COST RECOVERY FOR PIPED RURAL WATER SUPPLY SYSTEMS IN DEVELOPING COUNTRIES: CASE STUDIES FROM KENYA, RWANDA AND UGANDA.

by

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ABSTRACT

There has been increased rural water supply coverage. However, at any one time there are a number of piped rural water supply systems that are not functioning. One of the reasons attributed to this is poor cost recovery in the water supply systems. The main aim of the study was to investigate and evaluate cost recovery in piped rural water supplies and identify ways of improving to contribute to sustainability.

To explore cost recovery in piped rural water supply systems, a case study approach was undertaken covering six water supply schemes in Rwanda, Kenya and Uganda. Literature review, semi-structured interviews, focus group discussions, observation and document analysis were used to collect data.

Findings showed that tariffs were set by water supply design consultants and operators in consultation with the community. Revenue collected in two water supply schemes recovered the operation and maintenance (O&M) costs. The on-going use of alternative sources was found to undermine cost recovery and highlighted the intermittent water supply and high tariffs. It was also found that user satisfaction is affected by not only on water availability but on water quality and convenience. Therefore, tariff needs to be set to meet O&M costs taking into account the user's willingness to pay. The tariff should be increased in a gradual manner matched by improved water supply. Meters need to be installed in a phased manner in the systems.

Key words
Cost recovery, tariffs, rural water

EXECUTIVE SUMMARY

Background

There has been tremendous effort across the globe to increase access to safe and clean water in the past two decades which has increased the coverage in rural areas to 82% (WHO/UNICEF 2014). This increased coverage has majorly been due to capital investment in water facilities. However, a number of systems broke down and remain non-functional because of insufficient funds to construct and at the same time maintain the systems.

Therefore, to ensure that water supply systems continue to function, demand responsive approaches were incorporated to ensure that beneficiaries want and are able to pay for the systems as a means of sustainability. Users were to pay water tariffs to recover costs of the water supply service to ensure sustainability of the systems. However, due to water being a social and economic good, the tariffs charged for water supply service are usually low. This low tariff leads to insufficient revenue collected from users and water supply systems operating at low standards eventually non-functionality. The reliability of systems can be improved if users meet operation and maintenance (O&M).

Research Problem / topic

During an evaluation study conducted for the Norwegian Red Cross, it was noted that an important element of sustainability of such systems is how revenue is collected for both O&M (Wolfsbauer 2014). This in turn led to the question of how tariffs should be set, who should pay, how they should pay and how much (cost recovery). Given that the level at which a tariff is set can strongly influence the sustainability of a water supply, there was a need to explore how tariffs have been set, collected and managed in various types of rural water supply.

Research aims and objective

The main aim of the study was to determine how cost recovery can be improved to contribute to the sustainability of piped rural water supply systems. The objectives of the study were;

a) To investigate how cost recovery is applied to contribute to sustainability of piped rural water supply systems in developing countries.
b) To investigate and evaluate how cost recovery is currently applied for piped rural water supply systems in Kenya, Rwanda and Uganda.
c) To identify ways of improving cost recovery for more sustainable piped rural water supply systems in Kenya, Rwanda and Uganda.

Research Methodology

A case study strategy was used to carry out the study. The case study methodology used the mixed design which involved the use of quantitative and qualitative approaches.

Field work was carried out in six water supply schemes; Bomet water supply and Sergutiet water supply in Kenya, Nyamuringa and Cyong water supply systems in Rwanda and Butiaba and Kibibi water supply systems. These water supply systems were selected because they had been supported or were to be supported by the Red Cross with the exception of Kibibi water supply. Data was collected using literature review, focus group discussions, semi-structured interviews, observation and document review and. Literature review was carried out to determine cost recovery in piped rural water supply systems developing countries and inform the selection and implementation of the methodology. Semi-structured interviews were carried out with key officers who have a good knowledge of rural water supply schemes due to their experience in implementation or management. Focus group discussions were held with users of the water supply schemes.

Quantitative data collected was analysed and used to evaluate the cost recovery using simple calculations and the qualitative data was analysed using coding into themes and simple statistical calculation.

Findings and Discussion

The data was analysed and discussed in the following themes;

Enabling Environment

The communities are expected to meet the O&M costs as per the policies. In Kenya, there is a national regulator that approves and monitors the implementation of tariffs. Local (County) government is in charge of water service provision. In Rwanda, there is a national regulator that approves and monitors implementation of tariffs. In Uganda, there is no national regulator but tariffs are approved by the central government (Ministry in charge of water) and monitored by local government.

Tariffs and cost coverage

In Kenya, the tariff for Bomet Water supply was inherited from the previous management of the system. A stepped tariff with a lifeline block was used. The revenue collected in 2014/15 was meeting only 22% of the O&M costs. In Sergutiet, flat rate was used. The flat rate was agreed between the county government, community leaders and the operator. In Rwanda, the tariff was calculated and set between the district leaders and operator to meet O&M costs. In Uganda, the tariff was revised by the operator and approved by community leaders due to increasing O&M costs. The revenue collected was meeting all operational costs with a surplus of 15%. In Butiaba, the tariff was calculated by the design consultant to meet the O&M costs. The tariff met all the

operation and minor costs with a surplus of 39%. The revenue in the systems was collected using different methods door to door, payment using mobile money, payment in the bank, pay as you fetch and in the office and the users were aware of them.

Tariff and Affordability

In all the systems, over 50% of the users stated that the tariff was high. This is the case in rural water supply systems and this may discourage consumption of water from an improved water supply system (Arouna and Dabbert, 2012; Gine and Perez-Foguet, 2008). The users also stated they used and paid for the water to facilitate O&M of the system and access good quality water. This emphasises the need for water supply users to understand the need to pay for water. This was the case in all the systems. However the tariff for water supply systems need to match the ability of users to pay otherwise they will resort to cheaper unsafe sources.

Subsidies

In Kenya, Bomet Water Company received subsidies from the county government for capital investments, electricity and staff salaries. In Rwanda, the systems received no subsides. In Uganda, Kibibi water supply did not receive subsidies anymore. In Butiaba, the operator was part of central umbrella organisation. An organisation set up to enhance O&M of rural water supply systems through subsidies from government. Subsidies when planned well can contribute to the sustainability of the system. Subsidies are provided to meet financing gaps in revenue. It has been acknowledged that revenue from users is not enough to meet the costs of water supply (OECD, 2009)

Satisfaction

Some users stated they were satisfied with the water supply system because of the good water quality and convenience and was an improvement compared to the situation before the piped water supply. However dissatisfaction was due to the intermittent water supply. The systems provided water for less than 8 hours in a day with the exception of Cyong. Satisfaction of users affects their willingness to pay for the service. Therefore, the satisfaction of community needs to be sustained by improving the water supply to sustain their willingness to pay (Harvey, 2007).

Alternative Sources

The users in all the water supply systems stated they used alternative water sources; rainwater, springs and boreholes. The use of these sources was due to the intermittent water supply and as a means to reduce the expenditure on water supply. The users in one system stated they they preferred the taste of the spring water compared to the piped water. The use of alternative

sources of water is a copping mechanism by consumers due to high tariffs of improved water supply (Arouna and Dabbert, 2012; Gine and Perez-Foguet, 2008). However some users were using alternative sources as a coping strategy to the intermittent water supply. This on-going use of alternative sources will compromise the sustainability of the systems due to reduced use of pipe water and hence reduced revenue collected.

Monitoring and Evaluation

The users in the systems stated that they had community leaders carrying out monitoring of operators managing the systems. Therefore, the users stated all they needed was reliable water supply. One way suggested for accountability is for the operators to provide information to the users regarding revenue collection and expenditure (Mandara et al., 2013). However, this was not the case in these water supply systems. The users perceive good water supply service as a form of accountability from the operators. The users stated that they paid per water consumed and revenue collected was used to carry out O&M in the system. The exception was in Sergutiet which is the case because the users were paying a flat rate and felt they paid a higher amount of money compared to the amount of water consumed.

Recommendations

Kenya

- The operator needs to improve the water supply in the area. This will ensure that the users are accessing water for more than three hours a day.
- The operator needs to meter all the connections in a phased manner to ensure that their checks in the systems and also enable users pay for water consumed.
- The initial connection fee needs to be reduced so that even low income earners can be able to access the water and benefit from the lifeline tariff block.
- There is need to finalise the change in tariff to meet at least the O&M costs.
- In Sergutiet, the operator should install meters in a phased manner so that users are billed and pay for water as per consumption.

Rwanda;

- There is need to provide good water quality to the users at an affordable cost so that users are satisfied with the water supply service.
- The operator needs to repair the non-functioning taps so that users can access water at shorter distances.

Uganda

- In Kibibi, an alternative source of energy needs to be installed so that there is continuous supply of water.
- In Butiaba, politicians need to be sensitised by government officials, private operators and development partners so that their statements do not compromise the sustainability of water supply systems but encourage users to pay for water.

Following the findings, there is need to carry out further research on how to/not to incorporate the use of alternative water sources without compromising the sustainability of the water supply systems.

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CURRENCY EXCHANGE RATES

(Xe, 2015)

As per 20th July, 2015

1 United States Dollar (USD) = 101.24 Kenya Shillings

1 USD = 725.5 Rwandan Francs

1USD = 3345 Uganda Shillings

…….……

1 INTRODUCTION

1.1 BACKGROUND

There has been tremendous effort across the globe to increase access to safe and clean water in the past two decades which has increased the coverage in rural areas to 82% (WHO/UNICEF, 2014). In Sub-Saharan African the access to safe water in rural areas has increased from 35% in 1990 to 53% in 2012 (WHO/UNICEF, 2014). This increase in coverage was majorly due to capital investment in water facilities due to a supply driven approach.

However, a number of rural water supply systems broke down and did function. Up to 30% of rural water systems were not functional in rural sub Saharan Africa at any time hence reducing the access to improved water supply (Peter and Nkambule, 2012). This is because it became expensive for governments and development partners to construct and at the same time maintain the systems due to insufficient funds (Katko, 1990). Communities failed to operate and maintain the systems and resorted to unimproved water sources.

Following this, demand responsive approaches were adopted in the water sector to ensure that beneficiaries want and are able to pay for the systems as a means to ensure that systems remain functional (DFID, 1998). Hence users were to pay fees/tariffs to recover costs of water supply as a means to achieve sustainability of water supply. However water is a human and social good which meant that water was provided at almost or no cost. This is true especially in rural areas where communities are presumed not able to afford. Thus water tariffs were set at very low values leading to insufficient revenue. This led to water systems being operated at very low standards and eventually non functionality. One way of improving this situation is for users to meet at least operation and maintenance (O&M) costs (DFID, 1998). The main purpose of this study was to investigate cost recovery for piped rural water supply systems and identify ways of improving.

1.2 RESEARCH PROBLEM / TOPIC

During an evaluation study conducted for the Norwegian Red Cross, it was noted that an important element of sustainability of such systems is how revenue is collected for both O&M (Wolfsbauer, 2014). This brings in how tariffs were set and for what purpose. Given that the level at which a tariff is set can strongly influence the sustainability of water supply, there was a need to explore how tariffs have been set, collected and managed in various types of rural water supply. These aspects necessitated the study justifying the need to evaluate cost recovery in piped rural water supply systems and identifying ways of improving.

1.3 RESEARCH AIMS AND OBJECTIVES

1.3.1 Research aim

Following the background and research problem, the main aim of the study was to investigate cost recovery in piped rural water supply systems and identifying ways of improvement to contribute to the sustainability of piped rural water supply systems.

1.3.2 Research Objectives

From the above research aim, the following research objectives were developed;

a) To investigate how cost recovery is applied in piped rural water supply systems to contribute to their sustainability in developing countries.
b) To investigate and evaluate how cost recovery is currently applied for piped rural water supply systems in Kenya, Rwanda and Uganda.
c) To identify ways of improving cost recovery to contribute to sustainability piped rural water supply systems in Kenya, Rwanda and Uganda.

1.4 SCOPE OF THE RESEARCH

Rural water supply technologies are often a mix of point water sources (non-networked) and piped water supply (networked). The study will focus on piped water supplies in rural areas in Kenya, Rwanda and Uganda.

There are several dimensions to sustainability of pipe rural water supply systems; Social, Health, Technical, Economic, Financial, Institutional and Environmental (DFID, 1998) but this study will focus on the financial dimension.

Asset management is one of inputs for financial management but will not be part of the scope of the study. This is a wide topic and was excluded to allow for better focus of the research.

1.5 COUNTRY SPECIFIC INFORMATION

1.5.1 Location of countries

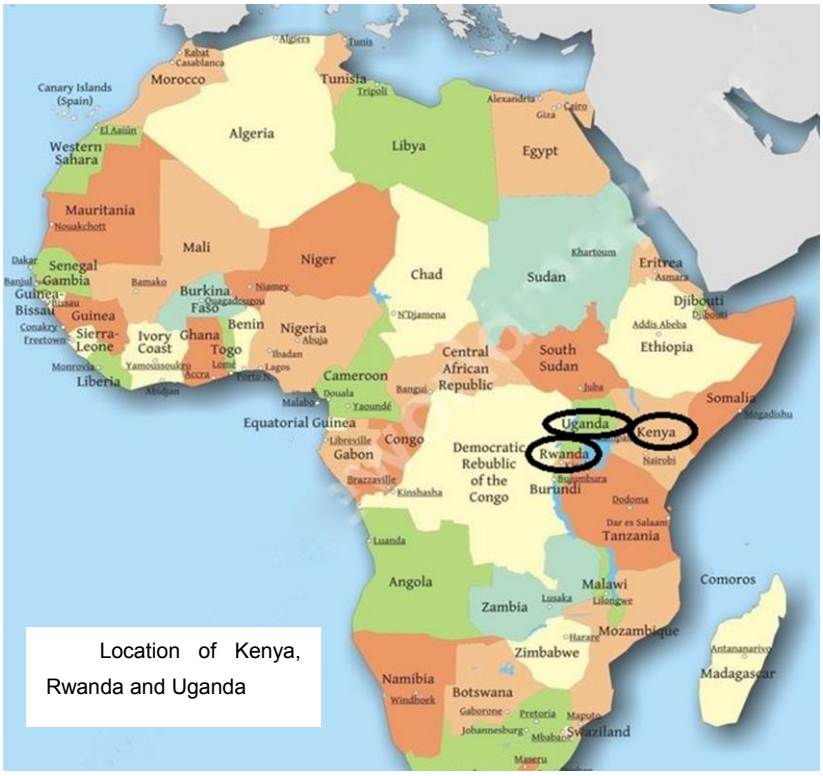


Figure 1.1: map showing location of Kenya, Rwanda and Uganda in Africa (Feher)

The study focused on case studies from Kenya, Rwanda and Uganda. This was because the study was carried out with the International Federation of the Red Cross East African office supported by Norwegian Red Cross. **Figure 1.1** shows the location of the countries (circled) in Africa.

Two rural water supply systems were visited in each country. Two from Bomet County in Kenya, Two from Rulindo district in Rwanda and one from Mpigi & Bullisa districts in Uganda. The location of the water supply systems visited in the three countries is as shown in **Figure 1.2**.

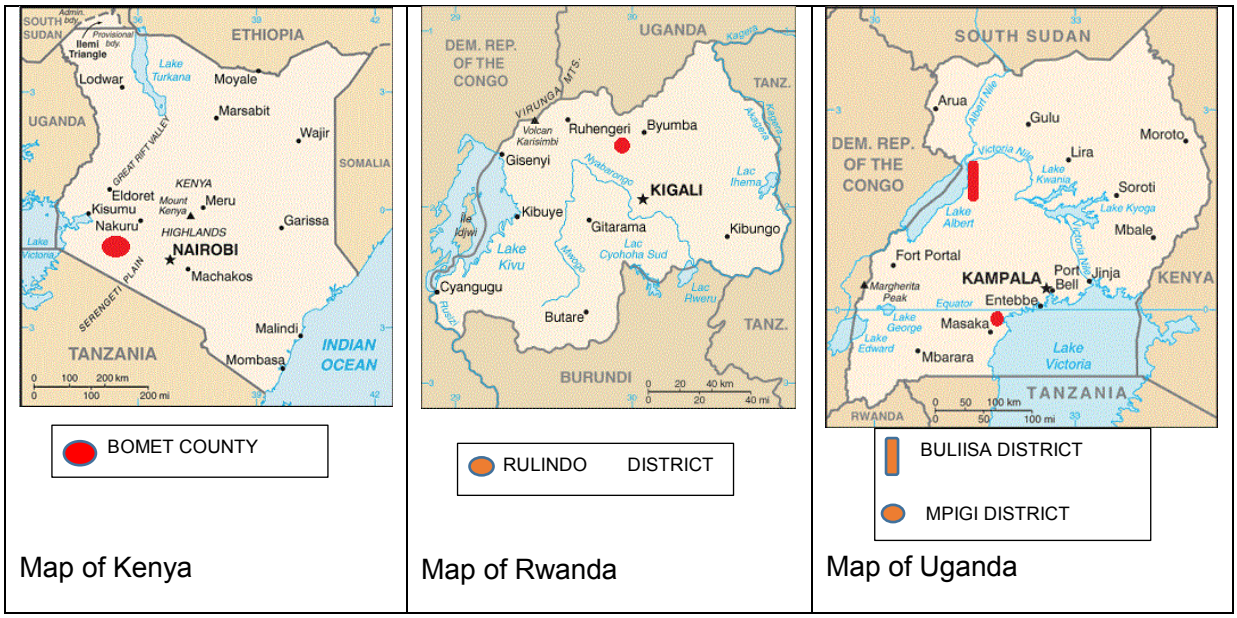


Figure 1.2: Maps of Kenya, Rwanda and Burundi showing location of schemes visited (CIA, 2015)

Below is brief background information about each country.

1.5.2 Kenya

Kenya is located on the equator with the Indian Ocean lying to the south-east and is bordered by Tanzania to the south, Uganda to the west, South Sudan to the north-west, Ethiopia to the north and Somalia to the north-east.

The population as of 2014 estimates is 45,010,056 of which 75% live in rural areas (World Bank, 2015). 57% of people living in rural areas have access to an improved water supply (WHO/UNICEF, 2014). The other 43% still collect water from unimproved water sources.

1.5.3 Rwanda

Rwanda is a landlocked country bordered by Uganda, Tanzania, Burundi and the Democratic Republic of the Congo.

It has a population of 12,012, 589 of which about 73% live in rural areas (World Bank, 2015). The JMP estimates the rural water coverage in Rwanda to be 68% as per the 2014 update (WHO/UNICEF, 2014).

About 46% of people in rural areas use protected springs and 2% use hand pumps as shown in the ***Table 1.1*** (Wolfsbauer, 2014)

Table 1.1: Rural water supply technologies in Rwanda.

Technology	Percentage
Protected springs	46%
Unprotected springs	32%
Hand pump	2%
Piped water	20%

One of the sector challenges is low sustainability and high water tariffs of water supplies in rural areas. According to a World Bank report, the rural water tariffs still tend to be high and make users to resort to unsafe water sources especially for pumped rural water systems.

1.5.4 Uganda

Uganda is a landlocked country in East Africa. It is bordered to the east by Kenya, to the north by South Sudan, to the west by the Democratic Republic of the Congo, to the southwest by Rwanda, and to the south by Tanzania.

The country has a population of 36,824,000 people of which 88% live in rural areas (World Bank, 2015). The rural water supply provision covers settlements with population 1,500 to 5,000 (MWE, 2015). According to the Water and Environment sector performance report, the percentage of

people in rural areas with access to safe and clean water is 64% compared to 72.8% in urban areas(WHO/UNICEF, 2014).

Boreholes are the most widespread technology used in rural areas whereas valley tanks are the least implemented (MWE, 2014). These technology options used in rural areas are as shown in Table **1.2**;

Table 1.2: Rural water supply technologies in Uganda.

Technology	Percentage
Protected springs	23
Shallow wells	25
Deep boreholes	41
Piped water schemes (Gravity and pumped)	11
Rainwater and valley tanks	Less than 1%

1.6 USE OF RESEARCH

It is hoped that this research will inform the Norwegian Red Cross who wish to produce guidelines for National Societies in the region which can allow those National Societies to work closely with communities and local government in order to improve sustainability of piped rural water supply systems.

This study also hopes to inform professionals in the water sector about the current state of cost recovery in rural water supply systems and how this can be improved.

1.7 DISSERTATION OVERVIEW

The first chapter of the report provides general information about the research and states out the research objectives and scope of the study. Chapter two provides literature review on cost recovery in developing countries. Chapter three of the report focuses on the methodology used during the study and includes methodological approach, limitations and how ethical issues were incorporated. The results are presented and discussed in Chapter 4. Conclusions are drawn based on the findings and research objectives and recommendations made in Chapter 5.

2 LITERATURE REVIEW

2.1 INTRODUCTION

This chapter provides literature review regarding cost recovery in piped rural water systems. The purpose was to describe and analyse cost recovery for piped rural water supply systems in developing countries. This was done to achieve objective two. Section 2.2 explains how the literature was accessed from various sources. Section 2.3 provides a general background regarding sustainability and how cost recovery fits into it. Section 2.4 to Section 2.10 provides literature on elements for cost recovery: cost recovery definition(section 2.4); costs and level of cost recovery(section 2.5) policies and strategies (section 2.6); ability and willingness to pay (section 2.7); community financing through tariffs (section 2.8); subsidies (section 2.9) and monitoring and evaluation (section 2.10). The chapter is concluded with a summary (section 2.11). Experiences from developing countries on the different elements have been included throughout the chapter.

2.2 LITERATURE SEARCH METHODOLOGY

The literature search was carried out to find out literature regarding cost recovery in piped water supply systems in rural areas in developing countries.

Table 2.1: Key words used during literature search

1.	2.	3.	4.
Tariff	Rural	Water	Developing country, Africa,
Cost recovery	Community	Water supply	
Sustainability	rural	Water supply	
User fee	Rural	Water	
Financial sustainability	community	Water	
Willingness to pay	rural	Water	

Therefore the search was started off using the key words 'cost recovery + rural+ water' and the rest of the key words as in ***Table 2.1*** were used to find documents from sources of information in ***Table 2.2*** in different combinations. Financial sustainability was also included as a key word but was restrictive thus it was broadened to sustainability. Sustainability was added to the key words as the search continued since it was noted that some information about cost recovery and tariffs was contained in articles with sustainability as a key word. The literature search was further refined by adding 'developing countries' or Africa to have a manageable number of documents to review.

The search was started with WEDC knowledge base which yielded conference papers, country specific information, reports, past MSc dissertations and links to other websites of NGOs and other development agencies for example the World Bank and African Development Bank. The NGO websites and Development agency sites were further explored to acquire some more information. In addition IRC and Water Aid were found to have information regarding piped rural

water supply. The search was continued in Google/Google scholar, library catalogue plus, specific library databases as shown in ***Table 2.2***

Table 2.2: Literature search strategy

Source	Strategy	Justification
WEDC Resources centre, knowledge base	Using the key words as in ***Table 2.1***. Yielded many conference papers which provided some country specific issues of rural water Research methodology was also included in the search.	This was used initially to identify any past MSc projects similar to this study so that the author was familiar with any previous studies and get acquainted with format and structure dissertation reports. WEDC has a collection of different on water documents for example conference papers, reports from different agencies.
Library Catalogue Plus	Using the key words, a number of journal papers were found and to reduce the number, Africa or developing country and peer reviewed journal was added to the filter. However as the search continued, it was noted that most literature about cost recovery was within papers titled sustainability. Therefore the key words used were sustainability + rural water + developing country proved a good search strategy as well as cost recovery + rural water + developing countries.	The Library catalogue has access to journal papers and university repository. This was used to find out journal papers whose titles were scanned and abstract quickly read to determine if it was relevant.
Google Scholar/ Google	The key words were also used especially cost recovery and rural water. It yielded some specific documents from IRC and the website was further explored.	It has a wealth and collection of information. It provided quick access to documents identified in the bibliography of selected journal papers.
NGO websites (Water Aid, IRC)	The website was accessed from a link to a paper on the WEDC knowledge. Thereafter the website was accessed and searched using key words of tariff and cost recovery and sustainability.	Water Aid and IRC have carried out a lot of work in rural water supply and have a wealth of knowledge regarding. Each of these websites had sections dedicated to cost recovery and sustainability.
Bibliography	The titles of documents in the reference list of papers which had information required were copied and pasted onto Google scholar. The papers were accessed and checked if they were helpful. Retrieved articles were scanned and those that were similar to the topic were searched for using Google scholar thus one article yielded more information (snow ball approach).	Bibliography of relevant articles provided a list of other articles which were explored more in-depth.
Databases in Library (Aqualine, Water Resources Abstracts, Compendex,	The key words were used as in ***Table 2.1***. However most of the articles that were obtained in Library Catalogue plus were the same here.	These databases are specific to civil engineering (water supply), engineering journals and conference proceedings. They also contained references to articles in civil engineering and its complementary fields, including management and

Source	Strategy	Justification
Geobase Civil Engineering Abstracts)		marketing of engineering services

For each search, the abstract of the documents found were quickly read to find out if the information was relevant to the study. Some documents needed to be browsed through since the abstracts were not sufficient or available. The documents that were relevant to the study were saved to be reviewed later.

The references of articles or documents retrieved during the search were further searched for to obtain more information from just one article/document. For example a past MSc dissertation (Wopereis, 2014) provided a starting point from which eight documents were noted and searched for later. This method of snow balling was used for most of the documents obtained. Google scholar was used to search for and obtain these documents articles identified in the reference list. The research was continued until it was noted that documents already accessed were being provided in the search.

2.3 SUSTAINABILITY

The concept of sustainability was defined as development that meets the needs the present needs without compromising the future needs (Brundtland et al., 1987). This warrants that the 'exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs' (Brundtland et al., 1987). Sustainability has also been broadly defined as the capacity of a project to deliver its intended benefits over the long term (Abrams, 1998). It can also be defined simply as 'whether or not something continues to function over time' (Abrams, 1998).

When it comes to rural water supply systems, the definition of sustainability becomes more specific. With regard to water service, water supply should be available for the period for which it was designed in the same quantity and quality as it was designed (Abrams, 1998). Sustainability can also be defined as the 'proper use of and equitable distribution of benefits from water supply across all members of rural society with particular reference to gender' (Peter and Nkambule, 2012). A sustainable rural water supply project has been defined as one in which;

> *'the water sources are not over-exploited but naturally replenished, facilities are maintained in a condition which ensures a reliable and adequate water supply, the benefits of the supply continue to be realised by all users over a prolonged period of time,*

and the service delivery process demonstrates a cost-effective use of resources that can be replicated'(Harvey and Reed, 2003).

This definition of sustainability goes beyond just the functioning of the water system and is adopted for this project. There are several inputs that have to be met in order for a water supply to remain functioning. These inputs include; technical expertise to repair the system in case of a break down, financial resources to purchase spare parts and government policies to enable proper management structures are in place for the water system.

The non-functionality of water systems is stated to be due to; facilities not desired by community, financial costs not affordable by community, poor systems of cost recovery, lack of ownership of facilities, benefits from facilities not materialized, behavioural change programmes too short and community members trained for O&M lose interest or move away (Carter et al., 1999; Parry-Jones et al., 2001; Peter and Nkambule, 2012). These inputs can be broadly classified into Social, Health, Technical, Economic, Financial, Institutional and Environmental elements. These multiple inputs form the different dimensions to sustainability (Abrams, 1998; DFID, 1998). In order for water supply systems to function throughout the period they were designed to, a holistic approach which addresses all these dimensions to sustainability needs to be developed and implemented (Harvey and Reed, 2003). Several authors have carried out studies to assess sustainability of water projects bearing in mind the above dimensions. While the dimensions are all important and possible to identify and are internal and external, it is noted that relative weighting of the factors change according to context, technological complexity, level of service, level of development of a community and general rural character (Peter and Nkambule, 2012).

Financial sustainability of water supply systems is one of the key dimensions of sustainability with a fundamental aim to operate and maintain, as well as expand the water systems throughout the design life. Safe water coverage in rural areas in developing countries has increased greatly over the years however it is becoming expensive for governments, development partners (DPs) and NGOs to meet costs of constructing and maintaining the water supply systems (Carter et al., 1999; Katko, 1990). It is no longer only about increasing coverage in rural areas but ensuring that the schemes are maintained in order to keep the water systems operating sustainably.

Rural water supply systems need to provide water supply for at least 8 hours and there should be efficient repair of any faults (Schweitzer and Mihelcic, 2012). This can be achieved by placing a price on the water service and recovering some or nearly all the costs of water from the users (cost recovery) (DFID, 1998). This is in line with the Dublin principle which states that 'water has

an economic value in all its competing uses and should be recognised as an economic good' (Dublin Statement, 1992).

However, water is also considered a human right and a social good and is often charged at a lower tariff or none at all. These aspects of water make it challenging to set appropriate tariffs for cost recovery. When the tariffs are set at a low rate, the revenue collected is insufficient or inadequate to operate and maintain the system thus leading to poor services. With poor services, users are not willing to pay for the water services leading to low revenue collected and this leads to poor maintenance of water supply systems. Poor maintenance means that systems will not function at high levels leading to poor services. Users will not pay for poor services and this could lead to low revenue. This is called the vicious cycle of cost recovery as shown in ***Figure 2.1*** (AFDB, 2010; Brikke and Rojas, 2001; Sansom et al., 2010).

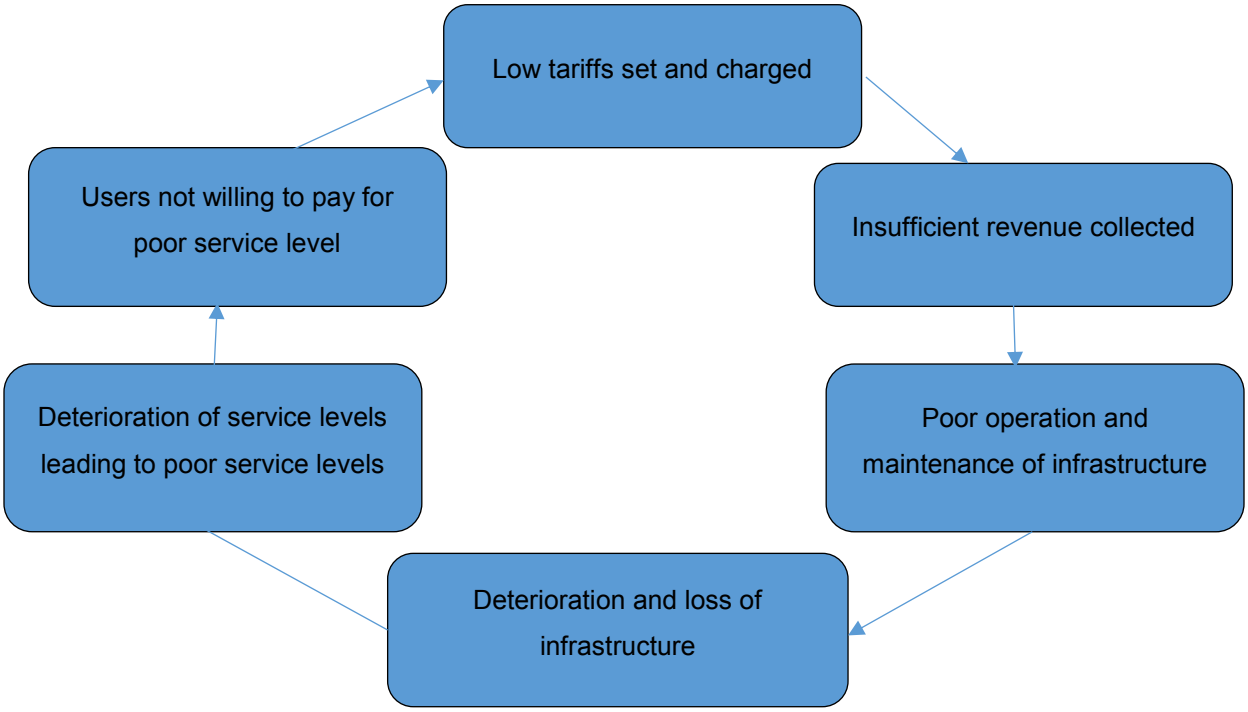


Figure 2.1: Vicious cycle of cost recovery

Poor cost recovery leads to water systems being operated at low standards or non-functionality leading to reduced coverage of and access to improved water supply. One way of improving the reliability of systems is for users to meet the O&M costs (DFID, 1998). From the vicious cycle, it is clear that water supply service will be improved once the revenues are adequate to sustain the

system and are managed well. This leads to the reverse of the vicious cycle which is the virtuous cycle as shown in Figure ***2.2*** (AFDB, 2010; Sansom et al., 2010).

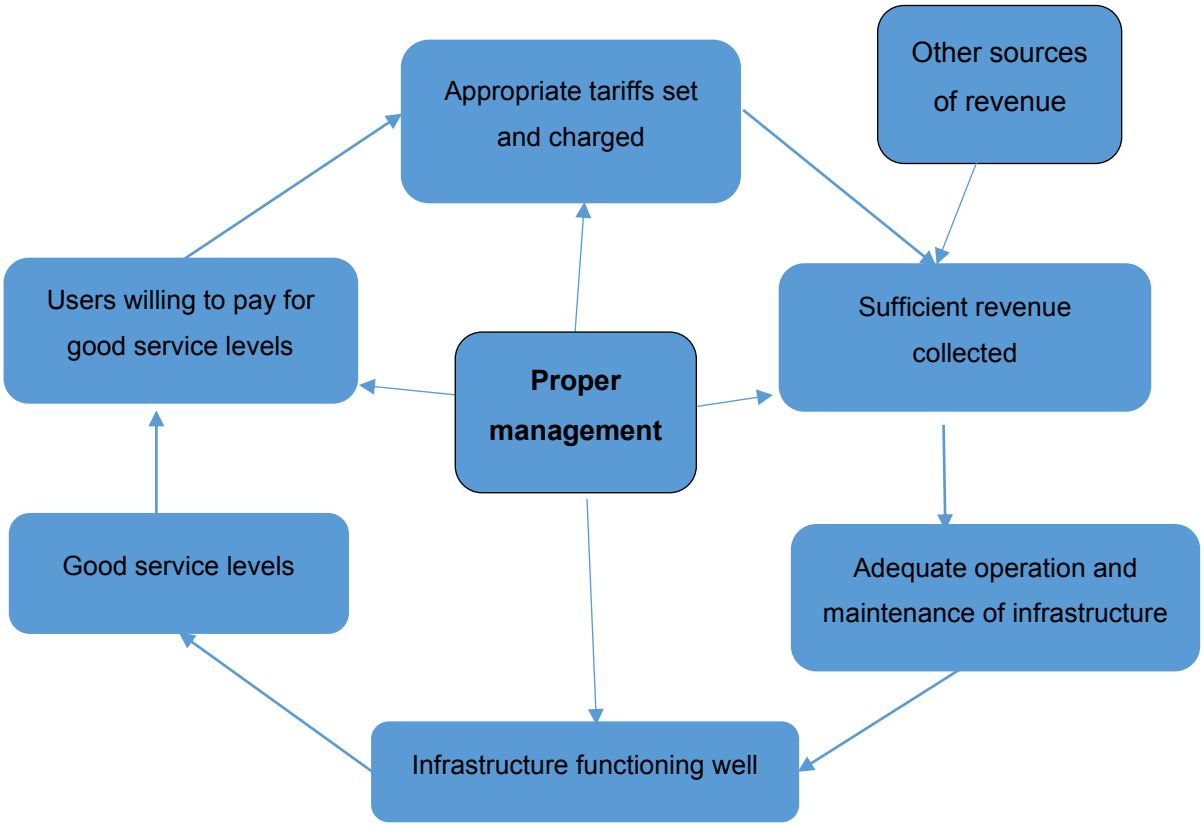


Figure 2.2 Virtuous cycle of cost recovery

In order to achieve the cycle in Figure ***2.2***, the sources of revenue have to be such that they meet the needs of O&M of the water systems so as to maintain a good service level. This can be done by setting appropriate tariffs and ensuring that any shortfalls in revenue collected are estimated and other sources of finance are identified. For long term sustainability, it is required that all costs of water supply are matched with all available funding.

It is recognised that true long-term financial sustainability requires cost recovery preparing for infrastructure replacement and expanding system capacity to accommodate growth. Therefore in

order to be sustainable communities must have sufficient income for recurrent costs and also have 'significant savings' to cover eventual crisis maintenance activities (Sansom et al., 2010).

2.4 COST RECOVERY

Cost recovery can be defined as recovering all associated costs with a water system, programme or service for long term sustainability as in Figure ***2.3*** (Fonseca and Cardone, 2003). These costs can be met from different stakeholders or sources of funding.

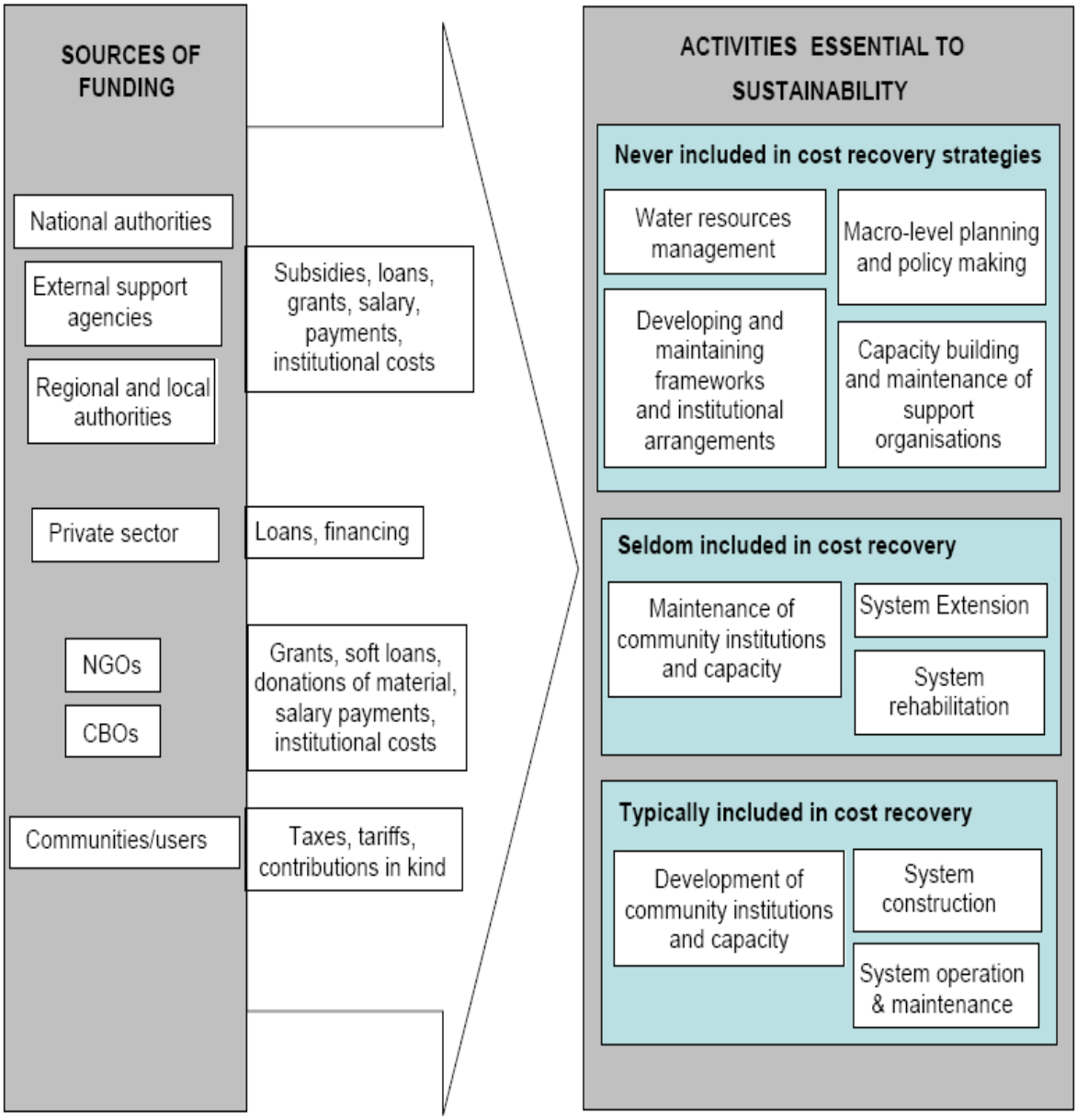


Figure 2.3: Costing with sources of funding for sustainability (Fonseca and Cardone, 2003).

For cost recovery to be sustainable, the costs of water supply need to be identified and estimated. This will enable that proper financing strategies are developed to keep the water supply running (Harvey, 2007; Sansom et al., 2010). From this it is clear that the first step in cost recovery, is identifying the costs associated with water supply which provides an indication on whether they can be met by the different stakeholders.

2.5 COSTS

The costs of water supply need to be understood to allow for proper planning and monitoring for development and sustainability of the systems. Once the costs are determined, financing strategies can be developed. The lifecycle costs approach has been recently promoted as a way of ensuring sustainability of systems by understanding and analysing the lifecycle costs in relation to service delivery. For delivery of sustainable services, the lifecycle costs requires that financial systems are such that infrastructure can be renewed and replaced, repairs are done timely and extensions of services is done to meet changing demand (Fonseca et al., 2011). Lifecycle costs include 'the construction and maintenance of systems including hardware and software, O&M, capital maintenance, cost of capital, and the need for direct and indirect support, including source protection, training and capacity development, planning and institutional pro-poor support'. (Fonseca et al., 2011).

The costs associated with water can be broadly classified into economic costs, financial costs, opportunity costs and supply costs (Fonseca and Cardone, 2003). Economic costs reflect the value of water in the broader framework. It reflects the different competing uses of water. Economic costs are in two categories; opportunity or environmental costs. Opportunity costs reflect the benefits forgone when the water is used for a particular use and not another for example lost agricultural production when water is supplied for drinking (Fonseca and Cardone, 2003). Environmental costs are those related to the impact on the environment of providing a water supply for example pollution from a diesel pump (Fonseca and Cardone, 2003). These costs are rarely used for tariff setting because of the difficulty in translating it into monetary value (Fonseca and Cardone, 2003). They are more useful for priority setting (Fonseca and Cardone, 2003).

Therefore, for cost recovery of water supply costs, only the financial supply costs are considered. Financial costs are the tangible costs of water supply. The costs of supplying water vary depending on the water supply technology and service level but the main categories of costs associated include; (Fonseca and Cardone, 2003; Harvey, 2007; Fonseca et al., 2011).

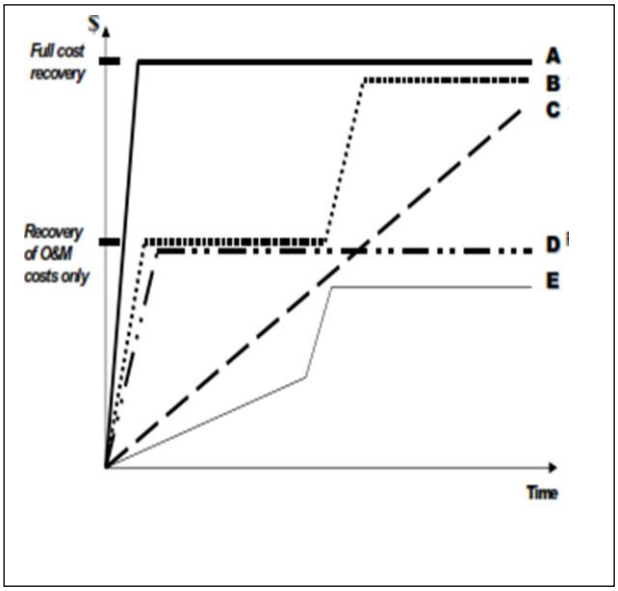
a. Capital Expenditure; this is a one off investment cost during system construction. These costs will include those used to construct the system (hardware) and those used to sensitize the stakeholders during system construction (software).
b. Operational costs; are recurrent costs on the system that keep it functioning for example pumping costs, treatment costs, staffing costs and chemicals.
c. Minor maintenance costs; this is routine maintenance done daily, weekly or monthly to keep the system functioning at design performance.
d. Capital maintenance costs are the costs required to renew, replace or rehabilitate assets in the water supply system.
e. Direct costs used for support activities; pre- and post-construction. These include costs that ensure that local governments have the capacities and resources to plan and implement system breakdowns and monitor service provider's performance.
f. Indirect costs used for capacity building and maintenance of support institutions. These are put on budgets for local government. The costs include policy, planning and monitoring that contribute to sector working capacity and regulation.

These costs should be estimated at the planning phase of projects. The costs can be estimated using experience from similar systems, prevailing market prices and projection of costs. When these costs are identified early enough, users are well aware of their financial obligations required to sustain the system (Harvey, 2007). This also helps to select the most appropriate technology and determine the extra funding required. Technology choice has a big influence on the costs of O&M thus emphasis should not only be on the investment cost but also on analysing the O&M costs to ensure costs are affordable and the community is willing to pay (Brikke and Rojas, 2001). Once the costs have been identified and estimated, the next stage is to determine which costs to be recovered.

2.5.1 Level of cost recovery

It is often a dilemma to determine which costs should be recovered. It has been suggested that the way out is to discuss and review possible solutions (Brikke and Rojas, 2001). There is also need to distribute the responsibility to recover the different costs of water supply to different stakeholders; the community, government and private sector. This responsibility is often determined by the national policy.

The level of cost recovery to be achieved will be determined by the availability and extent to which a financing source can recover certain costs. It is also the case that these costs do not have to be met as a one off but gradually over time. This leads to the various forms of cost recovery as stated by Brikke and Rojas (2001) and shown in ***Figure 2.4***.



OPTION	EXPLANATION
A (Immediate full cost recovery)	Full cost recovery done at beginning when communities have a good record of paying for water and proper management of service. Rarely done
B (Progressive full cost recovery)	O&M costs are recovered first and later all costs. Community needs to be aware of transition of payment of costs.
C (Progressive fill cost recovery)	Full cost recovery is achieved through periodic adjustment of tariff structure and financial responsibilities. The changes should not be too frequent and need to be explained.
D (Recovery of O&M costs only)	Only O& M costs are covered by community and responsibility of other costs should be determined.
E (Recovery of O&M costs with initial use of subsidies)	Some O&M costs are covered by community overtime while subsidies are provided to match the gap in O&M costs. There should be agreement as to how the subsidies will be provided and by whom.

Figure 2.4: Cost recovery options

Full cost recovery is the 'reimbursement to service providers of both recurring and non-recurring costs associated with construction, management, O&M, rehabilitation and expansion of water systems', Options A and B in Figure ***2.4***(Harvey, 2007).

When the costs are to be recovered from users, it is rarely the case that full cost recovery is achieved especially in rural water supply systems (Harvey, 2007; Brikke and Rojas, 2001). It has been acknowledged that full cost recovery is not feasible from the users due to the very nature of water being both a social and economic good (AFDB, 2010). The more applicable level of cost recovery for rural water is sustainable cost recovery. Sustainable cost recovery as opposed to full cost recovery is charging the users the cost of operating and maintaining the system which includes future system upgrade, rehabilitation and expansion costs, as well as ongoing O&M costs, Options D and E as in Figure ***2.4*** (Harvey, 2007).

Capital costs are rarely recovered in rural water supply systems because these systems are built using donations from Development Partners or as responsibility from government (AFDB, 2010; Brikke and Rojas, 2001). Therefore these costs of water supply can be met by revenue from users, government and Development partners. Users meet O&M costs through water Tariffs. The government meets capital costs and some O&M costs by use of Taxes. This is often known as subsidies. The Development Partners also contribute to the costs of water supply through foreign aid and this known as Transfers. This '3Ts approach therefore shows that full cost recovery cannot be achieved by only tariffs but from Tariffs, Taxes and Transfers (OECD, 2009). 'Revenue from these three sources can contribute to sustainable cost recovery which is considered a more realistic and practical policy principle compared to full cost recovery' (OECD, 2009).

The only exception to users meeting part of the capital costs is where beneficiaries of rural water supply systems contribute 2%-10% to the capital costs (AFDB, 2010). However this is generally done not as a cost recovery drive but to increase the sense of community ownership within the water supply area and is often done for point water sources (AFDB, 2010).

The prevailing government policies will also influence the level of cost recovery. Most central governments do not have the capacity to manage and provide the much needed support to all the rural water supply systems. Therefore, most policies provide for policies to decentralise responsibility to other agencies or the community (Davis and Brikke, 1995). The national policy of Ghana states that communities should contribute 5% of the capital costs. The policy also states that water tariffs from users should cover the 'O&M, major repairs, replacements and extension to new areas' but should not exceed '1 US$/$m^3$ (Nyarko et al., 2007). According to the study carried out by (Nyarko et al., 2007) in five community managed piped systems using household surveys, interviews and discussions with operators, it was found that none of existing tariffs are sufficient to recover the full supply costs. This is the case in many other developing countries.

For cost recovery of rural water supply systems, the costs for recurrent operation and minor maintenance are estimated and incorporated in the budgets but rarely plan for future replacement of components (capital maintenance costs) (Harvey, 2007). There is a difficulty in predicting when and how much the replacement costs are because of the futuristic nature of the cost. One reason as to why these capital maintenance costs are not recovered by the users is that they are often beyond the affordability of the users (Harvey, 2007). It is also the case that governments or development partners provide for capital maintenance as subsidies.

Once a feasible level of cost recovery is discussed and agreed, user fees can be calculated. The fees will be dependent on the community's ability and willingness to pay and the availability of any external funding. The collection and management of these costs also needs to be planned. Cost recovery comprises of these different elements which need to be appropriate for the water supply to achieve financial sustainability as shown in Figure 1 (Katko 1990; Harvey, 2007).

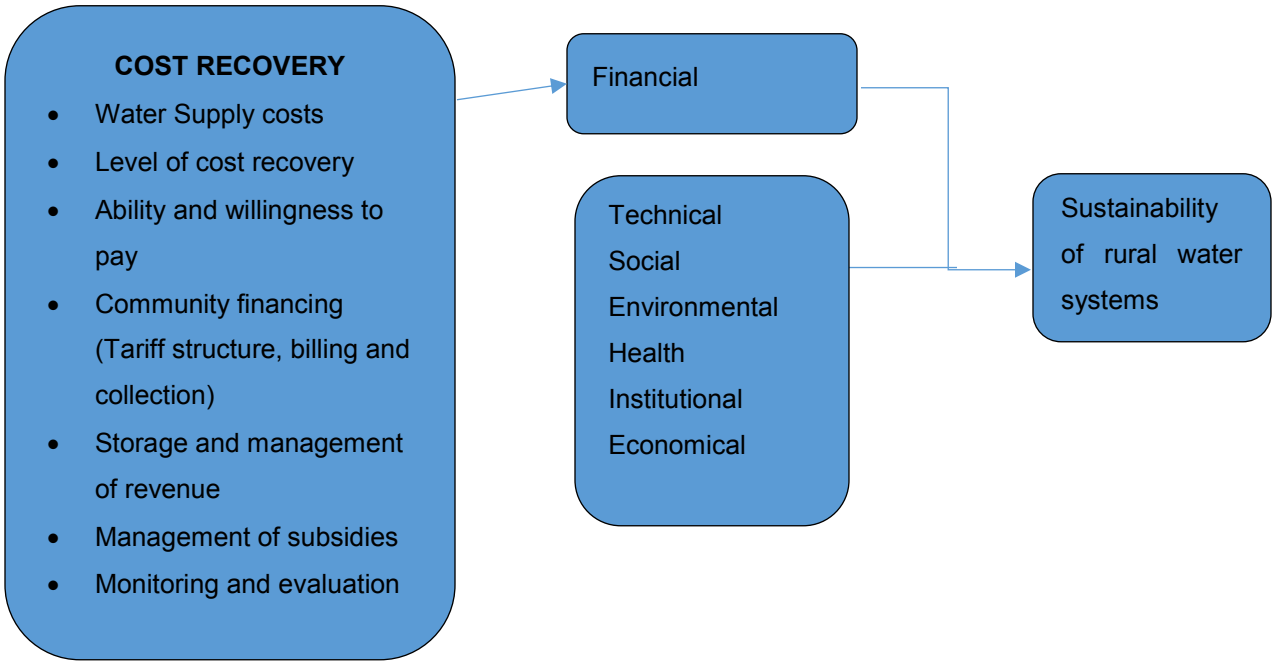


Figure 2.5 Elements of cost recovery as a means to sustainability

However, prevailing national policies and institutional structures need to be in place to allow for proper implementation of cost recovery. These policies and structures provide guidance for cost recovery and are looked at in the next section.

2.6 POLICIES AND STRATEGIES

In many countries, the government role has shifted from service provider to enabler and regulator. In rural areas this has greatly been due to the lack of resources to carry out both roles efficiently

(Sansom et al., 2010). It is therefore important for the government to adopt a decentralization programme with necessary capacity development. Capacity development will ensure that the partners, agencies or organisations that take on the responsibility are able to carry out the role (Sansom et al., 2010). This means that the government remains responsible for setting investment priorities and ensuring that services are expanded while providing incentives for both the community and other stakeholders to play an active role in funding, delivering and managing services (Sansom et al., 2010).This set up is commonly known as the enabling environment.

Thus the government has to adopt policies to ensure that this new approach is within the legal framework. This has a big bearing on the sustainability of projects. The existence of national water policies and a legal framework does not guarantee sustainability but it provides a common understanding among different stakeholders within the sector (Sansom et al., 2010). As already mentioned, the prevailing government policy will influence the cost recovered from the users. Therefore once the costs are beyond what the community is capable of, there is need for external support from the government or non-governmental organization (Fonseca and Cardone, 2003). In many governments, O&M costs are shared between the community, government and other DPs or NGOs. This mechanism of sharing O&M costs need to be within the national policy.

One of the major challenges to cost recovery is political interference. This is often manifested in the proclamation of free water or charging very low tariffs without a guarantee of financing from other sources (AFDB, 2010; Fonseca and Cardone, 2003). While there will be political interference, politicians can be involved in different aspects of water supply so that they understand the need for cost recovery. Transparency and stakeholder participation can also be used to ensure that political interference or decisions are more informed (AFDB, 2010; Fonseca and Cardone, 2003). There is also need to have commitment from high level so that the cost recovery policies ensure sustainability of the systems (Fonseca and Cardone, 2003; Sansom et al., 2010).

Cost recovery in itself is one of the decentralization strategies and must be done within the broader enabling environment. The effectiveness of cost recovery as a means to sustainability can only be realized by the management behind it (Fonseca and Cardone, 2003). The management options include community based, private sector and NGOs. This decentralized approach to water service delivery, enables the drive for cost recovery. Communities in this way are given an opportunity to identify their needs, costs to provide them and identify ways of recovering them (Fonseca and Cardone, 2003). Therefore, when communities are to meet certain costs of water supply, there is need to factor in their ability and willingness to recover these costs.

2.7 ABILITY AND WILLINGNESS TO PAY

Ability and willingness to pay is an indication of the community's ability and demand for better services. This provides an input in predicting the revenue to be collected from the system and thus provide an indication of the financial sustainability of the system.

Ability to pay (ATP) is the 'ability of users to pay for water services expressed as a ratio of monthly household water consumption expenditure to monthly household income' (Nyarko et al., 2007). ATP thus can be estimated by obtaining monthly bills/receipts of water from users and dividing by monthly income. However, where bills or receipts are not issued this is not a feasible method. The income distribution of the users can be used to estimate ATP of users using the indication that it should be in the range of 3-5% of household income (Schweitzer and Mihelcic, 2012). However, assessing income levels especially in the rural areas is difficult especially for households that do not have fixed daily or monthly wages. It is difficult where households depend on multiple sources of income with no records kept to determine the total income. When it is not possible to assess the income levels, Indicators of wealth can be used to estimate ATP (AFDB, 2010). These indicators include; livestock owned, type of house, size of farmland and others (AFDB, 2010).

In order for rural systems to be sustainable, users need to demonstrate that they can mobilize funds to carry out O&M (AFDB, 2010). When people are willing to pay for a service, it is an indication that it will be used and maintained and thus funds can be collected for O&M (Arouna and Dabbert, 2012). 'In economics, a user's Willingness to Pay (WTP) is defined as the maximum amount he or she would be willing to pay for a service rather than do without it' (Katko 1990). In rural areas, WTP is affected by a number of factors including level and quality of service which makes it a little more complex. In a study conducted in rural Bostwana in 135 households, it was concluded that high income levels, education, employment status and distance from existing water sources had significant impact on the WTP (Mbata, 2006). Age of the household head had no impact on the WTP. In another study in rural Benin done using structured questionnaires in 325 households, high income level, education affected WTP, age of household head, queue time at existing water sources, and the preferred improvements were noted as determinants of WTP (Arouna and Dabbert, 2012).

Furthermore, in a recent study conducted in Mubende a rural district in Uganda, where 122 interviews were held, it was determined that the number of children in the home and the distance from the existing source are significant in influencing household's WTP, while income, age, and gender are not (Wright et al., 2014). While these studies were carried out in small areas and do

not provide a general consensus on WTP, they give a glimpse of different factors that affect or influence WTP. These studies show that for every area, WTP is affected by underlying factors which need to be determined. This also emphasises the need to determine WTP on a case by case basis. ***Table 2.3*** below provides a range of factors that influence WTP positively or negatively. As such because of the difference in the influence of these different factors, WTP should be determined on a case by case basis.

Table 2.3 Factors influencing WTP (Mbata, 2006; Katko, 1990; Arouna and Dabbert, 2012; Harvey, 2007; Wright et al., 2014)

FACTORS THAT INCREASE WTP	FACTORS THAT REDUCE WTP
Reliable water supply	lack of transparency and accountability relating to the water management committee,
Improved service for example house connection, yard tap or nearby kiosk compared to traditional sources	no faults with the facility and therefore no clear reason for paying,
Availability of water for productive use	dissatisfaction with water supply (location, time to queue, water quality/quantity),
Reliable fund collection	competition from alternative cheaper water sources
User involvement	change in individual priorities
Sense of ownership regarding water system/point	Earlier or present "free water policy"
Strong community leadership	Distance to improved source more than to traditional ones.
Distance to improved source less than to traditional ones	Intermittent, unreliable supply
High quality of supplied water	Unreliable fund management
Public accountability and communication between users and water committees	Time delays between fee collection and working service
Education level	Non-involvement of users
household income	Lack of sense of ownership regarding water point
	Weak community leadership

The above factors can be used as a starting point in any rural area and determine their effect on the WTP. It also shows that using 3-5% of household income to predict how much a user is willing to pay becomes inaccurate and simplistic and therefore more factors need to be considered to determine WTP (Schweitzer and Mihelcic, 2012).

WTP will change overtime depending on the interaction of the above factors. It is therefore important to sustain the willingness to pay so that users continue paying for water service (Harvey, 2007). This can be done by involving the users from the inception of the project so that they understand and are convinced of the need to pay for water continuously (Harvey, 2007). The new water supply service should also be seen as an improvement depending on what the user defines

as an improvement. For users who already have services, the service provider should aim to keep a check on the factors listed in ***Table 2.3*** especially those that change over time for example the water quality and reliability of the system. Re-sensitisation of users of old schemes helps them understand this need to pay for water. Improving the relationship between the users and organisation improves the willingness to pay. Increased trust and confidence through better information and communication will influence the user's satisfaction and WTP positively (Fonseca and Cardone, 2003).

Generally, when the services provided meet the needs and the WTP of the users, cost recovery will be successful (WHO, 1998). Therefore a combination of socio-economic factors affecting WTP and a demand-side management approach improves the sustainability of water projects in rural areas of developing countries (Arouna and Dabbert, 2012). One way of ensuring this is by engaging with the community throughout the project period by using participatory approaches. A positive WTP shows that the community has potential and ability to recover some of the water supply costs (Kaliba et al., 2003). Therefore, WTP can be used to help ascertain the potential for fulfilling sustainability, at least from a financial viewpoint (Kaliba et al., 2003). Thus it should be one of the inputs in determining the tariff and level of service in a community.

There are several methodologies for estimating WTP. These can be direct techniques based on observation of what people actually do in order to ensure they have water including what they spend on it (Brikke and Rojas, 2001). Indirect techniques are based on user's respondents to hypothetical questions about their WTP for an improved water supply (Brikke and Rojas, 2001). For rural areas, it can be restricted to willingness to pay studies and focus group discussions or workshops at community level taking into account the views of women (AFDB, 2010). The focus group discussions should provide all necessary information about cost, tariffs, benefits and financing options so that the users can understand (Brikke and Rojas, 2001).

It is often stated that people are not able to pay for a service because they are poor (AFDB 2010). However in most cases in rural areas, low income users are paying for a water service at a much higher cost than households with higher income. Sometimes users are able to pay for a service but are not willing to pay for the service because it is not considered an improvement to the existing situation. In other scenarios, the service is an improvement the users want but cannot afford it. This also shows that there is no systematic link between ATP and WTP but suggests the importance of WTP (Fonseca and Cardone, 2003). This suggests the importance of WTP and the need to determine WTP and the reasons for it or the lack of it (AFDB, 2010; Brikke and Rojas, 2001). Therefore the willingness to pay is an important element in ensuring that users pay for the

service and hence contribute to sustainability of the water supply system (Brikke and Rojas, 2001). However estimates of ATP can be used to guide broad guidelines regarding thresholds of tariffs (WHO, 1998).

2.8 COMMUNITY FINANCING

Communities need to understand fully their roles and responsibilities throughout the life of the water project but one distinct responsibility is that they need to recover the costs of O&M (Sansom, et al., 2010). It is generally accepted that the most important way of recovering costs of O&M are from the users (Brikke and Rojas, 2001).

As mentioned earlier in 2.5:COSTS, the choice of technology for water supply has a direct bearing on the O&M requirements which in turn determines how much revenue is required. Communities should be guided using participatory approaches and explained early on the different technology options so that an affordable and appropriate choice is made. (Brikke and Rojas, 2001). The community can mobilise revenue through Voluntary fund, cooperative scheme, Loans and Tariffs.

The use of tariffs as a mechanism to cover the cost of water supply services has increased in rural and low income areas, mainly due to the following factors (Brikke and Rojas, 2001):

a) acceptance that users should pay for the service of water,
b) development of models for community management where communities are responsible (or are co-responsible for and co-own) and own the water supply scheme, their water supply scheme,
c) the trend towards decentralizing the management of public services,
d) reduction in government expenditure on recurrent costs.
e) Tariffs also provide a systematic, fair and transparent way of spreading this responsibility across the community.

2.8.1 Tariffs

Tariff is the price of water a user is expected to pay for a service (Brikke and Rojas, 2001). Water tariffs are set with the objective of meeting or recovering the water supply costs. In the long run, the tariff should be able to recover future system upgrade, rehabilitation and expansion costs, as well as ongoing O&M costs to achieve financial sustainability (Harvey, 2007; Brikke, 2000). However aside from the cost recovery view point, tariffs are set to achieve the following objectives (Brikke and Rojas, 2001);

- encourage conservation of water by regulating demand,

- as a political tool in local communities
- to promote supply of water for the poor by social price.
- Protect the environment by including costs of environmental protection and conservation
- create a sense of ownership with the users.
- equity and fairness, income redistribution,

The ‘‘best’’ tariff design for a particular community and situation is one which balances and meets most of the important objectives of the community (Brikke and Rojas, 2001). Due to the nature of water having no substitute, users are ready to pay for a better service especially if benefits are indeed proven (Brikke and Rojas, 2001).

The level of tariff should be determined by the revenue required to meet the O&M costs of water supply as well as the ability of the users. It has been emphasised that water should be made accessible ‘at an affordable cost on a sustainable basis’ (Gine and Perez-Foguet, 2008). Therefore tariffs should be set while considering the costs to be recovered as well as the ability and willingness to pay. In many developing countries, tariff setting is often marred by a lot of political interference (Fonseca and Cardone, 2003). On the extreme, local politicians have claimed that water services should be free and thus water tariffs are rarely set to their true value. There is also no determination of where the deficit in revenue will be acquired. In other cases, tariffs are set at a low value assuming that the users will not be able to afford (Fonseca and Cardone, 2003). However this has been disputed by several studies where it has shown that users are paying higher prices for water from vendors especially poor people in low income areas (Brikke and Rojas, 2001). Users are also spending a lot of time and effort to collect water. These users are often willing to pay for a more convenient and safe water supply (Fonseca and Cardone, 2003).

On the other hand, tariffs are also set based on only supply factors without regard to the users of the system. Tariffs should also be simple, transparent, acceptable and affordable by the community (Brikke and Rojas, 2001). Therefore the tariff set should take into consideration the supply factors (costs as in 2.5, level of cost recovery as in 2.5.1) and the demand factors (WTP as in 2.7). This therefore means that the tariff needs to be discussed and agreed upon by the community or set and approved by the community (Sansom et al., 2010).

Tariffs need to address needs of the poor based on the national policy. The tariffs are often calculated by community, private sector or the public sector for an individual project. However in order to do this, the process of tariff setting needs the right data and tools (Fonseca and Cardone, 2003). The challenge still remains of how to set tariffs so that they are affordable by the whole

community, achieve objectives important to the community and yet still meet the O&M costs. This implies that 'a realistic, targeted, and transparent financial mechanism for assisting the poor is required, while ensuring that sufficient finances are generated to sustain services' (Clever and Toner, 2006).

In Ghana, the tariff set for rural water systems is based on 'experiences from other communities, relates to projected water production, expenditure and future investments' (Siabi and Pebla Tambro, 2008). Once a water supply is installed, a meeting is held immediately among the water facility, beneficiary community, Water and Sanitation Development Board, district assembly and Community Water and Sanitation Assembly to discuss and fix the tariff (Siabi and Pebla Tambro, 2008). This emphasises the need for the tariff to be set in a participatory manner and also includes the associated costs. However it is not clear how the willingness to pay of users is incorporated. It can be argued since the tariff is set with the beneficiary community, it will reflect their WTP and ATP. However, this needs to be properly determined.

High tariffs increase inequality of access to water services since they cause the poor people to abandon improved water sources for unimproved cheaper sources (Arouna and Dabbert, 2012; Gine and Perez-Foguet, 2008). The World Health Organization recommends that user fees for basic water supply not exceed 3.5% of monthly household income (Schweitzer and Mihelcic, 2012).
However according to Rogers et al. (2002), high water prices allow for extension of services to the unserved due to increased revenue and thus promoting equity, allows demand reduction, efficient allocation of resources and increases supply. On the other hand, Rogers et al. (2002) states that low water prices encourage excessive consumption, shoulders users from important economic and environment signals. In this regard though, it is difficult to know what a low and a high price of water is since it will vary depending on the community and system. Rogers et al. (2002) goes on to state for sustainability of water supply systems, the price should not go below the supply cost. Rogers et al. (2002) further states that local, political and social conditions should be considered while setting tariffs.

It has been suggested that 'tariffs should be set in such a way that they are progressively adjusted to meet long term sustainability' (Brikke and Rojas, 2001; Katko, 1990). This can be done by estimating tariffs for the different levels of cost recovery. Estimating will entail assessing the O&M, repair and rehabilitation needs and costing these (Harvey, 2007). This helps determine what the tariff will cover and also provide an indication of financing gaps required. Once these levels are

determined, the tariffs can be gradually increased overtime. The change in tariffs also ensures that any changes in the O&M needs or willingness to pay of the users are factored in.

However most tariffs are not changed in developing countries because of the long process it takes to change a tariff which demotivates whoever is spear heading the change (Katko, 1990). Nevertheless, the change in tariff when done, should be with full consent and understanding from the users, otherwise it leads to user dissatisfaction and later non-payment. One reason for this is that users expect savings to have accumulated in the account over the previous period of payment and need clear accountability of usage (Mandara et al., 2013).

2.8.1.1 Calculation of tariffs

The tariff will be linked to the amount of revenue required to meet the water supply costs. However the amount will be guided by the national policy on cost recovery and the WTP of users. A basic tariff is the costs of water supply divided by the number of households (Fonseca and Cardone, 2003). A real cost tariff includes the O&M costs, replacement and extension costs and investment and depreciation costs (Fonseca and Cardone, 2003). Tariffs can be calculated at the beginning of the project however tariff formulas can be used at government level.

Tariffs cab be computed using methods based on historical cost or economic costs.
Tariffs computed based on the historical costs provide adequate income to meet financial commitments. Under this method, tariffs are set to recover (Sansom et al., 2010);

i. Operating Expenses,
ii. Operating and Capital Expenses
iii. Operating, capital expenses and a percentage mark-up based on return based on fixed assets or capital employed.

Tariffs can also be based on economic costs. These meet all financial costs and economic externalities. The tariff includes the long run marginal costs of all financial flows and economic costs and benefits estimated using Average Incremental Costs method. Marginal costs are additional operating costs for an additional unit of output. The tariff is calculated as in the formula below;

$AIC\ tariff = \frac{PVC}{PVW}$;

Where;

- PVC($) is the present value of all incremental capital, operating and maintenance costs net of taxes and duties
- PVW (m^3) is the present value incremental consumption over the design life of the facilities to be constructed (Sansom et al., 2010).

The present values are determined by discounting cash flows and consumption quantities at discount rate which equals the opportunity cost of capital in the national economy.

Once the tariffs are calculated, the bill is set. A water bill for a consumer is either a fixed amount per month or an amount dependent on the consumption.

2.8.1.2 Categories of tariffs

Tariffs can be classified by user/ charge or rate category. Tariff classification by user takes into consideration characteristics of users and should be done to adapt to local situations. These characteristics include; consumption levels, type of consumers, household characteristics, distance from water point and property size (Brikke and Rojas, 2001). When users consume the same amount of water due to similar water needs, a flat rate can be used without a meter. However, when the needs are different and water consumption can be differentiated, a graded rate needs to be introduced. This can be graded according to household size. The choice to use a meter or not depends on the demand of meters by the users and service provider. These different options for classification by rate are as shown in ***Table 2.4*** and gives advantages and disadvantages of each category (Brikke and Rojas, 2001).

Table 2.4: Classification of tariffs by rate category

RATE CATEGORY AND APPLICATION	ADVANTAGES	DISADVANTAGES
Non metered flat (Users pay same amount regardless of volume of water consumed. Users should be known and water needs similar)	No overheads for metering and Relatively easy to administer.	Charges may not reflect access to supply or level of consumption
	Easy to calculate	Rates may not reflect the ability to pay of all users
	Easily understood by consumers	Does not discourage the waste of water
	Provides a secure revenue	Equity is not taken into account
	Collecting the money is cheap	Differences between users (houses, income) not taken into account
Non metered graded (users classified into several categories based on differences of water use and income)	Charges reflect (estimated)	Disputes may arise over basis for grading
	consumption and ability to pay	Higher rate payers may have disproportionate influence over management of the scheme
	Poorer members of the community can be subsidised	Higher rate payers may have disproportionate influence over

RATE CATEGORY AND APPLICATION	ADVANTAGES	DISADVANTAGES
	by better off	management of the scheme
	Rates can better reflect actual service level	More complex to manage
Metered (Water meters are installed to charge according to actual volume consumed). There should be demand and WTP for house connections. Good management capacity and efficiency to ensure cost effectiveness, customer satisfaction and efficient maintenance and leakage control.	Charges reflect volume of water consumed	Raises cost of service due to meter reading, billing, collecting payments, policing delinquency
	Helps to reduce the consumption of water	Feasible, if reliable water supply
	Makes it possible for poor people to access a minimum level of water consumption	Difficult to define what is the minimum level of water consumption for poor people
	Demand can be regulated, and water resources conserved, by use of progressive rates	Users frequently break meters or make illegal by-pass connections
	Only one parameter: cost per m^3	Meters need maintenance
	Accounting made easier	Long delays in payment
Mixed system (House connections together with stand posts). There should be demand for and WTP to pay for household connections and where poor households cannot afford individual connections	Offers consumers choice of service level	May be difficult to optimise balance between house connections and stand posts
	Rates reflect level of service	Higher rate payers may have disproportionate influence over management of the scheme
	Poor can benefit from subsidised or free basic service	

Under the metered option, tariffs can be (Sansom et al., 2010; Katko, 1990);

1. Uniform rate: tariff increases as per water consumption.
2. Decreasing block tariff: tariff decreases in blocks or levels as consumption increases
3. Increasing block tariff: tariff increases in blocks or levels as consumption increases.

The choice of which option should not have too many blocks, otherwise the calculations and administration will be too complicated and costly.

2.8.1.3 Billing and Collection of revenue

Objectives for billing and collection need to be set clearly. The billing and payment options should be acceptable by the customers. The costs attached to these activities should not be so high that more money is spent on billing and collection compared to the revenue collected (Harvey, 2007). It is important to determine different ways and when to provide bills to users and options for payment.

In order for billing to be successful, there is need to know the number and different characteristics of users. Thus some register of users and details regarding address, water consumption and bills due is required (AFDB, 2010). This register with details may not important to rural water systems that use kiosks or stand posts and pay for the water as they fetch but helps for revenue projection. A common option for letting users know what they need to pay for water consumed is using water bills. The users need to understand the bill; amount they pay, how it is derived and for what purpose (AFDB, 2010).

Collection of the revenue is another aspect which needs to be determined depending on the need for cash flow and when the users are able to pay the bills for example monthly if the users get monthly wages or seasonal if they are agricultural farmers. The revenue can be paid at different places for example; door to door, at the offices of whoever is running the system or payment in the bank. Selection of option(s) needs to be discussed with the users so that they are acceptable. Therefore appropriate measures should be developed for billing and revenue collection in consultation with the community. Revenue can be collected by (Harvey, 2007);

a) Reactive financing; money is collected from users when there is a breakdown in the system. This kind of financing works where there is no need for daily financing for example for hand pumps. It is also be common where the community does not trust the water committee to keep the funds (Jansz, 2011).
b) Periodical tariffs; money is collected from users every after a specific period for example weekly or monthly.
c) Pay as you fetch; money is collected as users fetch water, usually done for kiosks or stand posts.

One major challenge in revenue collection is how to handle users that do not pay in time. Different strategies can be used to ensure fees defaulters pay up for example using traditional leaders to exert pressure (Nyarko et al., 2007). Disconnection is only effective if the users do not have alternative sources of water.

2.8.1.4 Storage and management of revenue.

The revenue collected can be kept in the following places;

- Bank; the challenge with this is that rural systems are often far away from commercial banks. Therefore, when chosen as an option, the cost of bank charges should be considered (Harvey, 2007).
- Treasurer; the revenue is kept with the treasurer but it requires self-discipline and trust of the community (Harvey, 2007).

- Cooperative for example communal agricultural produce can be bought with revenue and sold when the funds are required. This has the added advantage of avoiding devaluation effects (Harvey, 2007).

In a study conducted in Swaziland by Peter and Nkambule, (2012) in 15 functional water schemes in 11 communities, it was seen that existence of an O&M fund meant that the water supply was sustainable and those without were not sustainable. Collection and storage of cash does not necessarily reduce system down time but it provides a good place to start (AFDB, 2010; Nyarko et al., 2007). In a study carried out by Nyarko et al. (2007), it was concluded that systems that collect and store revenue were highly sustainable. Seasonal cash flow has a big impact on sustainability since revenue is rarely guaranteed (Nyarko et al., 2007). However it is not enough to collect and store revenue, it needs to be properly managed and budgeted for so as to ensure that the water systems are sustainable.

'A simple but reliable system of financial records can greatly improve cost recovery' (AFDB, 2010). With proper documentation, decisions can be made based on clear and accurate information. It also makes it easier to report to the different stakeholders hence building trust and confidence. Budgeting should be done for the system. User registration forms, a diary, a bank book and budgeting records can be used for simple record keeping and income book, expenditure book, unpaid account book, record of bills to collect and a general balance for more in depth record keeping (AFDB, 2010).

2.9 MANAGEMENT OF SUBSIDIES

Users of rural water systems contribute '10% to the capital costs of construction' and are expected to cover the O&M of systems. The revenues collected from the users are often insufficient to meet the O&M costs especially replacement costs. The government, development partners and NGOs often provide for this insufficiency in revenue through carrying out the rehabilitation, expansion of the systems and any other capital maintenance (Sansom et al., 2010).

'Indirect' or 'hidden' subsidies to the O&M of rural water supplies include support for spare part supply, storage and distribution, monitoring and regulation and institutional support for communities. These subsidies are required however Harvey et al, 2003 suggests that over time, these costs should be worked out into long term financial plans.

When subsidies are provided for in a 'transitional' or 'sustainable' manner, they do not compromise the sustainability of rural water supply systems. The World Panel of Financing Water

Infrastructure recommends that subsidies should be “targeted, transparent and, where they are intended to ease the transition to higher tariffs, diminishing” (Winpenny and Camdessus, 2003). Although some subsidies are targeted for the short run, some are required for the long run. An important aspect is that the subsidies should be budgeted and allocated for by the organisation providing the subsidy (Winpenny and Camdessus, 2003). Therefore it is important for the requirement for subsidies to be properly estimated, targets, managed and organised to ensure they contribute to the sustainability of the system (AFDB, 2010).

Also within the community, there are community members who are not able to afford the tariff levels. Different strategies can be employed to target the poor.

One of the barriers preventing poor community households to connect to water supply is the high connection fee. Subsidies can be targeted to reduce the initial connection fee so as to increase the number of users. Subsidies can help to reduce the initial costs of the connections, enlarging the client base and contributing to providing economies of scale to the water provider (Brikke and Rojas, 2001). The poor community members can be exempted from payment or pay a lower tariff than the richer community members. This is known as cross subsidy where high income households pay higher tariffs for water service as a way of subsidising the low income households (Sansom et al., 2010). However, these subsidies end up compromising the sustainability of the rural water system in the long run due to reduced revenue. When the poor are paying at low prices, the operators of the systems end up not collecting these revenues because they are low (Brikke and Rojas, 2001). Subsidies lead to wastage of water if the poor are accessing water at low prices or for free. However, there is also a challenge of targeting or knowing who the poor are. In a study conducted in Uchira village in Tanzania, the village water council was reluctant to have free water for the poor since everyone in the village would claim poverty (Cleaver and Toner, 2006). Thus instead of having the same level of service for the poor at lower costs, it is better to have different service levels at different costs (Sansom et al., 2010). The challenge with this is that often in rural areas, almost all the users have the same service levels. This therefore begs the question of how subsidies in rural areas are currently being targeted and managed (Sansom et al., 2010). Cross subsidy can be done for the poor using demand assessment and improving payment mechanisms.

Subsidies are also provided from the government to operators to address any gaps in service delivery. These subsides are known as output based subsidies. These include subsidies to; increase coverage through new extensions and connections or support transition of an existing tariff to a revised one.

2.10 MONITORING AND EVALUATION

Monitoring and Evaluation provides checks and helps to identify any weaknesses in the system which can be corrected. In order to carry out monitoring and evaluation, targets need to be set. For cost recovery, the main areas to be monitored include revenue collection and management. The monitoring can be done by the users of the system and any other institutions set up to ensure functionality of the water supply.

One way of monitoring can be done is by providing feedback to users about revenue collection and management. The operator communicates with the users through village meetings or display of reports at council offices. When there is poor communication between the operators and the users, there is a lack of trust and in the long run, users are unwilling to pay the user fees as they had been doing (Mandara et al., 2003). Poor accountability, mistrust of water committees with no feedback regarding water sales affects willingness to continue paying (Mandara et al., 2003). 'Making the management organisation accountable to users is an important factor in sustaining services' (AFDB, 2010).

Regular meetings with community leaders and members enhances transparency and accountability which promotes community confidence in the Water Board and Water and Sanitation (WATSAN) Committees (Opare, 2011). However the need for feedback regarding water sales and expenditure is applicable for point water sources for example boreholes and wells where the use of the money is not directly seen by the users. Point water sources need minimal O&M (cleaning and fencing the area) therefore users need to understand how the revenue collected is being used.

Checks on the use of funds should be done to encourage public accountability and proper use of funds. In a case study in Ghana to ensure accountability to users and proper management of funds, the following was done;

> *'Key measures included requirements for vendors to lodge sales revenue with treasurers of WATSAN committees on a daily basis, and while the latter were in turn obliged to make weekly payments of 75% of the revenue collected into Water Board accounts. All payment receipts were to be filed for future reference. Public displays of the audit findings in all the OATS communities were to be undertaken to promote transparency' (Mandara et al., 2013).*

In a study carried out to develop an adaptable sustainability assessment tool, it was concluded that systems that had more transparent accounting had higher compliance with the monthly tariff payments (Schweitzer and Mihelcic, 2012).

Monitoring and evaluation is not restricted to users but can also be done by institutions around the water supply system. Periodic inspection of financial documents and annual auditing by accounting staff was cited as one of the reasons for a sound financial standing in the OATS (Oyarifa, Abokobi, Teiman, and Sesemi) water supply system in Ghana (Opare, 2011). This can only be done when the institutions have the capacity and resources to carry out these audits.

Monitoring and evaluation also helps identify any capacity gaps to carry out cost recovery in rural water supply systems. The success of cost recovery will also be determined by how the community is supported by means of training in financial management, tariff setting. Without this all efforts for cost recovery will diminish and not done (Sansom et al., 2010).

2.11 SUMMARY

Cost recovery has been suggested by several authors to be the cause of failure or reason for success of rural systems (AFDB, 2010). The ability of a water system to meet the needs of the community and ability of the users to provide inputs for example monetary to the system for O&M will greatly affect the sustainability of a system. If revenue is collected from users to operate the system, finance expansion to new users and in the long run replace infrastructure after its useful life, the sustainability of the system will be to a great extent guaranteed (Sansom et al., 2010). Despite this, cost recovery is still problematic with poor design of tariffs, poor revenue collection and management.

3 METHODOLOGY

3.1 INTRODUCTION

This chapter provides the methodological approach used in the study. Section 3.2 is the research methodology and gives details about how the data collection was carried, the methods and tools used. Section 3.3 states how the rural water supply systems and informants were selected during the study. Section 3.4 explains how data was analysed and sections 3.5 and 3.6 states how validity, reliability and ethics were ensured during the study. Section 3.7 provides a description of challenges encountered during the study and how they were solved.

3.2 RESEARCH METHODOLOGY

The aim of the study was to determine the current situation of cost recovery in rural water supply systems and identify how it can be improved. The study was to find out and understand how cost recovery for water supply systems in rural areas was being carried and identify of ways of improving. Thus the world view for the research was constructivism which sees learning as an active process with knowledge being constructed through interactions with the environment and people (Fisher, 2012).

A case study strategy was used to carry out the study. Yin, (21013) defines case study methodology as a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon in its real life context using multiple sources of evidence. This will help answer the ‘how’ and ‘why’ regarding cost recovery in the study areas. Case study methodology allows for an in-depth situation to be explored fully or in a comprehensive manner. Case study approach has been criticized for lacking rigor and biased views influence the conclusions however rigor on the methods of data collection and analysis can be done (Wisker, 2001). It has also been criticized for providing little for generalization for population but can be used for theoretical generalization (Yin, 2013).

The case study methodology used the mixed design which involved the ‘use of quantitative and qualitative approaches in tandem so that the overall strength of the study was greater than either qualitative or quantitative research’ (Creswell. 2008). Quantitative research provides measurable and objective data but does not explain why. Qualitative research was appropriate when dealing with communities and was useful to incorporate people’s opinions, perspectives and attitudes. Therefore by combining these two research designs, the study was able to answer ‘how’ or ‘what’ and ‘why’ questions (Fisher, 2012). One of the main advantages of using the mixed approach is that it ‘could neutralize or cancel the biases’ of using one method (Creswell, 2008).

The quantitative nature of calculation of tariffs, costs of water supply and determining facts about the system for example the number of users, length of pipe line and qualitative on experiences, opinions and perspective of cost recovery warrant the use of mixed design. The data was collected concurrently because the sets of data complemented each other and due to the time constraint (Adolphus).

3.2.1 Data collection

The study used a mixed method which combined quantitative and qualitative data. The data collections methods used to achieve the research objectives were identified according to the research objective and the data required to achieve the objective. Each research objective needed particular data for example objective one regarding cost recovery in piped rural systems required general information regarding cost recovery specific to piped rural systems and any experiences documented. This was done using literature review. Data collection methods employed to achieve all the objectives were; literature review, focus group discussions, semi-structured interviews, observation and document review as shown in ***Table 3.1***.

Table 3.1 Data Collection methods

Research objective	Data required to achieve	Data collection methods
To investigate how cost recovery is applied to contribute to sustainability of piped rural water supply systems in developing countries.	General literature about sustainability and how cost recovery fits in	Literature review
	Experiences about cost recovery in developing countries	
	Different aspects considered for cost recovery in rural water supply	
To investigate and evaluate how cost recovery is currently applied in piped rural water supply systems in Kenya, Rwanda and Uganda.	How is cost recovery done in the rural water supply systems	Field work (FGDs, semi-structured interviews, observation, document review)
	Status of the different aspects of cost recovery in Kenya, Rwanda and Uganda for piped rural water supply	
	Details about the water supply systems	
	Perspective and opinion of users of water supply systems regarding cost recovery	
	Perspective and views from experts or managers in the water sector	
To identify ways of improving cost recovery in piped rural water supply systems.	Status of cost recovery in rural water systems	Desk study, field work
	Findings from field work	
	suggestions from key informants	

3.2.2 Desk study, literature review

This was carried out to obtain information about cost recovery mechanisms of rural water supply systems in developing countries and about research methodology. This was carried as described in Chapter 2. Elements of cost recovery were identified and this gave guidance on how the data collection tools were developed. The literature review gave guidance the data collection methods used, data collection tools and data analysis.

3.2.3 Field work

Field work was carried out from 16th June to 7th July 2015. Key informant interviews and focus group discussions with users were held as detailed in Appendix A1. Selected documents from the piped rural water systems and country specific documents were reviewed. Observation was also carried out. The field work began in Kenya, followed by Uganda and thereafter Rwanda as in ***Table 3.2***.

Table 3.2: Field work schedule

COUNTRY	ORGANISATION/WATER SUPPLY AREA	DATE
KENYA	Bomet County	16th-18th June 2015
	Water Services Regulatory Board, WASREB	19th June 2015
UGANDA	Bullisa	22nd - 24th June 2015
	Mpigi	25th-30th June 2015
	Ministry of Water and Environment	29th June 2015
RWANDA	FEPAIR	3rd July 2015
	Rwanda Utility Regulatory Authority	7th July 2015
	Water and Sanitation Corporation Limited (WASAC)	7th July 2015
	Rulindo	7th July 2015

The data collection methods and how the field work was carried out are described below from Section 3.2.3.1 to 3.2.3.4. The data to be collected will include the following as per ***Table 3.3***

Table 3.3: Data to be collected during the field work

Financial data	Service data
Tariff (amount, how it was set, process of setting)	Water quantity (amount)
Cost coverage (percentage of O&M costs covered by revenue)	Water quality (user's perceptions)
	Water Reliability (hours of supply, interruptions in supply)
Subsidies (amount, planning, reason)	Satisfaction (general, use of alternative water sources)

	Accountability (to the users)

Thereafter the data collection tools and how they were developed is discussed from section 3.2.4.1 to 3.2.4.4.

3.2.3.1 Semi-structured interviews with key informants

Semi-structured interviews were used because they allow divergence and exploration of issues (Wisker, 2001). They also enabled better understanding of the current situation of cost recovery in the water systems. Semi-structured interviews were carried out with key officers/experts who have a good knowledge of rural water supply schemes due to their experience in implementation or management. Therefore water supply operators or managers and experts were interviewed. The semi-structured format was used to interview to avoid the fear of closing out the possibility of finding new information and allow the informant speak freely about the topic. An interview guide (APPENDIX A2) was used during the interview. The information obtained from these experts was used to collaborate information from system operators and provide better understanding of the current situation. The interviews were also used as a way of asking about improvements that can be made. Appointments were made with the informants and all interviews were recorded.

3.2.3.2 Focus group discussions

Focus Groups are small groups brought together to specifically focus on certain issues. They enable close scrutiny and lengthy discussion of an issue and end up being time consuming (Wisker, 2001). However set questions/points to focus on were asked to the group to ensure focus of the group using a guide (APPENDIX B). Therefore a semi-structured interview setting was used to capture information about cost recovery from the consumer's perspective.

The intention was to have focus group discussions with 5-8 local community representatives and general community members. This was done in one scheme in Kenya as in ***Image 3.1***

Image 3.1: Focus group discussions in Sergutiet, Kenya

In this scheme, the focus group was planned and held with users of the water supply. These were conducted by marketing officers of Bomet Water Company and lasted for 30 minutes.

However for the other systems in Kenya, Rwanda and Uganda it was not possible to have planned discussions. This was because the systems to be visited were selected during the field visit therefore it was not possible to plan and arrange focus group discussions prior. There was also a limited amount of time in each water supply system. Therefore, users were sought and discussed with at public stand posts and public areas as shown in ***Image 3.2*** and ***Image 3.3***.

Image 3.2: Focus group discussion in Butiaba, Uganda

Image 3.3: Focus group discussion in Rulindo, Rwanda

These spontaneous focus group discussions each lasted between 15-25 minutes and were conducted with water users sought at the public stand posts. In Bomet Kenya, the marketing officers facilitated the discussions. In Uganda and Rwanda, the users spoke only the local language therefore the Red Cross staff facilitated the discussions due to their knowledge in the language and experience with the communities. These discussions also lasted 15-25minutes.

Discussions with staff from Red Cross also helped provide further information to help understand when issues were not clear. For example in Rwanda, the users stated that they used both the piped rural water supply and spring. The staff from the Red Cross explained that most of the users paid and collected piped water supply for drinking but used the spring water for washing.

The spontaneous focus group discussions due to their less formal nature allowed the participants to speak more freely as compared to the planned discussions. The spontaneous discussions also took a shorter time and were able to involve users randomly who were fetching water at the time. The planned discussions because of the meeting setting took much longer since the invited participants had to introduce themselves and there was need to make them comfortable so that they could speak freely.

However for the spontaneous discussions, the participants were less willing to provide their names or signatures for the study compared to the planned discussions.

3.2.3.3 Document review

This was done to obtain past information regarding tariff setting and financial data. It was done to obtain information regarding the enabling environment. A document review guide was used for guidance section 3.2.4.3. The list of documents obtained are as in APPENDIX D.

3.2.3.4 Observation

To find out the current state of water supply in the systems visited and determine how well maintained the system was observation was carried out. This was done by taking pictures for visual evidence, taking note of the physical water quality, time it took to fill a 20litre jerry can, the length of queues at the public stand posts, drainage of tap area and the condition of taps and area surrounding the stand posts. This was done as per the checklist in ***Table* 3.4**.

3.2.4 Data collection tools

3.2.4.1 Interview guide

The interview guide was developed based on elements of cost recovery from the literature review. Each element was explored and questions were developed under each of the elements. For example under level of cost recovery, policy was one of the aspects that affect the level of cost recovery therefore a question on it was included. This was continued as shown in ***Figure* 3.1**. The interview guide is in APPENDIX A2.

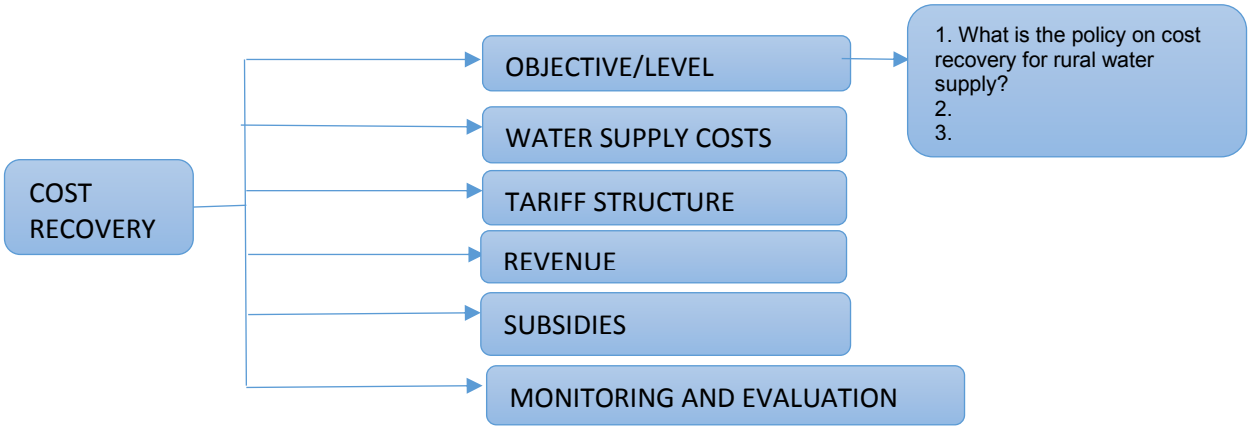


Figure 3.1: Developing interview guide using elements of cost recovery

It was not possible to pilot this tool before the field work. However it was reviewed during a kick off meeting with the Red Cross WASH expert. Revisions were made to sections regarding billing to make it inclusive for systems that have kiosks. The first interview was also used as an opportunity to pilot. The duration of the interview was noted and a general question regarding management of rural water supply was added to allow for background information.

3.2.4.2 Focus group discussion guide

The focus group discussion guide was developed similar to that in ***Figure 3.1*** however the questions for the users were to answer their involvement in the different elements of cost recovery and satisfaction with the current water supply service and cost recovery. It was not possible to pilot this tool however it was reviewed during a kick off meeting with the Red Cross WASH expert and follow up questions regarding use of alternative sources was added. The guide used is as in APPENDIX B.

3.2.4.3 Document review guide

The following list of documents was used as a guide to be obtained from water supply systems and organisations visited;

- Any official documents (policies or guidelines) about cost recovery for rural water supply, Tariff levels, Subsidy policy
- System specific reports from operator (customer database, budget, O&M plan, financial report)
- Monitoring reports, audit reports.
- Books of accounts, reports
- Demand note, receipts.
- Log repair book

3.2.4.4 Observation checklist

The checklist used as shown in ***Table* 3.4.**

Table 3.4: Observation checklist

1.	Water Supply Scheme:
2.	District:
3.	Country:
4.	Type of water supply:
5.	Is the system well maintained?
6.	Are the taps functioning?
7.	Proper drainage at the tap stands?
8.	Is there queuing at peak times?
9.	Amount and quality of water

3.3 SAMPLE DESIGN

3.3.1 Piped rural Water supply systems selected

Purposive sampling was used to select the piped rural water supply systems. The study was carried out with support from the International Federation of the Red Cross supported by the Norwegian Red Cross. The study focused on piped rural water supply systems which had tariffs set for O&M. Therefore the water supply schemes selected were schemes implemented or to be supported by the Red Cross in the different countries. In Kenya two schemes were selected which were to be rehabilitated by the Red Cross.

However in Uganda and Rwanda, this was not the case. In Uganda, the Red Cross had implemented only one piped rural water supply system in Bullisa district. The other interventions were point water sources therefore a second piped rural water scheme had to be selected from the many rural piped water supply systems in Uganda. The system in Mpigi was selected because it was a rural growth water supply system that was carrying out O&M from revenue collected from users. The district leadership and management at the system were willing to participate in the study. The system was convenient for the researcher to travel to and fro every day. In Rwanda due to the limited time in the country, the nearest piped rural systems were visited. Therefore convenient sampling was used to select these water supply systems because of the ease to get to them and willingness to participate (Denscombe, 2003). Therefore in total six schemes were visited two from each country as shown in ***Table* 3.5**.

Table 3.5: Water supply systems visited

No	Country	Water Supply scheme
1.	Kenya	Bomet water supply
2.		Sergutiet water supply
3.	Uganda	Butiaba water supply
4.		Kibibi water supply
5.	Rwanda	Nyamuringa water supply
6.		Cyong water supply

Therefore some schemes were selected by the Water and Sanitation Coordinators in the National Societies of the Red Cross in Kenya, Rwanda and Uganda in consultation with the researcher and others vice versa.

3.3.2 Selection of organisations and key informants

Organisations that work in the water sector were targeted at the national level and local level. This included the Ministries in charge of water supply at national and local government level. Community leaders and operators managing water supply were also selected.

3.3.3 Focus group discussion participants

Convenient sampling was used to select participants. Users that were willing and available for the discussion were selected.

3.4 ANALYSIS OF DATA

3.4.1 Document review analysis

The National strategic plans obtained were used to determine the policies and institutional structures for O&M for rural water supply and determine the tariff setting process. This information was also used to collaborate information from the semi-structured interviews (APPENDIX C).

Monthly financial reports for Kibibi and Butiaba water supply systems were obtained and strategic plan with annual projections for Bomet water supply was obtained (APPENDIX D). Revenue collections and O&M costs were entered into an Excel sheet. This data was used to compute the percentage of O&M costs recovered by the current tariff to determine the cost coverage. The cost coverage was determined as a ratio of O&M costs to revenue collected. For comparison purposes, the tariffs and costs were changed to United States Dollars using the exchange rates as of 20th July, 2015 (CURRENCY EXCHANGE RATES).

3.4.2 Key informant interview analysis

The data from the interviews was transcribed. This was done by listening to all recorded interviews and typing them out under the different questions where possible. The transcripts were then read. Themes from the literature review and those that were recurring as the data was collected were highlighted. Quotes that were interesting were highlighted. The identified themes were noted in an Excel sheet and notes under each.

3.4.3 Focus Group Data Analysis

The data from the focus group discussions was typed out under each question that was asked. This was done per focus group and per country. These were read looking out for themes and exceptions. During the field work, certain themes had already been identified because of their recurrence in all systems visited. This was done for all the transcripts and along the way others were highlighted. The data was grouped into simple tables under each theme and transcripts read again to add any additional information under each theme.

The data under each theme and system in each country was entered into an excel file, this was done to cluster the information into the various themes as shown in **Image 3.4**. Simple statistical calculations were done.

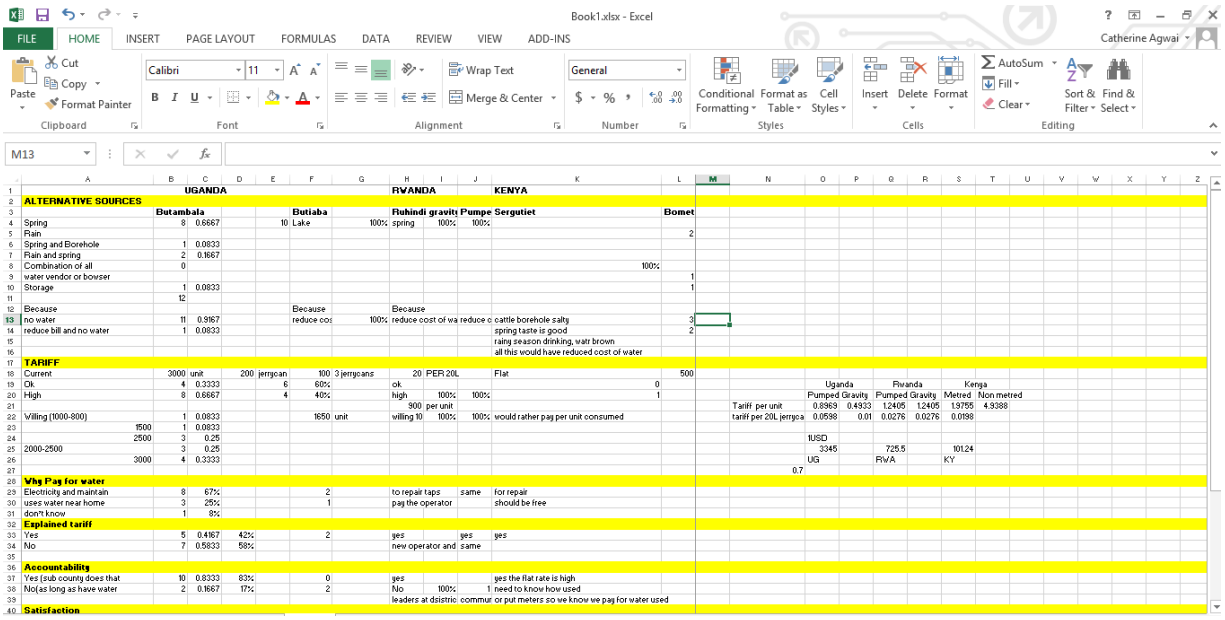


Image 3.4: Clustering of data from focus group discussions

3.5 VALIDITY AND RELIABILITY

During data collection in order to ensure a reasonable level of accuracy and minimise bias and error, the following was done;

- The focus group discussions with communities were carried out in the local language. This was done with Red Cross volunteers who had experience working with the communities and conducting focus group discussions. They spoke the local language in the particular area. This allowed for participants to understand the questions and speak with ease since in most of the rural areas visited, the participants stated they did not speak English well.

- The same questions were asked in all focus group discussions to allow for triangulation of results.
- In all the interviews and some focus group discussions, a tape recorder was used to ensure that all information was recorded. This was not the case for all focus group discussions where the local language was being used during the discussion. However during the discussion, notes were taken down.
- Leading questions were avoided during the design of the interview and focus group discussion guide. The same was also applied during the interviews and discussions.

To ensure that the research was 'valid, reliable, accurate and precise', data from one source/method was used to cross check with that from another (Fisher, 2012). Therefore the data from the key informants at national level was checked with data from local level and documents. The data from the operator was cross checked with that from consumers and water supply reports.

3.6 ETHICAL CONSIDERATIONS

The study was approved by the ethical board of the university (APPENDIX E). During the data collection, the study was introduced to the informant (APPENDIX F) and participant information sheet was issued or read out and explained to the informants (APPENDIX G and APPENDIX H). Participation of the informants was voluntary throughout the study. Permission was sought from the participants to record the interviews and focus group discussions.

Appointments were booked with the various informants.

3.7 CHALLENGES TO THE METHODOLOGY USED

***Table* 3.6** lists the challenges that were encountered during the study and how they were resolved.

Table 3.6: Challenges encountered during the study

NO	CHALLENGE	ACTION TAKEN
1.	No opportunity to pilot the data collection tools.	Interview and focus group guide were reviewed during a kick off meeting with the WASH Coordinator of the Red Cross. Revisions were made to sections regarding billing to make it inclusive for systems that have kiosks. Follow up question regarding alternative water sources was added to determine when and why they are used. The first interview and focus group discussion were used also to determine the length required.
2.	Carrying out focus group discussion in local language	Volunteers from the Red Cross with experience with the community facilitated the focus group discussions in local language.

3.	Difficulty in organising focus group discussion at short notice because of a delay in selection of water supply schemes	Convenient sampling. The users were found at found at public stand posts and public areas (market) and discussed with.
4.	Selection of water point schemes which were not part of the scope for example in Uganda	A rural water supply scheme was selected using convenient sampling for the study although it was not implemented by the Red Cross.
5.	Travelling to new water supply scheme selected which had not been planned for.	Being prepared to use any means of transport available to travel to the system.
6.	Some data was lost in translation during the focus group discussions.	The facilitators of the discussions were briefed about expectations. This meant all the information was noted down and later sorted out.

4 RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter states the findings and discussion of data collected from the focus group discussions, key informant interviews, observation and document review as stated in Chapter 3. Section 4.3 to Section 4.5 provides information regarding the current cost recovery in Kenya, Rwanda and Burundi to answer objective two and section 4.6 identifies ways to improve cost recovery to answer objective three. Section 4.2 provides demographic information about the key informants and focus group participants. Section 4.3 provides information about the water supply systems visited in Kenya, Rwanda and Uganda. Section 4.4 provides data analysed and discussed from key informant interviews and document review. Section 4.5 provides information from data analysed and discussed from the focus group discussions held. Section 4.6 states how improvements in cost recovery can be made in rural water supply systems as analysed from the key informant interviews.

4.2 DEMOGRAPHIC DATA

Table 4.1: Key Informants Information

Country	Organisation	Number
Kenya	Bomet Water Company	4
	WASREB (Water Services Regulatory Board)	1
Uganda	MWE (Ministry of Water and Environment	1
	Local Government (District Water Officer)	6
Rwanda	FEPAIR	1
	RURA (Rwanda Utility Regulatory Agency)	1
	WASAC (Water and Sanitation Corporation)	1
	DISTRICT	2
TOTAL		17

Table 4.2: Focus Group Informants Information

Country	Water Supply system	Number of female participants	Number of male participants	Total
Kenya	Bomet Sergutiet	2	8	10
	Bomet	3	7	10
Uganda	Butiaba	5	2	7
	Kibibi	9	7	16
Rwanda	Pumped	3	3	6
	Gravity	2	3	5
TOTAL		25	26	51

4.3 WATER SUPPLY SYSTEMS

4.3.1 Kenya

Bomet Water supply comprises of an intake at River Nyongores. Raw water is pumped by two alternating pumps with a capacity of 50m^3/hour from the sump to the treatment works. The treatment works produces a total capacity of 75m^3/hour. There are three high lift pump sets of 30m^3/hour, 50m^3/hour and 63m^3/hour which operate one at a time. The system has three storage tanks with a total capacity of 335m^3. The total design capacity of the system is 1,800m^3/day. The system is run by Bomet Water Company on behalf of the county government. There are 1,056 connections with 781 active and 275 dormant. The taps visited were functioning and water flowing was clear with no particles.

The company issues paper bills to all consumers on a monthly basis door to door and by post to some commercial users. The users paid for water bills through mobile money, at the bank, at the operator's office and door to door. The revenue collected was kept in an account in a commercial bank with four signatories (commercial manager, technical manager, financial accountant and managing director who is mandatory).

Sergutiet water supply is a pumped water supply system within Bomet County. It is also run by Bomet Water Company. Previously the system was run by the community with no tariff. Water is pumped to a 100m^3 masonry tank from Kipsoni River. The system has 162 connections. The water bills are issued to the users door to door. The users paid any amount of the water bill at the operator's office or through mobile money. The money was kept in an accountant in a commercial bank.

4.3.2 Uganda

Kibibi water supply is a pumped water supply. Water is pumped from a borehole into a reservoir. The system has 217 domestic users and 2 kiosks. Length of distribution is 6.5km. The system is run by a private water operator, Trandit Limited and supervised by a Water Board (Sub County). At the time the system was visited, there was no water. The system pump had been taken to Mpigi town for repair due to a failure. The kiosk visited had satisfactory drainage.

The water bills are issued door to door to the users. The revenue was collected by the operator 'door to door', at the operator's office or at the bank. The revenue collected was kept in an account in a commercial bank. The signatories to the account were operator, sub county chief and sun county accountant. The users paid any amount of money during the course of the month.

Butiaba water supply is a gravity flow scheme set up to serve 7,000 people. The water from the system is abstracted from R. Waki, collected in sedimentation tanks and distributed by gravity to the users. The system has 7km of distribution, 36 domestic connections with 26 active connections and 12 stand posts (10 are functioning). Each stand post has an operator to clean and collect revenue as users fetch water. The system has an overall scheme operator in charge of O&M and collection of revenue from the stand post operators and private connections. There is also a Water Board in place. The stand posts were clean, well-drained and fenced. The water during the visit was clear with no particles.

The revenue was collected by the stand post operator at the stand post while the users fetched water (pay as you fetch). This revenue was collected by the scheme operator at the end of the month. The revenue from individual connections was collected door to door at the end of the month by the scheme operator. The revenue was saved in a Savings and Credit Cooperative Organizations (SACCO) account at the sub county office.

4.3.3 Rwanda

Two water supply systems were visited in the Northern Province in Rulindo district.

Nyirambuga pumped water supply with 68 stand posts and 128 private connections.

Cyongo gravity flow scheme. The stand post visited was functioning and had proper drainage. The water was clear with no particles. Both systems in the district were run by one private water operator, CTH. The revenue was collected 'pay as you fetch' at the stand post. All stand posts were metred. The scheme operator collected the revenue at the end of the month and verified the collections with the metre readings. The users with private connections paid their bills at the bank after which the operator collected the payments slips for verification.

4.4 KEY INFORMANT INTEVIEW DATA AND ANALYSIS

The transcripts from the interviews (APPENDIX I) were analysed together with country specific documents as in Chapter 3 and findings are clustered as below.

4.4.1 Enabling environment

In Kenya, water reforms were initiated and culminated into the Water Act 2002. In the water act of 2002, water service provision was separated from regulation. In 2010, the constitution was revised and two levels of government were stipulated for the provision of water service; the central/national and county government. The county government (local level) was given the mandate to oversee water service provision. The separate institutions under the water act are, Ministry of Water and Irrigation (MWI), Water service Trust Fund (WSTF), Water Services

Regulatory Board (WASREB), Water Services Boards (WSB), Water Resources Management Authority (WRMA) and the Water Appeals Board (WAB). Others are Water Service Providers (WSPs), Catchment Area Advisory Committees (CAACs) and Water Resource Users Association (WRUAs) as shown in ***Figure 4.1***.

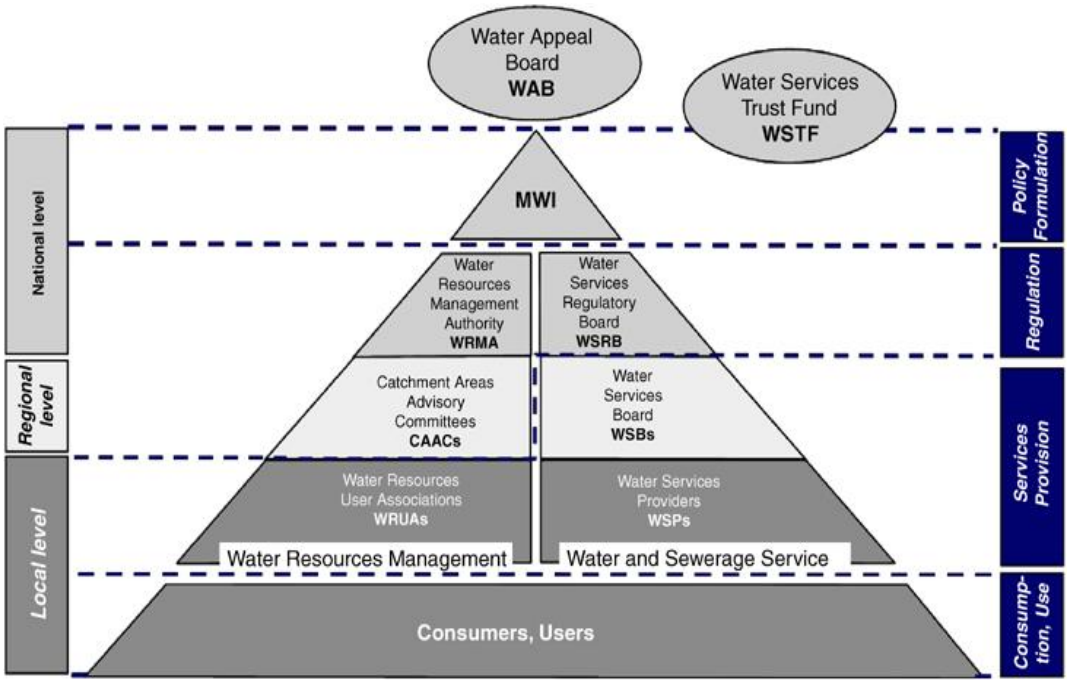


Figure 4.1: Kenya Water sector reform, Institutional Framework

WRMA is responsible for regulation of water resources issues. WASREB is responsible for the regulation of water and sewerage services by giving guidelines for tariffs. WSB is responsible for the efficient and economical provision of water and sewerage services within its area of jurisdiction. The Ministry of Water and Irrigation deals with policy formulation and direction, sector coordination, planning and financing. The Water Act 2002 states that the tariff for rural water supply system has to meet at least O&M costs. Once the service provider has calculated the tariff based on the water supply costs and carried out public consultation and advertising in public media, the operator submits the tariff to WASREB for approval. According to WASREB, the amount of money spent on water should not exceed 5% of the income.

In Rwanda, the national policy and strategy for water supply and sanitation states that there should be development of management infrastructures and Public Private Partnerships (PPP) to ensure functionality of infrastructure. It also emphasises decentralisation through delegation of water and sanitation service delivery to districts and the use of Private operators to carry out O&M. The Rwanda Utility Regulatory Agency (RURA) has the mandate to supervise private

operators and regulate tariffs. At the local level, districts are to prioritise rural water supply and plan and budget for capital investment and carry out O&M. The district is also to carry out monitoring and auditing of private operators as well as training and capacity building. However local government support varies by district depending on the priority level given to rural water supply. Forum for Private Operators of Water and Sanitation Systems (FEPEAR in French) was formed in 2011 as a platform to lobby for interests of the Private Operators, share good practices and build capacity.

The National Strategy for rural water and sanitation states that tariffs for rural water supply are to meet the running O&M costs and cost recovery should aim at repair and replacement of electromechanical equipment. The tariff is calculated based on revenue requirement (tariff formula) for O&M, depreciation and cost of capital as well as the WTP of the users. Currently tariffs were negotiated between the district and private operator depending on the terms of management of the system. However discussion with RURA stated that the tariff for rural water was high and thus a rural water tariff review was carried out. Recommendations from the review await approval. One of the recommendations of the review was to lower the tariff by 20%. It was also proposed that one district should have one private operator to manage all systems in the district and benefit from economies of scale. During the discussion it was also stated that there was no special tariff for low income earners however they were expected to fetch water from public stand posts.

In Uganda, according to the Water Act 1997 and the national policy framework for O&M, the central government, Ministry of Water and Environment (MWE) is in charge of policy formulation and setting standards & guidelines, mobilisation of funds and capacity building for O&M with support from Development Partners and NGOs. The Districts are to provide back up support, technical guidance to the sub county, carry out monitoring of the systems and maintenance by use of conditional grant (CG) from MWE. The sub county is to plan and oversee implementation of development programmes as well as provide for follow up support and co-finance repairs. The community is responsible for the recurrent costs of water supply. Umbrella Organisations (UOs) were set up to enhance operational performance and sustainability of piped water schemes and sanitation facilities in Small Towns and Rural Growth Centres by helping with maintenance and extensions/expansions among other roles. UOs are regional associations of Water Supply & Sanitation Boards. Financing of UOs is from conditional grant from MWE and funds from DPs.

The rural department stated that there was no standard way of setting tariffs however they were calculated by the design consultant during feasibility and detailed study of the system or by a

private operator. The design consultant factored in the O&M costs as well as the WTP of users. The tariff for pumping systems was based on energy costs, staff structure and replacement of running parts while for gravity systems it was based on staffing structure and replacement of running parts. According to the district and MWE, the tariff was to be approved and accepted by the water board, community leaders and minister of MWE. From interview with MWE, it was stated that there was no special tariff for the poor but it was up to the community to decide who should fetch water for free.

All the countries, policies and strategies are in place to ensure sustainability of rural water supply. Consumers have been given the responsibility to meet O&M costs. In all countries, management of rural water supply systems has been delegated to the lowest level for efficiency and effectiveness. In Kenya, there was a national regulator in place to approve and monitor implementation of the tariffs which was the same in Rwanda. In Uganda, there was no national regulator in place but tariffs were approved and monitored by Central government.

4.4.2 Tariffs and cost coverage

The tariffs for the different water supply systems are as shown in ***Table 4.3***. The tariff in Bomet was stepped as shown in ***Table 4.4*** while in Sergutiet, it was a flat rate. The tariff in the pumped system was high compared to the gravity system in Uganda. This was due to the increased cost of pumping and O&M requirements for a pumped systems. However in Rwanda, the tariff was the same for both pumped and gravity. This was due to the need to have a harmonious tariff in the district since one operator managed all the systems as explained by the district and operator.

Table 4.3: Water tariffs (USD) in visited schemes in Kenya, Rwanda and Uganda

Country	Kenya		Rwanda		Uganda	
System	**Metered (Bomet)**	**Non metered (Sergutiet)**	**Pumped (Nyirambuga)**	**Gravity (Cyongo)**	**Pumped (Kibibi)**	**Gravity (Butiaba)**
Tariff per m^3	Stepped tariff see Table 4.4	4.94 /household /month	1.24	1.24	0.90	0.49
Tariff per 20L jerry can(kiosk / stand post)	0.02		0.03	0.03	0.06	0.01
Tariff per m^3 (kiosk /stand post)	0.99		1.38	1.38	2.99	0.50

In Kenya, the tariff for Bomet Water supply was inherited from the previous management of the system. A stepped tariff is used with a lifeline block. Consumption up to $6m^3$ is sold at USD 2.5

Table 4.4: Tariff structure Bomet water

supply

m^3	Tariff(USD)
0-6	2.5 (flat rate)
7-20	0.5
21-50	0.6
51-100	0.8
101-300	1.0
Over 300	1.3

inclusive of the meter rent. The meter rent is to carry out routine servicing of the meter. Any additional m^3 is charged according to subsequent rates shown in ***Table 4.4***. The 0 – $6m^3$ is a subsidised block and is used as a pro-poor strategy for low income earners. This means that at this block, each m^3 is sold at USD 0.33 and USD 0.5 for meter rent. Therefore consumption within this first block is cross subsidised through the higher rates in the other blocks. The revenue collected in 2014/15 was meeting only 22% of the O&M costs. Projections done for the next four financial years show that the tariff will meet a maximum of 89% of the costs as shown in ***Table 4.5***.

Table 4.5: Bomet Financial Performance (Amounts in USD)

Item	Year 2014/15	Year 2015/16 (Forecast) (1)	Year 2016/17 (Forecast) (2)	Year 2017/18 (Forecast) (3)	Year 2018/19 (Forecast) (4)
Total Billing	565,381	651,916	839,589	938,364	1,037,139
Revenue Collected	234,868	553,141	790,202	888,977	987,752
O&M Costs	1,064,852	1,263,829	1,342,849	1,516,199	1,145,792
Deficit	(829,984)	(710,687)	(552,647)	(627,222)	(158,040)
Cost Coverage	22%	44%	59%	59%	86%

The commercial manager stated that the tariff was outdated and an application had been made to the Regulator to increase the tariff.

In Sergutiet, the operator stated the flat rate was used for the system because of the lack of metred connections. The community had not been paying and collecting revenue for running the system. Therefore the flat rate was calculated based on the accumulated electricity arrears and set to pay up arrears in electricity and ensure continued running of the system. The flat rate was agreed between the county government, community leaders and the operator.

In Rwanda, the tariff was calculated and set between the district leaders and operator. The operator stated that the level two contract signed with the district gave the responsibility of O&M to the operator. The users stated that in a meeting it was explained that the tariff was increased because of increased expenses and a new operator. The researcher was not able to determine the cost coverage for both systems as the reports were not obtained during the study due to the limited time in the area.

In Uganda, the tariff per m^3 in Kibibi was revised and increased from USD 0.4 to USD 0.7 to pay off arrears in electricity. The tariff was later increased from USD 0.7 to USD 0.9 in 2015 as above in ***Table 4.3*** due the increasing costs of pumping using electricity. The tariff was revised in consultation with the community leaders, operator and district and approved by the Minister of Water and Environment. The users stated the reason for the new tariff was explained to them.

Table 4.6: Kibibi Financial Performance May 2015

Item	Amount in USD
Amount Billed	700
Amount collected	621
Collection efficiency	79%
Operation costs	540
Surplus	81
Cost coverage	115%

The revenue collected was meeting the operational costs (power, salaries and minor repairs for example pipe bursts) and had a surplus of USD 81 as shown in ***Table 4.6***. However the operator stated that this surplus was not enough to meet the cost of making extensions and new connections.

In Butiaba, the tariff was set by a design consultant to meet the O&M costs.

The consultant carried out a WTP study to determine what the users were able and willing to pay. The tariff was approved by the Sub County and district. The tariff was meeting all the operation and minor maintenance costs. These costs included payment to the stand post operator to clean around the stand post and collect revenue, repair taps and pipe bursts. The stand post operators were paid 20% of revenue collected. There was a surplus of 39%, as shown in ***Table 4.7***. The operator and water board member stated that the surplus was used to carry out extensions and purchase taps although they had to wait a quarter to accumulate enough funds to do so.

Table 4.7:Butiaba Financial Performance for May 2015

Item	Amount in USD
staff costs	54
Repairs	24
Subscription to UO	15
Fuel consumption on transport	36
Management fee	120
Total O&M	248
Revenue collected	344
Surplus	96
Cost coverage	139%

The elderly and disabled were allowed to fetch water free of charge from the stand post. The rural department stated that *'Households with orphans, the lame and elderly may be allowed to get free water by the community but this is not encouraged since the tariff is affordable.'* The rural department stated the tariff was affordable since users were to meet only the recurring costs and minor maintenance. Users using 3 stand posts in the systems were not paying

for water. The operator stated that the politicians in the area had told the community surrounding these stand posts that the water was free.

In the systems visited, there was an emphasis of involvement of users during tariff setting, this was done through involvement of community leaders and information sharing to users. This makes the tariff process participatory. The tariffs in the systems visited were set by the design consultant, operator. The revenue was collected using different methods door to door, payment using mobile money, payment in the bank, pay as you fetch and in the office and the users were aware of them as shown in ***Table 4.8***. This gave the users different options and convenience.

Table 4.8: How tariffs and collected in the water supply systems

Country	Water Supply System	How/who set tariff	Collection of revenue	Cost coverage
Kenya	Bomet	Inherited from old management	Paid at office, mobile money	22%
	Sergutiet	Operator set based on electricity arrears and	Paid at office, mobile money	Not determined
Rwanda	Nyiramung	Operator based on TORS	Pay as you fetch, paid at bank for private connection	Not determined
	Cyong	Operator based on TORS		Not determined
Uganda	Butiaba	Design Consultant based on estimated O&M costs and WTP	Pay as you fetch, door to door	139%
	Kibibi	Design consultant based on estimated O&M costs and WTP , revised by Operator due to increasing O&M costs	Door to door, paid at office, paid at bank	115%

From the above analysis, when the tariff is set by the operator or design consultant, there is cost coverage as in Uganda. However the tariff should also be revised to meet the changing costs as in Kibibi. In Kenya where the tariff was inherited, it was covering only 22% of the O&M costs. The commercial and technical managers attributed this to low tariff level and inefficiencies in the system for example non-revenue water which were increasing the costs of water supply. The study was not able to establish cost coverage for the schemes in Rwanda and Sergutiet water supply in Kenya. The operator discussed with in Rwanda did not have access to the documents at the time and there was a limited amount of time spent at the scheme.

Tariffs should also be fair and equitable. None of the systems visited had social tariffs for the poor however some strategies were in place. The stand posts and kiosks were lower service levels for low income earners who were not able to afford the private connection but in the long run, users paid a higher for a cost of a m^3 of water (as shown in ***Table 4.3***).This shows that the low income earners are still paying as the high income earners or even higher. In Kenya, the lifeline tariff will benefit the poor if they have private connections and use only $6m^3$ of water. In Kibibi water supply, free water was given to the lame and elderly.

Tariffs should encourage resource conservation. In the systems where consumers paid according to water consumption per jerry can or through a metred connection this was being achieved. This was the case in all the systems in Uganda, Rwanda and Bomet in Kenya. However in Sergutiet, a flat rate was being used. This meant consumers used as much water as they could because they were not paying per water consumed.

4.4.3 Subsidies

The key informants were asked which subsidies were available for rural water supply systems and when they were available.

In Kenya, the water company stated that they received subsidies from the county government. The subsidies included capital investments, cost of electricity and paying staff. According to the commercial manager, a subsidy account was run where the county government deposits money for payments and salaries for the employees. The agreement for subsidies was done at the beginning of the financial year. It was agreed that an average of USD 59,265 (6M KSH) for electricity per year. However during the course of the year, the budget is reviewed and revised quarterly and in case of need for extra funding, a supplementary budget is requested for from the county government. The commercial manager stated that the tariff was to be revised to meet O&M costs however the tariff was not to pay for inefficiencies in the system for example unaccounted for water due to illegal connections, no system metering, pipe bursts and old pipe network which increase the costs of water supply.

In Rwanda, the operator stated that they had a level two contract and were not entitled to any subsidies from the district. Thus the operator was to carry out O&M during the five year contract period without subsidies from the district.

In Uganda, the private operator for Kibibi stated that the government stopped providing subsidies in form of conditional grant to the system. The operator stated that the conditional grant was used

to make extensions and new connections. The district and MWE stated that the allocation of conditional grant was for systems that were not able to meet O&M costs and for point water sources. The system was not part of the UO.

In Butiaba Uganda, the operator stated that they were part of the central umbrella organization. The District Water Officer stated that '*No support is given to the Butiaba system, there is no funding at the district to support the scheme since the system is collecting money and they are part of the UO'.* The rural water department in the ministry of water and environment stated that water supply systems joined umbrella organisations to have access to subsidies from the government. The rural department in MWE stated that, *'the tariff does not take care of major extensions and replacement.'* Thus for these rural systems, there has to be a mechanism for the provision of subsidies

Subsidies when planned well can contribute to the sustainability of the system. Subsidies are provided to meet financing gaps in revenue. This is the case in Kenya where the government is providing direct subsidies for electricity, staffing costs and capital investments. The Minister of water in Bomet County stated this was the case because *'the tariff should not be prohibitive because access to safe water is a constitutional right thus the county government is taking the step to subsidise the system so that the tariff is low.'* This should not be the case as users should meet O&M costs but is done as a transitional step to improve the water supply service.
In Uganda, Butiaba water supply is getting subsidies through the Umbrella Organisation. This can be seen as a form of indirect subsidy since the scheme operator is supported. The operator of Kibibi Water supply stated the system was not able to finance extensions and new connections in time because the conditional grant was suspended. Therefore continuity of the subsidies is important otherwise it can compromise the sustainability of the systems.

4.5 FOCUS GROUP DATA AND ANALYSIS

Table 4.9, ***Table 4.10*** and ***Table 4.11*** provide responses from selected questions (APPENDIX B) from the Focus group discussions in the six water supply systems.

Table 4.9: Responses from Focus Group Discussions in Kenya

No.	Questions	Bomet	Sergutiet
1.	How many hours a day is the water available?	Morning 3 hours, thrice a week	3 - 4 hours a day
2.	What would you say about the water quality?	water quality good, no particles	Not good quality, has brown particles
3.	Are you satisfied with the water supply service?	not satisfied coz water not reliable	not satisfied, quality is not good and not reliable
4.	How much do you pay for	the tariff is high it should be	500 Kenyan shillings/month

No.	Questions	Bomet	Sergutiet
	water? Do you think the amount of money you pay for water is worth the	lowered	
5.	Why do you think we pay for water?	water is clean and we need it, no need to go to the river or hire people	get water, for system repairs
6.	Do you use other sources of water?	rainwater, use water vendors	rainwater , boreholes, springs
7.	If yes, Why? When?	to afford water, no water, rain available and free	during rainy season, for drinking, cattle use boreholes, prefer taste of spring water
8.	What information does the operator provide?	explained the tariff	told about the tariff
9.	What information or aspects of the water supply does? What information do you expect from the operator? (Revenue collection and expenditure).	as long as we have water, reduce tariff	yes we need to know because we are paying a high tariff and water is not available always, install meters

Table 4.10: Responses from Focus Group Discussions in Rwanda

No.	Questions	Gravity (Cyong)	Pumped (Nyiramunga)
1.	How many hours a day is the water available?	6-10am, 11am-2pm, 3pm-9pm	6am - 8am, 12pm-2:30pm, 6pm-8pm
2.	What would you say about the water quality? Taste, colour	water quality good except when it rains	water is clear, no particles, no smell
3.	Are you satisfied with the water supply service?	Not because tariff is high, some taps don't have water	yes water is always there except tariff
4.	How much do you pay for water? Do you think the water you use is worth the amount of money you pay?	20 Rwandan francs per jerry can	20 Rwandan francs per jerry can
5.	Why do you think we pay for water?	for repairs, pay operator	pay for electricity, repair, pay operator
6.	Do you use other sources of water?	Spring	Spring
7.	If yes, Why? When?	when we do not have money	we do not have money to pay for water
8.	What information does the operator provide?	new tariff because of increased expenses	New tariff
9.	What information or aspects of the water supply does? What information do you expect from the operator? (Revenue collection and expenditure).	we just need clean water	there are community representatives at the district, we need water only

Table 4.11: Responses from Focus Group Discussions in Uganda

No.	Questions	Responses from FGDs (Kibibi)	Responses from Butiaba

No.	Questions	Responses from FGDs (Kibibi)	Responses from Butiaba
1.	How many hours a day is the water available?	7am-2, sometimes all day no water, only morning, morning up to 2pm, 7-4pm	morning to evening, sometimes not available all week
2.	What would you say about the water quality? Taste, colour	once water was bad but now good, good quality no particles, taste is ok, no smell	sometimes water is brown when it rains, clear no smell, no particles
3.	Are you satisfied with the water supply service?	no water is available for few hours, tariff is high yes water quality is good, better than before	no because sometimes there is no water
4.	How much do you pay for water? Do you think the water you use is worth the amount of money you pay?	UGX 3000 per unit of water used, ok high	3 jerry can at 100 UGX but it is high
5.	Why do you think we pay for water?	to maintain the system, pay for electricity, pay the operator, use the water	Pay the operator, water is safe
6.	Do you use other sources of water?	yes spring, storage in jerry cans, rain water, borehole	use lake for washing and cleaning,
7.	If yes, Why? When?	when no water and reduces bill	when no water and reduces bill, piped water is expensive
8.	What information does the operator provide?	explained the need for a new tariff in a meeting because of VAT, electricity	sensitised to use water and pay for it because of cholera
9.	What information or aspects of the water supply does? What information do you expect from the operator? (Revenue collection and expenditure).	the water board receives that information, all we need is reliable water	the sub county receives that information, we need water all the time

The above responses were analysed as described in Chapter 3 and findings and discussion are presented in Sections ⁋4.5.1, ⁋4.5.2, ⁋4.5.3 and ⁋4.5.4

4.5.1 Tariff and Affordability

The users were asked about the tariff, if they thought it was affordable and if they were paying for water as in Questions number 4 and 5 in ***Table ⁋4.9***, ***Table ⁋4.10*** and ***Table ⁋4.11.***

In Bomet Kenya, 57% of the users stated that the tariff was high and 43% stated it was ok. They stated they were paying for the water because they used clean water within their premises.

In Sergutiet, all the users stated that the flat rate was high and not as per their consumption.

'It is not fair that I pay the same amount of money for water as a hotel or a school'. User, Sergutiet

However they stated they paid for repairs in the

system and for the water service.
In Nyirambuga Rwanda, in the one discussion held, all users stated that the tariff was high and were requesting for it to be reduced by half. They stated that they paid for repairs, electricity and the operator to manage the system.
In Cyong, in the discussion users stated that the tariff was high. They stated the tariff had been doubled but the old tariff was more affordable. They stated that they paid to contribute for tap repairs and pay the operator to manage the system.

In Kibibi Uganda, 56% stated that the tariff was high and 44% stated it was okay. However 69% stated they paid for the system's O&M and water quality was good. The O&M stated by users included electricity payments, repairs and payment to the operator. The remaining 31% stated that they used good quality water at their premises so they had to pay for the service.
In Butiaba, 71% of the users stated that the tariff was high and 21% stated it was okay. However, all the users stated they paid for system repairs and wanted to fetch safe water.

In all the systems, over 50% of the users stated that the tariff was high. This is the case in rural water supply systems and this discourages consumption of water from an improved water supply system (Arouna and Dabbert, 2012; Gine and Perez-Foguet, 2008) for example in Kibibi Uganda the rural water tariff (USD 0.67/m^3) is higher than average water tariff (USD 0.9/m^3) in urban areas run by the National Utility (NWSC, 2015). The users also stated they used and paid for the water to facilitate O&M of the system and access good quality water. This emphasises the need for water supply users to understand the need to pay for water. This was the case in all the systems.
However the tariff for water supply systems needs to match the ability of users to pay otherwise they will resort to cheaper unsafe sources.

4.5.2 Satisfaction

The consumers were asked how many hours they received water and if they were satisfied with the water service as in Questions 3 in ***Table 4.9***, ***Table 4.10*** and ***Table 4.11***.

In Bomet, all users stated that they received water only in the morning for about 3hours, three times a week. However 29% stated they were aware that the water was not enough and was being rationed. 57% of the users stated they were not satisfied with the water supply. The reason given was that the water supply was not available all day. However 43% stated they satisfied because the water quality was good and water was now closer to them in their compounds.
In Sergutiet, 60% of the user stated they received water for 3 hours and the remaining 40% stated they received water for 4hours. All the users stated that they were not satisfied with the water

supply because it was not available all day and the water quality was not good. It was brown with particles.

In Nyirambuga, the users stated they received water for 6.5 hours in a day during times agreed with the stand post operator. The users stated they were satisfied with the service.
In Cyong, the users stated they received water for 12 hours in a day during times agreed with the stand post operator. The users stated they were not satisfied with the service because some taps were not functioning and therefore they had walk longer distances downhill and uphill to get water.

In Kibibi Uganda, 50% of the users stated that they received water for 7 hours, 31% stated they received for 5 hours and 19 stated 3 hours. The system had only one source of energy for pumping. However 69% of the users stated they were satisfied and 31% said they were not. The 69% stated that the water quality was good, they did not have to walk long distances or hire people to collect water with the piped water. The rest cited unreliability of the water supply as their reason of dissatisfaction. This is as shown in ***Table 4.12***

Table 4.12: Satisfaction of users

Satisfied	Percentage	Reason
Yes	69%	water is of good quality, no need to walk long distance or hire people to fetch water
No	31%	unreliable water

In Butiaba, 71% of the users stated they were not satisfied with the service because sometimes they do not have water for a week. They also mentioned that sometimes the water is brown with particles.

Rural water supply systems should supply water for at least 8 hours. (Schweitzer and Mihelcic, 2012). Cyong one system in Rwanda was providing water for more than 8 hours (12 hours). However not all taps were functioning hence the users were not satisfied. In Nyirambuga where the system supplied water for 6.5 hours users stated they were satisfied. In Butiaba users stated their dissatisfaction was due to intermittent water. However in Kibibi users stated they were satisfied with the system not because of the number of hours they assessed the water, but because of water quality and convenience. In Kenya, all users in Sergutiet and more than half stated they were dissatisfied because of intermittent water supply.

It is the case that satisfaction is influenced by the availability of water and a number of other factors for example water quality. When water supply users in a system are not satisfied, it affects their willingness to pay for the service. Water service providers should be aware so that users are

kept satisfied. Therefore, the satisfaction of community needs to be sustained so that they continue paying for the water supply (Harvey, 2007).

4.5.3 Alternative Sources

The users were asked whether they used alternative water sources, when and why as in Question 6 and 7 in ***Table 4.9, Table 4.10*** and ***Table 4.11***.

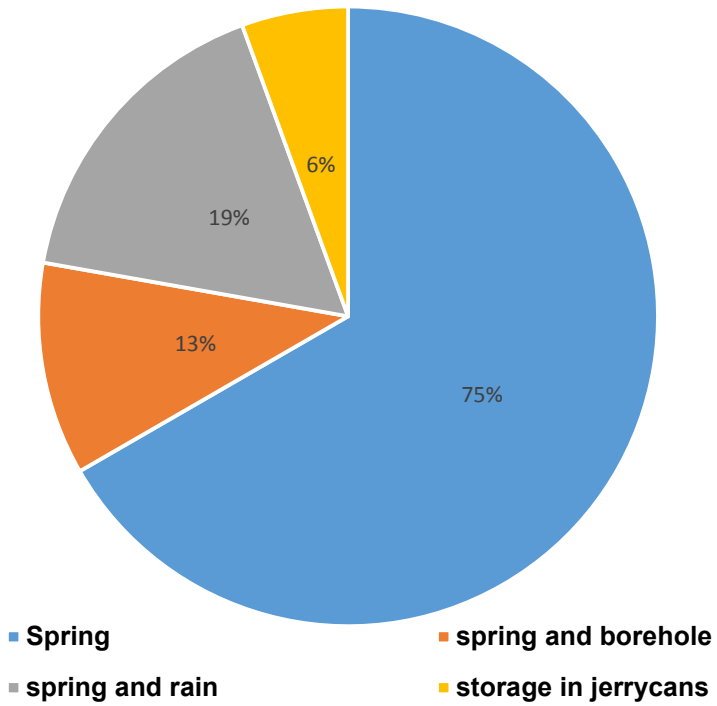
In Bomet Kenya, 47% of the users stated they used rainwater when there was no piped water and to reduce the expenditure on water. The 53% stated they bought water from water vendors as shown in ***Figure 4.1***

Figure 4.1: Images showing a water vendor using motorcycles to fetch water

In Sergutiet, 60% stated that they used rain water while 40% stated they used a combination of borehole water for cattle, spring water and rain water for drinking. The reason for this was that they preferred the taste of the spring water and the borehole water was salty which to them was suitable for cattle.

In Nyirambuga Rwanda, the users stated they used water from the spring when they did not have money to pay for water. They stated that most times they bought water for drinking from the stand post and fetched the rest for other uses from the spring. This was the same in Cyong.

> *'The water tariff is high and sometimes we do not have money to pay for a jerry can. So we buy water for drinking and fetch the rest from the spring. The spring is very far but sometimes we do not have money.'* User Cyong water supply



In Kibibi Uganda, 75% of the users stated that they used springs. The rest used a combination of spring and rain (19%), spring and borehole (13%) and starge in jerrycans (6%) as shown in ***Figure 4.2***. The reason 15 users gave was because of the intermittent water supply. One user stated that using an alternative source reduced the expenditure on water.

Figure 4.2: Pie chart showing use of alternative water sources

In Butiaba, all users discussed with stated that they used the lake water for washing because they were not able to afford to use the piped water for all uses. They also stated that it was the only source of water when there was no piped water.

The use of alternative sources of water is a copping mechanism by consumers due to high tariffs of improved water supply. (Arouna and Dabbert, 2012; Gine and Perez-Foguet, 2008). This is the case in all systems in Rwanda and Butiaba in Uganda. However some users were using alternative sources as a coping strategy to the intermittent water supply as seen in Kibibi Uganda and Bomet in Kenya. The availability of a more convenient source of water for example rainfall was also a reason. Tastes and preferences in Sergutiet was also a reason for use of alternative sources. These other reasons for example intermittent water supply and high tariff if not solved, will mean that users will continue using these sources and thus move away from the improved

water supply. This compromises the sustainability of the system due to reduced use. The water supply systems will be underutilised hence reduced revenue collected.

4.5.4 Monitoring and Evaluation

The users were asked if they would like to be given information regarding revenue collection and expenditure as in Question 7 and 8 in ***Table 4.9, Table 4.10*** and ***Table 4.11***.

In Bomet Kenya, users stated they did not need to receive any information regarding revenue collection and expenditure as long as they had water all hours in the day.
In Sergutiet, 60% stated that flat rate was much higher compared to the water used and felt they needed to understand how all the revenue was being used by the operator. However 40% stated they did not want/need that information but wanted meters installed.

The users in Nyiramunga in Rwanda stated that they had representation at the district and felt that these leaders should be given this information. However they stated that as long as they had water, they did not need revenue data from the operator. The users in Cyong also stated that all they needed was water supply.

In Kibibi Uganda, in all the discussions, the users stated that this information was given to the leaders at the sub county office and so they did not need it. However they stated that all that they needed was to have water 24 hours a day.
For Butiaba they stated that they did not need the information as long as the water was available and of good quality.

From literature reviewed one way suggested for accountability is for the operators to provide information to the users regarding revenue collection and expenditure (Mandara et al., 2013). However this is not the case in these water supply systems. The users perceive good water supply service as a form of accountability from the operators. This was the same in a study conducted in Tanzania (Haysom, 2006). This is due to the fact that the users are aware and make the link between revenue collected to meet costs of water supplied. As seen in section 4.5.1, users understood why they paid for water. They understood that the revenue collected was used to carry out O&M in the system. Another factor is that they paid per unit consumed or per jerry can.
Therefore monitoring and evaluation should be done by the district officials and community leaders to ensure that the private operators are held accountable.

The exception was in Sergutiet which is the case because the users felt they were paying a higher amount of money compared to the amount of water consumed. This also makes it unfair since the users used alternative sources which with a metred connection translates to a reduction on the amount of money spent on water.

4.5.5 Comparing the financial data with the service quality data

Table 4.13: Comparing the cost coverage with service quality data

Country	**Kenya**	**Uganda**	
Water Supply	**Bomet**	**Kibibi**	**Butiaba**
Tariff (m3)	stepped tariff	0.9	0.49
Cost coverage	22%	115%	139%
Tariff affordable	43%	44%	21%
Hours of water supply	3hours	3-7hours	5hours and above
Satisfied users	43%	69%	29%
Alternative water sources	Rainwater, water vendors	Rainwater, borehole, spring	lake
need for accountability	0	0%	0%
Subsidies available	yes	no	yes
structures for O&M	yes	yes	yes

From the table above, the high cost coverage in Kibibi is due to a high number of consumers finding the tariff affordable and also more than 50% being satisfied with the water supply system due to the good water quality. The alternative sources available are also not convenient for the users so they use the piped water supply. However, this is not the case in Butiaba since only 21% of the consumers find the tariff affordable and only 29% are satisfied. The high cost coverage in Butiaba is due to the fact that users still use the water supply since it is the only available clean water in the area. The lake water is not clean and the ground water is salty. In Bomet, the water supply is only available for 3 hours and only 43% are satisfied with the water supply because of the water quality and convenience when it is available. However, the users are forced to use other alternative sources of water.

4.6 IDENTIFY WAYS OF IMPROVING

The third research objective was to identify ways of improving cost recovery in rural water supply systems. The key informants were asked how cost recovery can be improved. ***Table 4.14*** provides a summary of suggestions from key informants.

Table 4.14: Responses from semi-structured interviews on how to improve cost recovery

ORGANISATION	SUGGESTION
Minister Bomet	• sensitize rural people on cost of water supply, • improve water service
Technical manager, Bomet Water	• provide well planned subsidies from the beginning, • efficiency in operation to reduce costs by use meters
Managing Director, Bomet Water	• improve water service by use of meters, • increase tariff
Managing Director, WASREB	• subsidize private connections to increase revenue base
Commercial manger, Bomet Water	• water supply design should be done well to minimize costs • determine tariff at the beginning based on costs • involve the community so that they understand
Commissioner, MWE	• Political statements should support payment of water service, • proper management of revenue, • ensure backup and follow up structures for O&M
District Water Officer, Bullisa	• Systems need to be metered to allow for proper monitoring, • government should provide capital investments to expand schemes
District Water Officer, Mpigi	• use private operators who are professional
Permanent Secretary, Fepair	• provide meters in all schemes from the beginning, • need to sensitise community that water service has a cost, • the Regulatory authority needs to monitor the implementation of tariffs in the districts

Using the above responses and the issues identified in the water supply systems, the following are recommended to improve cost recovery in water supply systems;

1. Tariffs should be set based on costs that need to be recovered and willingness to pay of the users. Therefore;
    - Costs of O&M should be estimated during the design of the system by the design consultant or operators. This will ensure that proper estimates are done. This will also give guidance on which costs can be recovered.
    - Willingness to pay surveys or focus group discussions need to carried out to estimate how much the users can pay.
2. Subsidies need to be planned and budgeted for. It has been acknowledged that revenue generated from tariffs will not meet all the O&M costs. Once the deficit is determined,

financing strategy needs to be developed by the local government. This include determining where and how the deficit will be recovered.

3. Tariffs should be increased in a gradual manner. This increase in tariff should be accompanied by improved water supply service. Consumers should also be informed about need to increase.
4. Tariffs should be introduced to the system as soon as the users start consuming water from the improved water supply. This will prevent resistance.
5. Meters need to be installed in a phased manner in these schemes to allow for proper monitoring of the system and also ensure that consumers are paying for amount of water used. For new systems, meters should be installed as early as possible.
6. Initial connection fees should be subsidised to ensure that even the low income earners can access water through a private connection which provides water per m^3 at a cheaper rate compared to the stand post and kiosks.
7. Users need to be sensitised about the importance of safe water supply and understand that there is a cost attached to it.
8. Politicians need to be sensitised by government officials, private operators and development partners so that their statements do not compromise the sustainability of water supply systems but encourage users to pay for water.
9. Rural water supply systems need training of water boards and other community structures so that they can be able to carry out proper monitoring of the system. There is need to follow up on these structures to ensure that they are in place.
10. Management of piped rural water supplies should be done by private operators because they are less influenced by the politicians in the area compared to water user groups.

4.7 SUMMARY

Key findings show that regarding cost recovery in the piped rural water supplies;

- In Kenya, the tariff was meeting only 22% of the O&M costs and was considered high by most users. In Uganda, the tariffs in both systems were meeting operation and minor maintenance costs and the tariff was considered high. In Rwanda, the tariff was considered high by the users.
- In all the systems, the users stated they did not need information regarding revenue collection and expenditure but needed constant supply of good quality water.
- The systems needed subsidies from government to meet the deficit in revenue but also to carry out system extensions and new connections.
- There is use of alternative water sources because of intermittent water supply, and high tariffs and due to tastes and preferences.

5 CONCLUSION

5.1 INTRODUCTION

The chapter shows how the research objectives were achieved as in section 5.2. Recommendations for improvements in cost recovery are stated in section 5.3 and for further research in section 5.5. Limitation of the study are also stated in section 5.4.

5.2 HOW RESEARCH OBJECTIVES WERE ACHIEVED

The aim of the study was to determine current cost recovery in piped rural systems and identify ways of improving.

The first objective was to investigate how cost recovery can be applied to contribute to sustainability of piped rural systems in developing countries. This was done by carrying out a literature review as in Chapter 2. Elements of cost recovery were determined and ways of determining them was explained.

The second objective was to investigate and evaluate how cost recovery was currently applied in Kenya, Rwanda and Uganda. This was done by carrying out field work as described in chapter 3 and findings and discussion were presented in Chapter 4. It was found that;

- In Kenya, the tariff was meeting only 22% of the O&M costs and was considered high by most users.
- In Uganda, the tariffs in both systems were meeting operation and minor maintenance costs and the tariff was considered high.
- In Rwanda, the tariff was considered high by the users.
- In all the systems, alternative water sources were being used because of intermittent water supply and also to reduce expenditure spent on water and due to tastes and preferences.
- In all the systems, the users stated they did not need information regarding revenue collection and expenditure but needed constant supply of good quality water.
- The systems needed subsidies from government to meet the deficit in revenue but also to carry out system extensions and new connections.

Following this therefore, revenue collected from users is not sufficient to meet all O&M costs therefore subsidies should be carefully planned and provided to meet the deficit in revenue. Users need to understand the link between revenue collected and its use for O&M. This will enable them understand the need to pay for the water and pay for it.

Tariffs for rural water supply system should be set based on the operation and maintenance costs, ability of users to pay and with consultation with the users. Users should also pay for water based on consumption. Tariffs for rural water supply system should be increased in a gradual manner to cater for changes in O&M costs and ability to pay of users matched by improvements in water supply service.

The third objective was to identify ways to improve cost recovery of rural water supply systems. These ways were determined as in Chapter 4. Recommendations for the systems are as stated in section 5.3.

5.3 RECOMMENDATIONS

Kenya

- The operator needs to improve the water supply in the area. This will ensure that the users are accessing water for more than three hours a day.
- The operator needs to meter all the connections in a phased manner to ensure that their checks in the systems and also enable users pay for water consumed.
- The initial connection fee needs to be reduced so that even low income earners can be able to access the water and benefit from the lifeline tariff block.
- There is need to finalise the change in tariff to meet at least the O&M costs.
- In Sergutiet, the operator should install meters in a phased manner so that users are billed and pay for water as per consumption.

Rwanda;

- There is need to provide good water quality to the users at an affordable cost so that users are satisfied with the water supply service.
- The operator needs to repair the non-functioning taps so that users can access water at shorter distances.

Uganda

- In Kibibi, an alternative source of energy needs to be installed so that there is continuous supply of water.
- In Butiaba, politicians need to be sensitised by government officials, private operators and development partners so that their statements do not compromise the sustainability of water supply systems but encourage users to pay for water.

5.4 LIMITATIONS OF THE STUDY

1. Data on how tariffs were calculated was not accessed therefore the study was not able to determine and evaluate the way tariffs were set.
2. Some data on costs of water supply and revenue expenditures were not assessed in some of the systems for example in the systems in Rwanda therefore the study was not able to determine cost coverage of the tariff.
3. It was not possible to carry out some interviews, discussions and observation due to the lack of time. For example in Rwanda, the researcher was held up due to flight delays and arrived in the country during a weekend followed by a holiday. This meant it was not possible to reschedule some of the interviews.
4. Some data was not able to be collected because the personnel who had the information were no longer part of the water supply system. For example in Bullisa the water officer was new and did not have access to any past system records.

5.5 RECOMMENDATIONS FOR FURTHER RESEARCH

The researcher was keen to carry out research, constraints as listed in section 5.4 limited this enthusiasm. However, in undertaking this study, other areas of interest and likely impact on water supply were identified. There is need to investigate the extent to which cost recovery is compromised by the use of alternative water sources and determine how the use of alternative sources can/not be factored in without compromising the sustainability of the water supply. This is particularly for Sergutiet where users preferred the taste of the alternative sources. Water quality tests of the sources should also be done.

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APPENDIX A1

	KENYA		
	Role	**Organisation**	**Date**
	SEMI-STRUCTURED INTERVIEWS		
1.	Minister	Bomet County	16th June 2015
2.	Managing Director	Bomet Water Company	16th June 2015
3.	Technical Manager	Bomet Water Company	16th June 2015
4.	Commercial Manager	Bomet Water Company	16th June 2015
5.	MD	Water Services Regulatory Board, WASREB	19th June 2015
	FGDs		
6.	Consumers	Bomet	17th June 2015
7.	Consumers	Bomet	17th June 2015
8.	Consumers	Sergutiet	18th June 2015
	UGANDA		
	SEMI-STRUCTURED INTERVIEWS		
9.	DWO	Bullisa	23rd June 2015
10.	WBM	Bullisa	23rd June 2015
11.	Opertaor	Bullisa	23rd June 2015
12.	Operator	Mpigi	25th June 2015
13.	DWO	Mpigi	26th June 2015, 30th June 2015
14.	Commissioner, RWSD	Ministry of Water and Environment	29th June 2015
	FGDS		
15.	Consumers	Bullisa	24th June 2015
16.	Consumers	Mpigi	29th June 2015
17.	Consumers	Mpigi	30th June 2015
	RWANDA		
18.	Permanent Secretary	FEPAIR	3rd July 2015
19.	Commercial department	RURA	7th July 2015
20.	Operator	Ruhindi	7th July 2015
21.	Engineer	WASAC	7th July 2015
	FGDS		
22.	Consumers		7th July 2015

APPENDIX A2

COST RECOVERY MECHANISMS IN PIPED RURAL WATER SUPPLY SYSTEMS: CASE STUDIES FROM KENYA, RWANDA AND UGANDA

INTERVIEW GUIDE – Key Informants (Operators, Local Government, Red Cross and National)

This interview is being conducted as part of a research study about *'Cost Recovery Mechanisms in Piped Rural Water Supply Systems: Case Studies from Kenya, Rwanda and Uganda'*. Key informants will be selected from national level, Local Government Level and water supply system level who have knowledge in rural water supply through experience in operation, management and construction. Discussions will also be held with the users of the system and observation will be carried. It is expected that the findings from the research will identify ways of improving cost recovery for piped rural water supply systems. The responses from this interview will be kept anonymous and confidential. The study is for academic purposes but recommendations will be considered for application by the funding organisation Internal Federation of Red Cross East African Regional Office supported by Norwegian Red Cross.

GENERAL INFORMATION

1. Water Supply Scheme:		
2. District:		
3. Country		
4. Interviewee:		
5. Start time of interview:	Finish time:	Duration:
6. Name of respondent:		
7. Type of water supply:		

8. Which organisation do you work?
9. What is your job title?
10. What are key roles/responsibilities do you do for organisation?

	QUESTIONS	O	LG	
A.	**Objective**			
	1. How is the water supply system managed?	O		
	2. What are the objectives of cost recovery?	O	LG	N
	3. What level of cost recovery is to be achieved?	O	LG	N
B.	**Water supply costs**			
	4. Which water supply costs are considered?	O	LG	N
	5. How are the costs of water supply calculated?	O		
C.	**Tariff Structure**			
	6. What is the price of the water service?	O	LG	
	7. What are the tariff levels used in the system?	O		

	QUESTIONS	O	LG	
	8. What are the different tariff levels intended to achieve?	O		
	9. How long has the tariff been in use?	O		
	10. What factors are considered to calculate/set the tariff?	O	LG	
	11. What is the process of setting a tariff for the water supply?	O	LG	
	12. Which stakeholders were involved in the process of tariff setting?	O	LG	
D.	**Billing**			
	13. How are billing records kept?	O	LG	
	14. What categories of customers do you have? Individual, group	O		
	15. What are the components of the bill?	O		
	16. How are the bills issued?	O		
	17. When are the bills issued?			
	18. How are the billing methods selected?	O	LG	
E.	**Revenue Collection**			
	19. Which options of bill payment are available for customers to pay their	O	LG	
	20. Can you explain how the options of bill payment were selected?	O		
	21. How do you deal with customers who fail to pay their bills in time?	O	LG	
F.	**Storage and management**			
	22. How do you store revenue collected?	O	LG	
	23. How are the records of payment kept?	O		
	24. How is the revenue used?	O	LG	
	25. What is the authority of payment?	O	LG	
	26. How long does it take to fix a system breakdown?	O		
	27. How do you finance system repairs?	O	LG	
	28. When do you get involved with system repairs?			
G.	**Management of subsidies**			
	29. Which subsidies are available for the rural water supply system?	O	LG	
	30. How are the subsidies managed?	O	LG	
H.	**Monitoring and Evaluation**			
	31. Which reports are written regarding the water supply system?	O	LG	
	32. Which targets are set for rural water supply systems?	O	LG	
	33. How are the targets monitored?		LG	
	34. How is information about the water supply presented to the	O		
	35. How are complaints from consumers handled?	O		
	36. What activities/process in revenue collection are audited?	O	LG	
	37. How are the audits carried out?	O	LG	N
	38. How often do you prepare a budget for cost recovery for the water	O	LG	
	39. What external support is provided to carry out cost recovery?	O	LG	
	40. What external support would you like to receive to carry out cost	0		
	41. How can cost recovery be improved			
	KEY: O - Operators, LG - Local Government, N- National			

APPENDIX B

INTERVIEW GUIDE, FOCUS GROUP DISCUSSION - Users

This focus group discussion is being conducted as part of a research study about *'Cost Recovery Mechanisms in Piped Rural Water Supply Systems: Case Studies from Kenya, Rwanda and Uganda'*. The focus group discussions will be conducted with consumers/users of the water supply within the selected water supply systems. Local leaders, water board members and members of the community will be targeted. Men and women will be included. Interviews will be conducted at national level, Local Government Level and water supply system level with key informants with experience in operation, management and construction. Observation around system will be carried. It is expected that the findings from the research will identify ways of improving cost recovery for piped rural water supply systems. The responses will be kept anonymous and confidential. The study is for academic purposes but recommendations will be considered for application by the funding organisation Internal Federation of Red Cross East African Regional Office supported by Norwegian Red Cross.

GENERAL INFORMATION

1. Water Supply Scheme:			
2. District:			
3. Country:			
4. Facilitator::			
5. Secretary:			
6. Start time of interview:		Finish time:	Duration:
7. Number of respondents:	a. Male:	b. Female:	Total:
8. Type of water supply:			

QUESTIONS

1. How is the water supply system managed?
2. How do you receive water?
3. How many hours a day is the water available?
4. How long does it take you to fetch or collect water? How far is it? How long do you wait?
5. What would you say about the water quality? Taste, colour
6. How long is the system down in case of a breakdown?
7. Are complaints regarding water supply handled?
8. Are you satisfied with the water supply service?
9. How much do you pay for water?
10. Why do you think we pay for water?

11. Do you understand the bill?
12. What percentage of your income do you spend on water?
13. Do you think the water you use is worth the amount of money you pay?
14. Do you use other sources of water?
    If yes, Why? When?
15. What did they discuss with you during system set up?

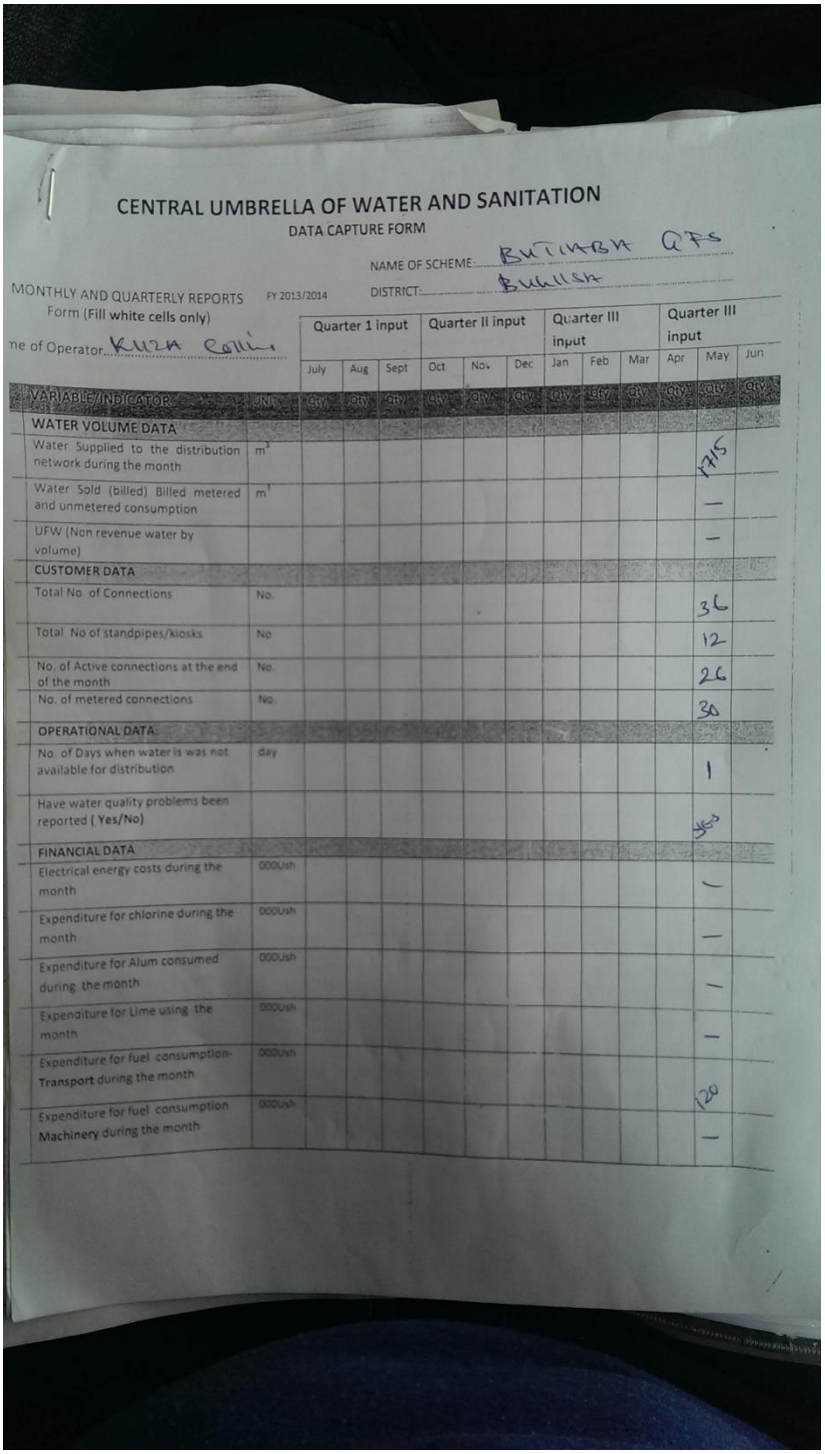
What information or aspects of the water supply does the operator provide to you? (Revenue collection and expenditure). How is this information provided to you?

APPENDIX C

1. Strategic plan for Bomet water supply
2. Revenue projections data Bomet
3. Monthly financial report from Bullisa (May, 2015)
4. Monthly financial report from Kibibi (May, 2015)
5. National Framework For O&M Of Rural Water Supply Uganda 2011, Ministry of Water and Environment
6. National Policy & Strategy for Water Supply and Sanitation Services (February 2010) Ministry of Infrastructure, Rwanda.

APPENDIX D

Monthly report for Butiaba water supply



CENTRAL UMBRELLA OF WATER AND SANITATION

DATA CAPTURE FORM

NAME OF SCHEME: BUTIABA QTS

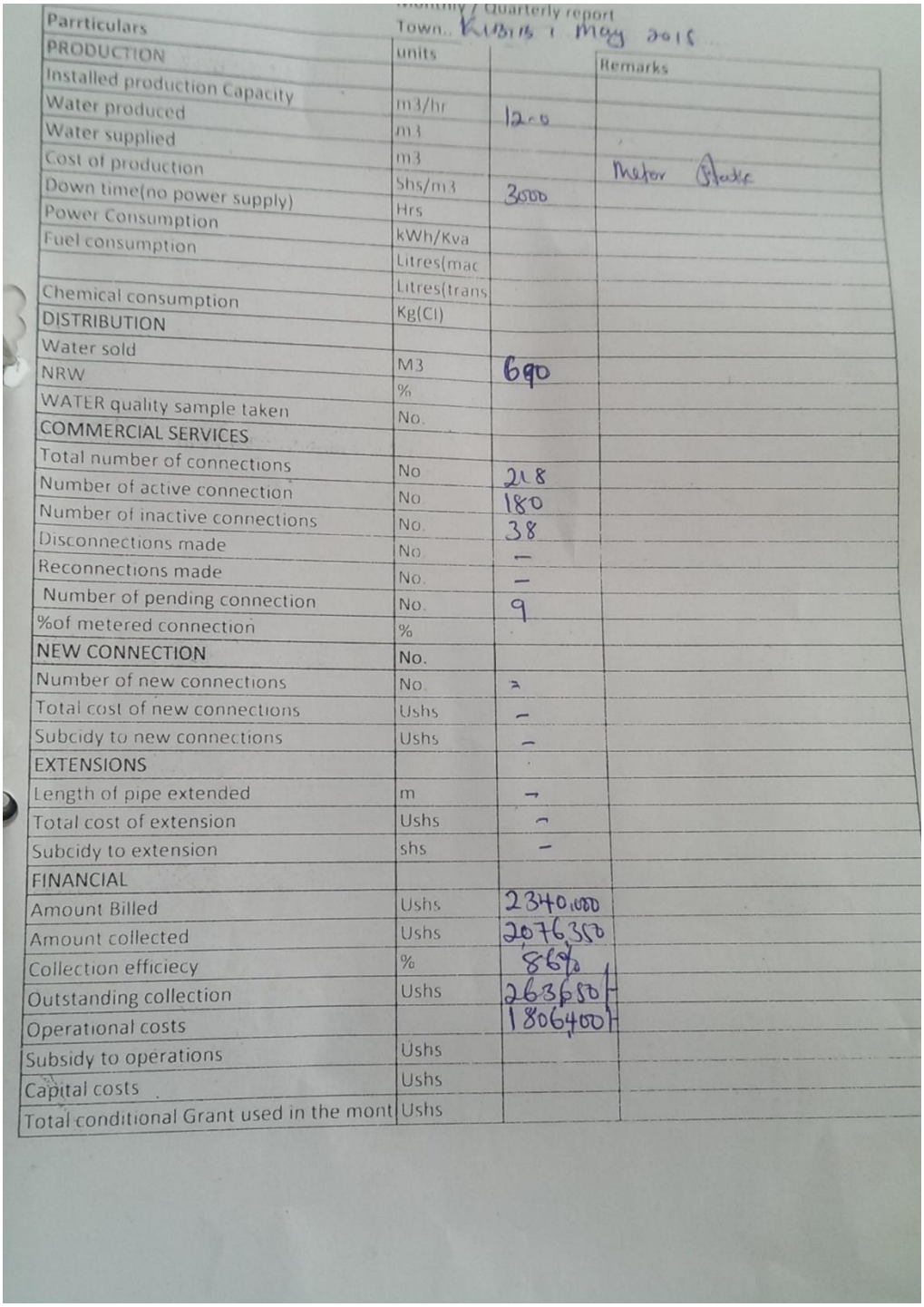
MONTHLY AND QUARTERLY REPORTS FY 2013/2014 DISTRICT: BULISA

Form (Fill white cells only)

ne of Operator: KUZA Coll.

		Quarter 1 input			Quarter II input			Quarter III input			Quarter III input		
		July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
VARIABLE/INDICATOR	UNIT	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty	Qty
WATER VOLUME DATA													
Water Supplied to the distribution network during the month	m^3											1715	
Water Sold (billed) Billed metered and unmetered consumption	m^3											—	
UFW (Non revenue water by volume)												—	
CUSTOMER DATA													
Total No. of Connections	No.											36	
Total No of standpipes/kiosks	No											12	
No. of Active connections at the end of the month	No.											26	
No. of metered connections	No.											30	
OPERATIONAL DATA													
No. of Days when water is was not available for distribution	day											1	
Have water quality problems been reported (Yes/No)												Yes	
FINANCIAL DATA													
Electrical energy costs during the month	000Ush											—	
Expenditure for chlorine during the month	000Ush											—	
Expenditure for Alum consumed during the month	000Ush											—	
Expenditure for Lime using the month	000Ush											—	
Expenditure for fuel consumption-Transport during the month	000Ush											120	
Expenditure for fuel consumption Machinery during the month	000Ush											—	

Monthly report for Kibibi Water supply



Monthly / Quarterly report

Town.. Kibibi May 2015

Parrticulars	units		Remarks
PRODUCTION			
Installed production Capacity	m3/hr	12-0	
Water produced	m3		
Water supplied	m3		Meter Stuck
Cost of production	Shs/m3	3500	
Down time(no power supply)	Hrs		
Power Consumption	kWh/Kva		
Fuel consumption	Litres(mac		
	Litres(trans		
Chemical consumption	Kg(Cl)		
DISTRIBUTION			
Water sold	M3	690	
NRW	%		
WATER quality sample taken	No.		
COMMERCIAL SERVICES			
Total number of connections	No	218	
Number of active connection	No	180	
Number of inactive connections	No.	38	
Disconnections made	No	–	
Reconnections made	No.	–	
Number of pending connection	No.	9	
%of metered connection	%		
NEW CONNECTION	No.		
Number of new connections	No	=	
Total cost of new connections	Ushs	–	
Subcidy to new connections	Ushs	–	
EXTENSIONS			
Length of pipe extended	m	–	
Total cost of extension	Ushs	–	
Subcidy to extension	shs	–	
FINANCIAL			
Amount Billed	Ushs	2340,000	
Amount collected	Ushs	2076,350	
Collection efficiecy	%	86%	
Outstanding collection	Ushs	263650/-	
Operational costs		1806400/-	
Subsidy to operations	Ushs		
Capital costs	Ushs		
Total conditional Grant used in the mont	Ushs		

Financial data for Bomet Water Supply

ANNEX 2 GENERAL DATA		Year 2013/14	Year 2014/15	Year 2015/16 (Forecast) (1)	Year 2016/17 (Forecast) (2)	Year 2017/18 (Forecast) (3)	Year 2018/19 (Forecast) (4)
1. Billing / Collection				**(In Ksh)**			
	Total Billing	23,802,911	57,239,138	66,000,000	85,000,000	95,000,000	105,000,000
	Total Collections including Billing for other Services	12,244,333	23,778,053	56,000,000	80,000,000	90,000,000	100,000,000
	Collection Efficiency	51.44	41.54	84.85	94.12	94.74	95.24
	Collection Efficiency agreed	95	95	95	95	95	95
2. Cost							
	Total O&M Cost WSP (O&M Cost WSP, Regulatory Levy and Administrative cost WSB for WSP)	0.00	107805622.00	127950000.00	135950000.00	153500000.00	116000000.00

APPENDIX E

Ethics Approvals (Human Participants) Sub-Committee

WEDC

Ethical Clearance Checklist

Project Details

1. Project Title: COST RECOVERY MECHANISMS FOR PIPED RURAL WATER SUPPLY SYSTEMS: CASE STUDIES FROM KENYA, RWANDA AND UGANDA

Applicant(s) Details

2. Name of Student: ANGWEC CATHERINE AGWAI	6. Name of Supervisor: DR. SAM KAYAGA
3. Programme: MSC WATER AND WASTE ENGINEERING	
4. Email address: c.a.angwec-14@student.lboro.ac.uk	7. Email address: s.m.kayaga@lboro.ac.uk
5a. Contact address: 33 FOREST COURT, FOREST ROAD, LOUGHBOROUGH LE1 3NT	8a. Contact address: WEDC, THE JOHN PICKFORD BUILDING SCHOOL OF CIVIL AND BUILDING ENGINEERING, LOUGHBOROUGH UNIVRSITY LE11 3TU
5b. Telephone number: +44 (0)743 5858 668.	8b. Telephone number: +44 (0)1509 22 8743

Participants

9a. Does the research involve human participants?	Yes
If you have selected No to this question you do not need to complete the rest of the form. Please sign it on page 6 and submit to your supervisor.	

9b. Has the Investigator read the 'WEDC Guidance for completion of Ethical Clearance Checklist' before starting this form?	Yes

Positions of Authority

9c. Are researchers in a position of direct authority with regard to participants (e.g. academic staff using student participants, line manager using junior staff, donor using staff of a recipient organisation)?	No

Vulnerable groups

10. Will participants be knowingly recruited from one or more of the following vulnerable groups?	
Children under 18 years of age	No
Persons incapable of making an informed decision for themselves	No
Pregnant women	No
Prisoners/Detained persons	No
Other vulnerable group Please specify: Click here to enter text	No

11. Will participants from vulnerable groups be chaperoned by more than one investigator at all times?	N/A - replied no to question 10
12. Will at least one investigator of the same sex as the participant(s) from vulnerable groups be present throughout the investigation?	N/A - replied no to question 10
13. Will participants from vulnerable groups be visited at home?	N/A - replied no to question 10

Researcher Safety

14. Will the researcher be alone with participants at any time?	No
14a. Will the researcher inform anyone else of when they will be alone with participants?	N/A - replied no to question 14
14b. Has the researcher read the guidance document 'Conducting Interviews Off-Campus and Working Alone', and will the researcher abide by the recommendations within?	N/A - replied no to question 14

Methodology and Procedures

15. Please indicate whether the proposed study:

Involves taking bodily samples (please refer to published guidelines)	No
Involves using samples previously collected with consent for further research	No
Involves procedures which are likely to cause physical, psychological, social or emotional distress to participants	No
Is designed to be challenging physically or psychologically in any way (includes any study involving physical exercise)	No
Exposes participants to risks or distress greater than those encountered in their normal lifestyle	No
Involves collection of body secretions by invasive methods	No

Prescribes intake of compounds additional to daily diet or other dietary manipulation/supplementation	No
Involves pharmaceutical drugs	No
Involves use of radiation	No
Involves use of hazardous materials	No
Assists/alters the process of conception in any way	No
Involves methods of contraception	No
Involves genetic engineering	No

Involves testing new equipment with human participants	No

Observation/Recording

16a. Does the study involve observation and/or recording of participants?	Yes
16b. Will those being observed and/or video/audio recorded be informed that the observation and/or recording will take place?	Yes

Consent and Deception

17. Will participants give informed consent freely?	Yes

Informed consent

18. Will participants be fully informed of the objectives of the study and all details disclosed (preferably at the start of the study but, where this would interfere with the study, at the end)?	Yes
19. Will participants be fully informed of the use of the data collected (including, where applicable, any intellectual property arising from the research)?	Yes

20. For children under the age of 18 or participants who are incapable of making an informed decision for themselves:	
a. Will consent be obtained (either in writing or by some other means)?	N/A
b. Will consent be obtained from parents or other suitable person?	N/A
c. Will they be informed that they have the right to withdraw regardless of parental/guardian consent?	N/A
d. For studies conducted in schools, will approval be gained in advance from the Head-teacher and/or the Director of Education of the appropriate Local Education Authority?	N/A

Deception

e. For detained persons, members of the armed forces, employees, students and other persons judged to be under duress, will care be taken over gaining freely informed consent?	N/A
21. Does the study involve deception of participants (i.e. withholding of information or the misleading of participants) which could potentially harm or exploit participants?	No
22. Is deception an unavoidable part of the study?	N/A
23. Will participants be de-briefed and the true object of the research revealed at the earliest stage upon completion of the study?	N/A
24. Has consideration been given on the way that participants will react to the withholding of information or deliberate deception?	N/A

Withdrawal

25. Will participants be informed of their right to withdraw from the investigation at any time and to require their own data to be destroyed?	Yes

Storage of Data and Confidentiality

26. Will all information on participants be treated as confidential and not identifiable unless agreed otherwise in advance, and subject to the requirements of law?	Yes
27. Will storage of data comply with the UK Data Protection Act 1998?	Yes
28. Will any video/audio recording of participants be kept in a secure place and not released for any use by third parties?	Yes
29. Will video/audio recordings be destroyed within ten years of the completion of the investigation?	Yes
30. Will full details regarding the storage and disposal of any human tissue samples be communicated to the participants?	N/A
31. Will research involve the sharing of data or confidential information beyond the initial consent given?	No
32. Will the research involve administrative or secure data that requires permission from the appropriate authorities before use?	No

Incentives

33. Will incentives be offered to the researcher as an inducement to conduct the study?	No
34. Will incentives by offered to potential participants as an inducement to participate in the study?	No

Work Outside of the United Kingdom

35a. Is your research being conducted outside of the UK?	Yes
35b. Is your research being conducted in a country different to where you currently live and study/work?	Yes
36. Has a risk assessment been carried out to ensure the safety of the researcher whilst working outside of the UK and in a country other than their own?	Yes
37. Have you considered the appropriateness of your research in the country to which you are travelling?	Yes
38. Does carrying out your research in another country increase the risk to yourself or the participants in your research?	No
39. Have you obtained any necessary ethical permission needed in the country to which you are travelling?	Yes

Information and Declarations

Checklist Application Only:
If you have completed the checklist to the best of your knowledge, and not selected any answers marked with an *, # or †, your investigation is deemed to conform with the ethical checkpoints. Please sign the declaration and send it to your supervisor, who will lodge the completed checklist with your Head of School or his/her nominee.

Checklist with Additional Information to the Secretary of the Ethics approvals HPSC:
If you have completed the checklist and have only selected answers which require additional information to be submitted with the checklist (indicated by a †), please ensure that all the information is provided in detail below and send this signed checklist to your supervisor who will forward it to the Secretary of the Ethics Approvals HPSC.

Full Application needed:
If on completion of the checklist you have selected one or more answers which require the submission of a full proposal (indicated by a # or *), please download the relevant form from the Ethics Approvals HPSC's web page. **A signed copy of this Checklist should accompany the full submission to the HPSC.**

Space for Additional Information as requested:

For completion by Supervisor

Please tick the appropriate boxes. The study should not begin until all boxes are ticked.

☐ The student has read the University's Code of Practice on investigations involving human participants

☐ The topic merits further research

☐ The student has the skills to carry out the research or is being trained in the required skills by the Supervisor

☐ The procedures for recruitment and obtaining informed consent are appropriate

Comments from supervisor:

Signature of Applicant:

Signature of Supervisor (if applicable):

Signature of Head of School or his/her nominee:

Date:

APPENDIX F

Water, Engineering and Development Centre (WEDC)
The John Pickford Building
Loughborough University Leicestershire LE11 3TU UK
Telephone: +44 (0)1509 222885 Fax: +44 (0)1509 211079
www.lboro.ac.uk/wedc E-mail: WEDC@lboro.ac.uk

Loughborough University

5th June 2015

To whom it may concern

Dear Sir/Madam

MISS CATHERINE AGWAI ANGWEC – MSc Research Student

This is to introduce to you the above-named, who is currently undertaking a full-time postgraduate course leading to MSc in Water and Waste Engineering of Loughborough University, UK.

Part of the requirement for the course is an individual research project on a topic of interest to the student, carried out between April and August of the academic year. Catherine's research topic is 'Cost recovery in piped rural water systems in developing countries'. The study is funded by the International Federation of the Red Cross East African Regional Office supported by the Norwegian Red Cross. This topic requires collection of primary and secondary data.

The purpose of this letter is to request you to facilitate Catherine during the data collection process. For further information, please do not hesitate to contact me by email (s.m.kayaga@Lboro.ac.uk).

Thank you for your cooperation.

Yours faithfully,

Sam Kayaga PhD, CEng
Senior Lecturer/Programme Manager and Project Supervisor

APPENDIX G

Loughborough University

Adult Participant Information Sheet

Project Title: Cost Recovery Mechanisms for Piped Rural Water Supply Systems: Case Studies From Kenya, Rwanda and Uganda

Research investigator and contact details:

Name: Angwec Catherine Agwai
Address: 33 FOREST COURT, FOREST ROAD, LOUGHBOROUGH, LEICESTER, UNITED KINGDOM
LE11 3NT
Email Address: c.a.angwec-14@student.lboro.ac.uk
Contact Number: +44735858668

What is the purpose of the study?

The purpose of the study is to investigate cost recovery mechanisms that are suitable for the sustainability of piped rural water supplies in developing countries.

Who is doing this research and why?

The primary investigator mentioned above (MSc student) and Dr Sam Kayaga (student supervisor). The study is being funded by the International Federation of Red Cross (IFRC) East African Regional Office supported by the Norwegian Red Cross. This study is part of a Student research project supported by Loughborough University.

What do you intent to do during the visit?

I intend to conduct interviews with key informants at national, local and system level, carry out focus group discussions with users of rural water supply schemes and note down any observation.

What will I be asked to do?

Only participate in the interview or focus group discussion.

Once I take part, can I change my mind?

Yes. After you have read this information and asked any questions you may have we will ask you to complete an Informed Consent Form, however if at any time, before, during or after the sessions you wish to withdraw from the study please just contact the main investigator. You

can withdraw at any time, for any reason and you will not be asked to explain your reasons for withdrawing. However, once the results of the study are aggregated/published/dissertation has been submitted, it will not be possible to withdraw your individual data from the research.

Are there any risks in participating?

No

Will my taking part in this study be kept confidential?

Yes. The audio recording and notes taken will be used for data analysis which will be stored for a period of six years before being destroyed. Names will only be mentioned if the participants agree to it. Reference number or code will be assigned to participants to ensure anonymity.

I have some more questions; who should I contact?

The research investigator mentioned above.

What will happen to the results of the study?

The results will be analysed and used for the MSc thesis. Recommendations from the MSc dissertation may also be considered for application by the funding organisation IFRC.

What do I get for participating?

This research study is part of the student MSc thesis. No stipend or compensation will be given.

APPENDIX H

Loughborough University

Title of Research Project: Cost Recovery Mechanisms for Piped Rural Water Supply Systems: Case Studies From Kenya, Rwanda and Uganda

INFORMED CONSENT FORM
(to be completed after Participant Information Sheet has been read)

The purpose and details of this study have been explained to me. I understand that this study is designed to further scientific knowledge and that all procedures have been approved by the Loughborough University Ethics Approvals (Human Participants) Sub-Committee.

I have read and understood the information sheet and this consent form.

I have had an opportunity to ask questions about my participation.

I understand that I am under no obligation to take part in the study.

I understand that I have the right to withdraw from this study at any stage for any reason, and that I will not be required to explain my reasons for withdrawing.

I understand that all the information I provide will be treated in strict confidence and will be kept anonymous and confidential to the researchers unless (under the statutory obligations of the agencies which the researchers are working with), it is judged that confidentiality will have to be breached for the safety of the participant or others.

I agree to participate in this study.

Your name: Johnstone Isemegal

Your signature: _____

Signature of investigator: _____

Date: 17/06/2015

APPENDIX I

TRANSCRIPTS FOR SEMI-STRUCTURED INTERVIEWS: KENYA
Summary of Transcripts regarding tariff setting and subsidies

Minister of water, Bomet Water Company

The tariff should not be unfriendly, it should be pro-poor. This brings about a challenge in issues to do sustainability because the cost of water is high compared to the revenue collected from the consumers. Therefore the county government department provides subsidies like major capital infrastructure investment. The government is giving subsidies to offset the power bills so that what is collected from the consumers is used for operation and maintenance. The tariff is not prohibitive because access to safe water is a constitutional right article 46 that is why the government is taking the step to subsidise the system so that the tariff is low.

The national policy provides a guideline and provides for public participation. The WASREB recommends the tariff. There has to be public participation. The current tariff is as per the old service provision. Not yet reviewed though.

Currently Water Company is still very small and cannot stand on its feet. The county is supported in terms of cost of electricity and staff. The county is still paying for staff and capital investment.

Managing Director, Bomet Water Company

At the moment the system is not sustainable. The tariff or price charged is not able to recover the cost of input. The company gets subsidy from the county government of Bomet. Now that the company cannot recover the costs therefore the company provides a budget so that the government can meet the deficit.

Agreed with the department, came up with projections of revenue to be collected and budget and came up with deficit

Adjusting the tariff upwards, submit application to WASREB

Technical manager, Bomet Water Company

The company is a young company still get subsidy from the government like extensions only provide skilled labour but materials from the government.

Use revenues for operation. Capital and electricity from the county. Upgrade of the system from county.

For rural schemes need a lot of subsidies, need to be efficient so that there are no high operation costs and metering the system.

It is not necessarily high tariffs which will improve since if the consumers are unable to pay then the system is underutilised and cost recovery will become a big challenge.

Commercial and Finance manager, Bomet Water Company

The company adopted the old tariff. For the new tariff, domestic and commercial will be different.

Revenue is used for operations not saving any currently. Not yet operating sustainably.

Electricity and salary are subsidies.

Money is sent to the subsidy account from this account, cheques is written from the account. Payments are made to the power company and for salaries sent to the different employer accounts. Had a discussion from the beginning and agreed with the county. The salary it was easy because the salaries are standard. For electricity and average was agreed because sometimes the cost is high sometimes it is low. 6M KShs.

MD, WASREB

WASREB is water services sector in the Kenya and has a duty of implementing government policies. It ensures that we have uniform standards on water service provision.

Rural system; tariff should the minimum required is the o&m cost recovery pay for electricity, pay for pump breakdown. WASREB uses rising block tariff and a lifeline tariff that includes a consumption up to 6m3. It is kept as low as possible. Rising block in the sense that the tariff is as an instrument for water use efficiency, social equity and use for sustainability for these systems. Social equity is ensured by the rising block tariff, more you consume the more you pay. The higher blocks subsidise the lower blocks and kept as low as possible. Also guided that the amount spent on water should not exceed 5% of the income. This is guided by tariff studies, affordability willingness to pay.

TRANSCRIPTS FOR SEMI-STRUCTURED INTERVIEWS: RWANDA

Summary of Transcripts regarding tariff setting and subsidies

FEPAIR

The private operator signs a contract with the district. The board of director decides on the tariff level in the district. After tendering, the private operator based on the TORs proposes a tariff and is negotiated with the district. Tariff is based on the following

- Investment cost to do cost recovery
- Subsidies available
- Operation and maintenance
- Life condition of users

RURA

Tariff is based on revenue requirement

Revenue req = O&M + depreciation + cost f capital

Rural water tariff currently undergoing review where the tariffs are to be reduced, remove VAT and have one operator per district to benefit from economies of scale. Currently the private operator negotiates a tariff with the district depending on their obligations/TORs in contract. For low income earners, they are expected to use public standposts.

OPERATOR

We signed a contract with the district to carry out operation and maintenance. We have to collect revenue, repair both minor and major system repairs.We consider all costs that is electricity for pumping, costs for repairs, for paying the stand post operators and for managing. We calculated these costs at the beginning of managing the system to determine the tariff. The standpost rate is for people who cannot afford the private connection.
The tariff was introduced a year ago and we considered our contract which states that we have carry out operation and maintenance fully with no support. Once we calculated the costs, we had a meeting with the district and other stakeholders were invited like water for people, wasac, fepear and representatives of the people who discussed and the tariff was approved. Receive no subsidies
The contract states what should be done per year, the number of new connections, extensions and operation and maintenance, therefore we work towards these targets and the district monitors every quarter. We usually present reports to the district and the district presents them to the community representatives

TRANSCRIPTS FOR SEMI-STRUCTURED INTERVIEWS: UGANDA

Summary of Transcripts regarding tariff setting and subsidies

Bullisa District Water Officer

Piped schemes in the district are managed under water boards in the sub county.

No support is given to the Water Board, there is no funding at the district to support the scheme since the system is collecting money. No subsidies available even for water quality done using revenue collected.

Commissioner, Rural Water Department

The policy states that the users should meet recurrent costs, the cost of running the system. Replacement of parts of less than 8 years. Pumps are given 5 years and government supposed to provide support when there is need for replacement.

During design the costs of running system are estimated determined using the staffing and diesel. There is no module but relies on the parameters of costs. For diesel look at pumping costs, for Gravity it is the staffing structure and replacement of running parts. Based on that the tariff is set. It relies on those and varies from scheme to scheme.

Under water act, minister approves changes in tariff. They work out the tariff and write to minister for approval. There is a guideline on the maximum/ standard.

In case of major extensions because the tariff does not take care of that. Any earlier breakdown for example bursts, through conditional grant is sent and used for rehabilitation. 13% conditional for capital maintenance but conditional grant not for operation and maintenance.

Households allows for orphans, elderly low income areas to get free water. But this not encouraged since it is believe the tariff is affordability by all.

All systems should be part of umbrella organisation which provide technical back up have technicians source spares and water quality especially for pumped. Give them t gives subsidies to meet overheads. Pull resources together (membership fee), which is used for in case a system breakdown.

Kibibi operator/area manager

However the system cannot do extensions coz of insufficient revenue.

Currently there is no conditional grant but before the grant was being used for extensions and new connections.

The system is meeting the operation and maintenance costs.

District Water Officer Mpigi

Most of the funding from the district is for point water sources. Hand pump mechanics association to work in point water sources using conditional grant for this especially deep boreholes. Most of the repairs of the piped rural are beyond the design period and need input from WSDF and ministry of umbrella. For example loss of transformer from umbrella. Umbrella organisations provides most of the support.