procedure

Orodho and Kombo (2000) define sampling as the process of selecting a number of individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire group.

This study adopted the stratified random sampling method. This is because the study will include people of all walks of life who benefit either directly or indirectly from the community water project. The strata will be based on the project members, project committee and opinion leaders. As Corchran (1977) argues, stratification ensures a gain in precision in the estimates of characteristics of the whole population. It also ensures the inclusion of sample groups which
would probably be entirely omitted (Mugenda and Mugenda, 1999). In this case stratification ensured that all stakeholders were given a chance in the sample. A total of 76 households, 13 committee members and 9 opinion leaders were sampled. The sample will be calculated using the Yamane formula which assumes a normal distribution. That is \( n = \frac{N}{1+N(e)^2} \) where \( n \) is the sample size is population size and \( e \) is the error of sampling. This study allows the error of sampling on 0.1.

### Table 3.2 Sampling Procedure

<table>
<thead>
<tr>
<th>Category</th>
<th>Target population</th>
<th>Sample size = ( n = \frac{N}{1+N(e)^2} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project members</td>
<td>300</td>
<td>76</td>
</tr>
<tr>
<td>Committee members</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>Opinion leaders</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Total sample size</td>
<td></td>
<td>98</td>
</tr>
</tbody>
</table>

Since the number of households in all the four villages were almost equal the researcher divided the sample for the project members in to four equal parts. From each village a total of 19 households were sampled. The committee members were equally picked from the four villages.

### 3.5 Methods of Data Collection

The study used questionnaires for the purpose of gathering information from the committee members, project members and community leaders. The researcher also used observation method to enrich the responses. The observation was made while administering the questionnaires. The observation was used to compare with responses given and fill in any gaps.

Both primary and secondary data was collected for the purpose of this study. The primary data was collected through the questionnaires with open and closed ended question. This helped in
seeking the in depth information. The secondary data was got through the existing records both at the company and from the community committee. The questionnaire had adequate instructions and easy to understand language.

3.6 Instrument Validity
Mugenda and Mugenda (1999) define validity as the accuracy and meaningfulness of inferences which are based research results. It is the degree to which results found from an analysis actually represent the phenomena under study.

To ensure validity the researcher ensured that research instruments were accurate through making adjustment after a pilot study. The pilot study was conducted at Kola water project in Makueni district, a project also run by Grundfos lifelink.

There was the use of triangulation, which is the use of different data collection methods to gather the same information. The researcher used both questionnaires and observation methods. The use of the two research methods enhanced validity.

3.7 Reliability of instrument
Mugenda and Mugenda (1999) also define reliability as a measure of the degree to which a research instrument yields consistent results or data after repeated trials. Reliability was important for it helped the researcher to identify ambiguities and inadequacy in the research instrument and made all necessary adjustment. This was done after the pilot study.
### 3.8 Operational Definition of Variables

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Variables</th>
<th>Indicators</th>
<th>Measuring scale</th>
<th>Data Tool</th>
<th>Type of analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>To assess the level to which management systems of the project influences the sustainability of water projects</td>
<td>Management systems</td>
<td>- Committee&lt;br&gt;- Minutes of meeting&lt;br&gt;- Records&lt;br&gt;- Training members on technology&lt;br&gt;- Training committee on management</td>
<td>- Nominal&lt;br&gt;- Nominal&lt;br&gt;- Nominal&lt;br&gt;- Nominal&lt;br&gt;- Nominal</td>
<td>Questionnaire Observation</td>
<td>Descriptive</td>
</tr>
<tr>
<td></td>
<td>Technology innovation</td>
<td>- Relaying information&lt;br&gt;- M-pesa services&lt;br&gt;- Automated water point&lt;br&gt;- Check balance&lt;br&gt;- Solar energy</td>
<td>- Nominal&lt;br&gt;- Nominal&lt;br&gt;- Nominal&lt;br&gt;- Nominal&lt;br&gt;- Nominal</td>
<td>Questionnaire Observation</td>
<td>Descriptive</td>
</tr>
<tr>
<td></td>
<td>Financial status of the community</td>
<td>-Mobile phones&lt;br&gt;- M-pesa charges&lt;br&gt;- Amount spent daily</td>
<td>- Nominal&lt;br&gt;- Nominal&lt;br&gt;- Nominal&lt;br&gt;- Nominal&lt;br&gt;- Nominal</td>
<td>Questionnaire Observation</td>
<td>Descriptive</td>
</tr>
<tr>
<td></td>
<td>Maintenance services</td>
<td>- No of break downs&lt;br&gt;- Spare parts&lt;br&gt;- Response for company&lt;br&gt;- Training on maintenance</td>
<td>- Nominal&lt;br&gt;- Nominal&lt;br&gt;- Nominal&lt;br&gt;- Nominal&lt;br&gt;- Nominal</td>
<td>Questionnaire Observation</td>
<td>Descriptive</td>
</tr>
<tr>
<td></td>
<td>Sustainability of water project</td>
<td>-Drawing water&lt;br&gt;-The smart card&lt;br&gt;-M-pesa Agents</td>
<td>-Nominal&lt;br&gt;-Nominal&lt;br&gt;-Nominal</td>
<td>Observation Questionnaire</td>
<td>Descriptive</td>
</tr>
</tbody>
</table>
3.9 Methods of Data Analysis

The data collected was analyzed using descriptive statistics. First the researcher eliminated all unwanted and unusable data which was ambiguous. The researcher then organized the data ensuring that the raw data had been edited to free it from inconsistence and incompleteness. This involved the scrutiny of the completed instrument in order to detect and reduce as much as possible, errors, incompleteness, misclassification and gaps in the information obtained from the respondents. Secondly, the data was coded to establish how possible answers would be treated by assigning to them numerical values. Then the data was analyzed using the SPSS and was presented using frequency tables. The data was stored in both electronic and paper format.

3.10 Summary

The study adopted a descriptive survey design to investigate the sustainability of water projects run by Grundfos lifelink company-Kenya. Stratified sampling was used to ensure there was equal representation of all stakeholders. Questionnaires were use as the instrument of collecting the data. They were pre-tested for validity and reliability. Management service, technology and innovation, financial status of the community and maintenance systems were tested as the dependent variables while sustainability of water project was the independent variable.

3.11 Ethical Issues

This research will contribute to the knowledge of how to attain sustainability in community water projects; it also maintained utmost confidentiality about all respondents. All necessary research authorities were consulted and permission sought. Adequate and sufficient explanations were given to the respondents. A copy of the report would be send to the community through Grundfos lifelink-kenya.
CHAPTER FOUR
DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction
This chapter presents the findings of the data collected from sampled Katitika community water project, an investigation of the sustainability of water projects run by Grundfos lifelink –Kenya. Out of the 98 respondents the study targeted there were 81 responses. This was 82.6% of the targeted group. The data was interpreted according to the research questions. The analysis was done through descriptive statistics and findings of the study were presented in form of frequency tables. The discussion of the outcome is based on outputs from statistical package for social sciences (SPSS).

4.2 Questionnaire response rate
The total number of households sampled was 78, while the committee members were 13 and 9 opinion leaders.

Table 4.1 Questionnaire Response Rate

<table>
<thead>
<tr>
<th>Title</th>
<th>Number of questionnaires issued</th>
<th>The percentage</th>
<th>Response rate</th>
<th>The percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community members</td>
<td>76</td>
<td>77.55%</td>
<td>66</td>
<td>87%</td>
</tr>
<tr>
<td>Committee members</td>
<td>6</td>
<td>13.26%</td>
<td>6</td>
<td>46%</td>
</tr>
<tr>
<td>Opinion leaders</td>
<td>9</td>
<td>9.18%</td>
<td>9</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>98</td>
<td>100%</td>
<td>81</td>
<td>82.6%</td>
</tr>
</tbody>
</table>
The target sample population for the study was 98. The overall respondent return rate was 81 (82.6%). Out of the 76 (77.5%) questionnaires issued to the project community members, 66 (87%) were returned. The response rate for committee members was 6 (46%). The response rate from the opinion leaders was 9 (100%).

4.3 Factors Influencing Sustainability of Water Projects

The study sought to assess factors that influence sustainability of water projects in Katitika division, based on the indicators of management services, technology and innovation, financial status of the community and maintenance services.

4.3.1 Management Services

On whether management services influence sustainability of water projects the study used various indicators such as meetings of the project members, training of project members and transparency of the project committee and the findings were as outlined.

The respondents were asked to indicate if they had a project committee and the responses are shown in table 4.2.

<table>
<thead>
<tr>
<th>Table 4.2 Project committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

There was a frequency of 58 (87.9%) of the respondents who said that they had a project committee in place while 6 (9.1%) indicated that there was no project committee in place.
4.3.1 Meetings for project members
On whether the project committee ever convened meetings for the project members, the respondents were asked to indicate if they ever had project meetings. The responses are shown in table 4.3.

Table 4.3 Meetings of project members

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
<th>Cumulative percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>58</td>
<td>87.9%</td>
</tr>
<tr>
<td>No</td>
<td>6</td>
<td>9.1%</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>97.0%</td>
</tr>
</tbody>
</table>

Out of the 64 members 58 (87.9%) agreed that they held meetings of the project member while 6 (9.1%) said that they never had any meetings as project members.

4.3.2 Transparency of the committee
The project members were requested to indicate whether they found the project committee transparent in the management of the project.

Table 4.4 Transparency of the Committee

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
<th>Cumulative percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>62</td>
<td>93.9%</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>3.0%</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>97.0%</td>
</tr>
</tbody>
</table>
The findings of the study reflected that 62 (93.9%) of the respondents found the committee transparent while 2 (3.0%) of the respondents found the committee not transparent in managing the project.

4.3.3 Training on Management
The committee members were asked to indicate if they had been trained on the skills of managing a community project.

Table 4.5 Training on Management

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
<th>Cumulative percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>2</td>
<td>33.3%</td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>66.7%</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>100%</td>
</tr>
</tbody>
</table>

Out of the 6 committee members 2 (33.3%) said they had been trained on management of the project while 4 (66.7%) indicated that they had never been trained on the skills of project management.

4.3.4 Membership
The respondents were required to state if there was any membership fee paid before one was accepted as a member of the project.
Table 4.6 Membership fees payment

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
<th>Cumulative percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>64</td>
<td>97.0%</td>
<td>97.0%</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>3.0%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>66</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

The findings from 64(97.0%) of the respondents indicated that it was mandatory to pay membership fees while 3% indicated that membership fees was not mandatory.

4.4 Technology and Innovation

On whether technology and innovation influence sustainability of water projects the study used various indicators such as ability to draw water and M-pesa charges.

The respondents were asked to indicate if they were able to draw water without assistance.

Table 4.7 Ability to Draw Water without Assistance

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
<th>Cumulative percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>60</td>
<td>90.9%</td>
<td>96.8%</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>3.0%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>93.9%</td>
<td></td>
</tr>
</tbody>
</table>

The findings showed that 60 (90.9%) of the project members were able to draw water on their own while 2(3.0%) of the respondents said they were not able to draw water on their own.
4.4.1 M-pesa Charges
The project members were requested to indicate how they rated the M-pesa charges, whether the charges were too high, or moderate.

Table 4.8 M-pesa Charges

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
<th>Cumulative percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too high</td>
<td>18</td>
<td>27.3%</td>
<td>30%</td>
</tr>
<tr>
<td>Moderate</td>
<td>42</td>
<td>63.3%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>90.9%</td>
<td></td>
</tr>
</tbody>
</table>

Out of the 60 project members who responded to the questionnaires 18 (27.3%) indicated that the charges were too high while 42 (63.3%) said that the M-pesa charges were moderate.

4.5 Financial status of the Community
On whether financial status of the community influence sustainability of the water projects the study used various indicators such as funding of the project, mobile phones and availability of M-pes agents.

4.5.1 Funding of the Project
The respondents were asked to rate the mode of funding of the project in terms of excellent, good or poor.
Table 4.9 Funding of Project

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
<th>Cumulative percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>60</td>
<td>90.9%</td>
<td>93.8%</td>
</tr>
<tr>
<td>Good</td>
<td>2</td>
<td>3.0%</td>
<td>96.9%</td>
</tr>
<tr>
<td>Poor</td>
<td>2</td>
<td>3.0%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>96.9%</td>
<td>100%</td>
</tr>
</tbody>
</table>

A total of 60 (90.9%) of the project members rated the form of funding as excellent, while 2 (3.0%) rated the same form of funding as good. Another 2 (3.0%) rated the mode of funding as poor.

4.5.2 Mobile Phone

The respondents were asked to indicate if they owned mobile phones which enabled them to load their key fobs though the M-peas money transfer service.

Table 4.10 Mobile Phones

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
<th>Cumulative percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>50</td>
<td>75.8%</td>
<td>80.6%</td>
</tr>
<tr>
<td>No</td>
<td>12</td>
<td>18.2%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>93.9%</td>
<td></td>
</tr>
</tbody>
</table>
A total of 62 (93.9%) respondents answered this question. Out of the total who responded 50 (75.8%) said that they had mobile phones while 12 (18.2%) indicated that they did not have mobile phones.

### 4.5.3 Availability of M-pesa Agents

The researcher sought to know if there were M-pesa agents within the reach of project members.

<table>
<thead>
<tr>
<th>Table 4.11 Availability of M-pesa Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Out of the 64 (97.0%), 48 (75%) indicated that there were M-pesa agents at their reach while 16 (24.2%) said that there were no M-pesa agents available.

### 4.6 Maintenance Services

On whether the maintenance services influence sustainability of the water project the study used various indicators such as breakdowns, frequency of the breakdowns and the one responsible for repairs. A Pearson correlation matrix was done to determine the strength of relationships amongst indicators in maintenance services.
Table 4.12 Pearson correlation matrix

<table>
<thead>
<tr>
<th></th>
<th>Are breakdowns</th>
<th>there frequency</th>
<th>Who repairs</th>
<th>Speed response</th>
<th>of Ever missed water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are breakdowns</td>
<td>1</td>
<td>-.692</td>
<td>.623</td>
<td>-.341</td>
<td>.185</td>
</tr>
<tr>
<td>their Frequency</td>
<td>-.692</td>
<td>1</td>
<td>-.983</td>
<td>.577</td>
<td>-.267</td>
</tr>
<tr>
<td>Who repairs</td>
<td>.623</td>
<td>-.983</td>
<td>1</td>
<td>-.573</td>
<td>.237</td>
</tr>
<tr>
<td>Speed of response</td>
<td>-.341</td>
<td>.577</td>
<td>-.573</td>
<td>1</td>
<td>-.124</td>
</tr>
<tr>
<td>Missed water</td>
<td>.185</td>
<td>-.267</td>
<td>.237</td>
<td>-.124</td>
<td>1</td>
</tr>
</tbody>
</table>

A correlation study on maintenance using the Pearson’s correlation indicated that the correlation was significant at the 0.01 level.

The relationship between frequency of breakdowns and who repairs had the highest positive correlation coefficient of 0.623. The was a strong negative correlation between who repairs and frequency of breakdowns at -0.983. There was no relationship between missing water and the breakdowns correlation 0.185.

4.7 Summary

This chapter makes an assessment of how the management services of the project committee, technology and innovation, financial status of a community, and maintenance systems influence the sustainability of community water projects. The findings are presented as received from the respondents.
CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings and discussion as per the responses from the respondents. This is in relation to the objectives of the study. The chapter also looks into the conclusions and recommendations as deduced from the study findings. Finally the chapter points out the areas the researcher thought would require further research in related fields.

5.1 Summary of Findings

This section summarizes the findings of the study based on the research objectives.
Table 5.1 Summary of Findings

<table>
<thead>
<tr>
<th>Findings</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>To assess the level to which management systems influence the sustainability of water projects</td>
<td>87.7% of the respondents cited that management services influenced sustainability while 9.1% said it did not lead to sustainability. Management services influenced sustainability of water projects.</td>
</tr>
<tr>
<td>To establish the extent to which technology and innovation influence the sustainability of water projects</td>
<td>90.9% of the respondents said that technology and innovation led to sustainability of water project while 3.0% said that it did not lead to sustainability. Technology and innovation influenced sustainability of community water projects</td>
</tr>
<tr>
<td>To investigate how the financial status of the community influences the sustainability of water projects</td>
<td>90.9% of the respondent cited that the financial status of the community influenced sustainability of water projects while 3% said that it did not influence sustainability. The financial status of the community influences the sustainability of water projects</td>
</tr>
<tr>
<td>To determine the level to which maintenance service influences the sustainability of water projects</td>
<td>89.9% agreed that maintenance contributed to sustainability of water projects while 3% said that maintenance did not contribute towards sustainability. Maintenance services influences sustainability of water projects.</td>
</tr>
</tbody>
</table>
5.2.2 Management Services
The importance of a project committee was seen with 87.9% agreeing it was important and 87.9% assuring the project members had regular meetings to be updated on the project. Though the committee members were never trained on project management skills, 66.7% noted that no training had offered to them. In terms of decision making the observation was that there was extensive consultation within the project members. The study shows 93.9% was consulted when decision was being made.

5.2.3 Technology and Innovation
The technology used in the project was rated in the three different questionnaires as appropriate. The study revealed that 93.9% found the technology quite appropriate and time saving. The use of the solar energy as a source of energy was viewed as economical since it cut on fuel expense. Members were trained on the use of the facility with the study revealing that 96.8% could draw water without assistance.

5.2.4 Financial status of the Community
The study revealed that the financial status of the community was good in relation to the demands made by the project. This was confirmed by the 97.0% registration of the members and acquisition of the key fob. The study also confirmed that 75.8% of the members owned mobile phones and rated the charges for charging their mobile phone and M-pesa as fair. The project which is a loan from the company to the community made it easy for the community to acquire the project. 90.9% of the members rated the agreement between the community and the company as excellent.
5.2.5 Maintenance Services
The study reveals the company’s commitment to their agreement, with 78.8% of the acknowledging their responsibility. The study too reveals the company’s response rate as prompt. 83.3% rated it at two days after breakdown. This ensures that the community never runs out water for long.

5.3 Discussions of the Findings
Sustainability of community water project is very fragile. As observed by Oenga and Ikumi (1997), most of these challenges range from problems related to maintenance, management, transparency in decision making and communication between committees and the community beneficiaries.

The management services of the project especially from the committee members on management issues and training of members is important for the sustainability of any community water project. The study revealed that the committee members had to take voluntary turns to guard the water point and all the members had been trained in the new technology. This agrees with what (Harvey 2006) observes community management has become prevalent model for management of rural water supplies.

The study also revealed that technology and innovation had a positive impact to the community members. The members argued that they were able to save time and spend less energy in drawing water. The findings seemed to agree with Carte et al (1999) who argues that women and children spend so much time and energy getting water for domestic use. The innovation, use of solar as a source of energy, saved the community financially.
An assessment of the financial status of the community revealed that the project members were able to meet the financial demands of the new technology. This included acquiring mobile phones, meeting the M-pesa charges and the charges of charging their mobile phones. This seemed to agree with an argument raised in (MKEPP Appraisal report, vol.1,2003) that each community in Kenya contributes 30% of the total project cost. They pay also as they fetch water.

During this study maintenance services was seen as the greatest challenge since no one had been trained among the project members to be able to repair the machine. Any breakdown requires the company to send technicians to the project. Though their response rate is fast it would be faster and cheaper if one among the project members were to maintain the project. As result then the proceeds from the project would spill over to other economic activities.

5.4 Conclusion
The study also realized that the businesslike approach given by Grundfos lifelink-Kenya to the community water project instilled a sense of ownership to the members and the members would guard it at all cost.

The study also revealed that technology and innovation was key to the sustainability of any community water project.

The study also established that the community projects were run and managed by elected community members. However the said committee lacked in skill in as far as project management skill was concerned; the most challenging part being conflict resolution. The committee also served on involuntary basis.

Another great challenge is the breakdown of communication between the company and the project members.
5.5 Recommendations

Based on the findings of the study the following recommendations were made:

1. It is important for the company to train a member of the community on maintenance service, so that they are able to run the project even if the company closes down.

2. The company should open communication with community to iron out the unresolved issues. The company should take the initiative to train communities who manage their projects.

3. The elected members to manage the project should be equipped with relevant management skills to ensure the projects run smoothly.

5.6 Areas for Further Study

There is need to assess how community members can get benefits accruing from the community project.

Another area of research is to assess to what extend the automated water projects can be replicated to other needy communities.
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APPENDIX 1: LETTER OF INTRODUCTION

University of Nairobi

College of Extra Mural Studies

School of Continuing and Distance Education

Nairobi

To whom it may concern

Dear Sir/ Madam,

Re: Academic Research

I am a post graduate student of Nairobi University pursuing a Masters Degree in Project Planning and Management. Am conducting a research on sustainability of water projects run by Grundfos lifelink-Katitika Water Project.

Your project has been chosen to provide information relating to issues of sustainability of water projects.

I hereby request you to kindly fill the enclosed questionnaire as accurately as possible. The questionnaire has four sections that will focus on Economic status of community, technology and innovations, project management and maintenance service. The information that you will give is confidential and will be used only for the purpose of my academic research. Thank you in advance.

Jane Mbatha
APPENDIX II: Questionnaire (Community project members)

Please answer these questions to the best of your knowledge

Write your responses in the spaces provided. Please put a tick (✓) where appropriate.

Section A: Background information

1. Gender

Male ( ) Female ( )

2. Are you a member of the water project?

Yes ( ) No ( )

3. How long have you been a member?

(a) Less than one ( )
(b) 1 to 5 years ( )
(c) 6 – 10 years ( )
(d) Ever since it began ( )

4. Age

(a) Under 25 years ( )
(b) 30 – 35 years ( )
(c) 30 – 35 years ( )
(d) Over 35 years ( )

Section B: Financial Status of the community

5. In your opinion indicate how you view the current funding of the water project.

a) Excellent

b) Good
c) Fairly good □ □

d) Poor □ □

6. Did you contribute any membership fee?
Yes □ No □

7. Do you think it was a fair amount to pay?
Yes □ No □

8. Do you have a mobile phone?
Yes □ No □

9. What do you use to charge your phone?
   Electricity □ Solar energy □

10. Do you pay to have your phone charge?
    Yes □ No □

11. How do you rate the charges?
    Too high □
    Moderate □
    Fair □

12. Are M-pesa agents available?
    Yes □ No □

13. Are they always open?
    Yes □ No □
14. Are non-members allowed to draw water?

Yes □  No □

15. Is use of Mpesa Expensive?

Yes □  No □

Section C: Maintenance services

16. Has the project ever broken down?

Yes □  No □

17. How many times does it breakdown in a month

One □

Twice □

Frequently □

Rarely □

18. Who repairs?

Company □

Trained member □

Hired artisan □

19. How fast is the company’s response?

Same day □
### After two days

- [ ]

### Same week

- [ ]

### Have you ever gone without water?

- Yes [ ]
- No [ ]

If yes for how long and why?

### Section D: Management systems

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. Do you have a committee?</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<tr>
<td></td>
<td>[ ]</td>
<td></td>
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<tr>
<td>22. Who constituted the committee?</td>
<td>Company</td>
<td>Community</td>
<td>Volunteered</td>
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<td></td>
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<tr>
<td>23. How was the committee constituted?</td>
<td>Elected</td>
<td>Appointed</td>
<td></td>
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<tr>
<td>24. Do they call meetings of project members?</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<td></td>
<td>[ ]</td>
<td></td>
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<tr>
<td>25. Do you trust the committee members?</td>
<td>Yes</td>
<td>No</td>
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<td></td>
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<tr>
<td>26. Are the committee members transparent?</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<td></td>
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<tr>
<td>27. Are there conflict in the management?</td>
<td>Yes</td>
<td>No</td>
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</tbody>
</table>
28. Is the committee able to deal with the conflicts?
   Yes □  No □

29. How are decisions about the project arrived at?
   a) Through consultation □
   b) Chairperson’s ruling □
   c) Others □

30. Were you trained on how to use this technology at the water point?
   Yes □  No □
   If yes who organized the training?
   i) Company □
   ii) Community □
   iii) Any other □

Section E: Technology and Innovation

31. Are you comfortable using this technology
   Yes □  No □
   If no explain why..........................................................................................................................
   ...................................................................................................................................................

32. Can you come to draw water on your own?
   Yes □  No □

33. Is there someone to assist always at the water point.
   Yes □  No □
34. Are you able to top up your key fob?

Yes □  No □

If no who assists you..............................................................

35. What do you think of the M-pesa charges?

a) Too high □

b) Moderate □

c) Fair □

36. Does the project have a bank account?

Yes □  No □

37. Are you usually updated on the account balance?

Yes □  No □

If yes how frequently..............................................................

38. Who pays for maintenance fee?

Proceeds from project □

Company □

I don’t know □

Government □

Section F: sustainability

If the company pulled out of the project will you be able to sustain it?

Yes □  No □
Appendix III: Questionnaire (opinion leaders)

Chief, subchief, village head

Instructions

Please put a tick where appropriate

Use the space provided to fill in your answers

Section A: Background information

1. What is your gender?

   Male □   Female □

2. How long have you been in your position?

   Less than one year □
   1-5 years □
   6-10 years □
   Over 10 years □

3. Please indicate your age?

   a) Under 25 years □
   b) 25 – 30 years □
   c) 30 – 35 years □
   d) Over 35 years □
Section B: Financial status of the community

4. In your opinion indicate how you view the current funding of water project?
   a) Excellent ☐
   b) Good ☐
   c) Fair ☐
   d) Poor ☐

5. In your opinion how do you rate accountability of this project?
   Poor ☐
   Fair ☐
   Good ☐
   Excellent ☐

SECTION C: Technology and innovation

6. What do you think of this technology?
   1. Appropriate ☐
   2. Moderately appropriate ☐
   3. Inappropriate ☐

7. Do you think it enhances accountability?
   Yes ☐  No ☐

   If no explain why: ...........................................................................................................
   .........................................................................................................................
Section D: Management systems

8. Do you think there is need for community committee?

Yes □  No □

9. How frequently do they meet?

a) Hardly ever meet □

b) Monthly □

c) Quarterly □

d) When need arise □

10. How is the committee constituted?

a) Appointment □

b) Electron □

c) Volunteer □

11. These are some of the factors affecting water sustainability. Please indicate the extent to which they influence the sustainability.

1) To great extent □

2) To some extent □

3) Moderately □

4) Moderately □

5) I don’t know □
<table>
<thead>
<tr>
<th>Economic status</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td></td>
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<tr>
<td>Technology and innovation</td>
<td></td>
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</tr>
<tr>
<td>Maintenance services</td>
<td></td>
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</tr>
</tbody>
</table>

Section E: Financial Status of the community

12. Do you think this technology is too expensive?
   
   Yes □  No □

13. What can be done to reduce the expense?
   
   ..........................................................

14. Are there people who are unable to member themselves?
   
   Yes □  No □

   Where do those who cant afford a phone get water from?.............................

End
Appendix IV: Questionnaire (Committee members)

Please answer the questions to the best of your knowledge

Please put a tick where appropriate

Section A: Background Information

1. Gender
   Male □     Female □

2. What leadership position do you hold in the project?
   Chairperson □
   Secretary □
   Treasurer □
   Any other □

3. How long have you been in that position?
   a) Less than one year □
   b) 1-5 years □
   c) 6-10 years □
   d) Over 10 years □

4. Age
   a) Under 25 years □
   b) Between 25 – 30 years □
   c) Over 35 years □

5. How long has the project been in operation?
   a) Less than one year □
b) 1-5 years

c) 6-10 years

d) Over 10 years

6. How many members does the project have?

Less than 500

More than 1000

B: Financial status of the community

7. Is there membership fee?

Yes

No

8. Does the project have money saved for maintenance?

Yes

No

9. It is difficult to sustain the project due to lack of funds. To what extent do you agree with this statement.

1. Strongly agree

2. Agree

3. Neutral

4. Disagree

5. Strongly disagree

10. In your opinion how do you think the project funds are used?

1. Poorly

2. Fairly well

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Section C: Maintenance services

11. Does the project require occasional repairs?
   Yes □   No □

   If yes, who does the repair?
   1. Company □
   2. Project □
   3. Trained Community members □
   4. Hired artisan □

12. How is the response from company?
   Same day □
   Two days □
   Not respond □

13. Were the members trained on the technology?
   Yes □   No □

   If yes who trained them..........................................................

Section D: Management systems

14. How frequently does the committee meet?
   1. Weekly □
   2. Monthly □
   3. Quarterly □
4. Annually

5. When need arise

15. As a project leader, have you ever trained on how to manage projects?

Yes □ No □

16. Who facilitated the training?

1. Government □
2. Company □
3. Community □

17. How do you arrive at decisions?

1. Consulting member □
2. Voting
3. Chairperson ruling □
4. Any other.....................

18. Are there conflicts in your project?

Yes □ No □

19. How do you resolve your conflicts?

Section E: Technology and innovation

19. Do you think this technology is appropriate for the community?

Yes □ No □

20. Do you ever run out of water because of lack of energy?

Yes □ No □
21. Is the technology too expensive for the community?  
Yes □   No □

22. Are all members able to draw water from the water point without help?  
Yes □   No □

23. Does the technology make work easy for the people?  
Yes □   No □

Section F: Sustainability

24. If the company pulled out of the agreement would you be able to sustain the project  
Yes □   No □

END