Life-Cycle Cost Analysis of Rural Water supply in Uganda

Kabarole District

Triple-S Uganda

IRC International Water and Sanitation Centre

Final Report

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Table of Contents

List of Tables

List of Figures

1 Executive Summary

1.1 Introduction

Triple-S is a six-year learning initiative that aims to carry out research on how to make rural water supplies sustainable at scale. Triple-S is a project under the IRC Water and Sanitation Centre, The Hague, which was also carrying out the WASHCost project[1], a programme promoting the Life-Cycle-Cost Approach (LCCA). IRC Uganda started the process of introducing the LCCA in the Ugandan water and sanitation sector in 2011, and has since carried out an information scan. The next step is to carry out cost analysis on district basis, as well as working towards an integration of the LCCA into the local monitoring, budgeting and planning framework.

The main aim of this process is to make Life-Cycle Cost data, together with service level data, available to stakeholders in order to understand the effectiveness and efficiency of the use of funds, as well as to think critically about management models. Are the financial inputs creating the desired outputs in the sector in terms of functionality, access and service levels? How are funds allocated today, and how could they be allocated better? Do we need to change the way funds are managed at user level, service management level, service authority level and national level? These are questions this process will help to answer, in addition to providing insights into the current spending patterns of the different stakeholders involved in the sector.

1.2 The Life-Cycle Cost Approach

Life-Cycle Costing is a common approach in developed countries to calculate and monitor the renewal of assets as well as optimising spending on operations and maintenance of water systems. Life-cycle costs (LCC) "represent the aggregate cost of ensuring delivery of adequate, equitable and sustainable water, sanitation and hygiene (WASH) services to a population in a specified area" (Fonseca et al 2010). The Life-Cycle Cost Approach "seeks to raise awareness of the importance of LCC in achieving adequate, equitable and sustainable WASH services, to make reliable cost information readily available and to mainstream the use of LCC in WASH governance processes at every level" (Fonseca et al 2010). A methodology adapted to the developing country context was developed by WASHCost, and detailed studies carried out in Ghana, Burkina Faso, Mozambique and India (Burr and Fonseca 2013).

1.3 Cost Categories

The approach uses the following categories for the collection of data and analysis:

- Capital expenditure (CapEx)
- Operations expenditure (OpEx)
- Capital maintenance expenditure (CapManEx)
- Expenditure on direct support (ExpDS)
- Expenditure on indirect support (ExpIS)
- Cost of capital (CoC)

Capital expenditures include both software and hardware costs, as well as extensions to existing schemes. Operations are regular expenses of smaller value, whereas CapManEx are expenditures on

[1] See washcost.info for more information

major repairs and replacements. Direct support refers to the support given to community and local actors through capacity building, follow up and monitoring and evaluation at local level such as at district level. Indirect support comprises the activities at central level, such as policy formulation, advocacy and creating an enabling environment. Cost of capital is the cost of servicing loans (Fonseca et al 2011).

1.4 The Kabarole Study

Triple-S Uganda contracted Fontes Uganda Ltd to carry out a cost analysis study in Kabarole district in Western Uganda. The study was carried out between February and May 2013.

1.5 Methodology

The study covered the last three financial years (2009/10, 2010/11 and 2011/12), and considered both point rural water sources as well as piped schemes in rural growth centres. In total, the consultants got data from 4 key informants at central level, and 18 key informants at district level through semi-structured interviews, and 24 people at sub-county level through focus group discussions and from 30 people representing different stakeholders through a validation workshop. Three sub-counties were visited; Buheesi, Hakibaale and Kasenda with approximately 42,000, 47,000 and 24,000 people respectively. The entire district had a projected population of approximately 415,000 people in 2012 (District Population Office 2013). Water sources of different technology types were surveyed, and in total, 3 protected springs, 4 shallow wells, 2 boreholes and 3 taps of piped schemes were visited, however cost data, all the way down to user level, was also collected from other sources such as from the Handpump Mechanic Association and the Umbrella organisation. In order to get an overview over the total district spending, an effort was made to talk to every stakeholder and capture every expense, and for community expenditures where records are difficult to obtain, informed estimates were made. The resulting study gives a relatively complete picture of all expenditures on rural water in Kabarole district over the last three years.

The study used the official rural water coverage figure for Kabarole from the Sector Performance Reports (MWE 2010a, MWE 2011, MWE 2012) which was 90% in 2009/10 and remained unchanged over the three years. For the number of water sources, the study relied on the latest overview provided by the District Water Office (DWO).

1.6 Overall District Expenditures

In 2010 a large gravity flow scheme that covers five small towns (three in Kabarole and two in Kasese districts) was completed with funding from the central government, therefore the capital expenditure is high in 2009/10 and the overall Kabarole district expenditure is more than 5.7 billion Uganda shillings (approximately USD 2.2 million). Otherwise, total expenditures in the district are around 1.5 billion (approximately USD 580,000) per year. Out of all stakeholders, the District Water office contributed approximately with 1.5 billion over the three years in expenditures and NGOs and other partners contributed approximately 2.3 billion (approximately USD 885,000). Other government institutions, such as the Umbrella organisation, the Technical Support Unit (TSU) and the central government contributed 3.7 billion (approximately USD 1.4 million) over three years, but 3.6 billion of this was for the gravity flow scheme completed in 2010.

1.7 Point Sources

Point sources in Kabarole are either boreholes (88) or shallow wells (658) with handpumps (mostly Mark II/U2 or Nira) or protected springs (562). Most common are springs and shallow wells. Between 2009 and 2012, 20 new boreholes, 88 new protected springs and 155 new shallow wells were constructed, whereas 29 boreholes, 66 springs and 74 shallow wells were rehabilitated.

The average expenditure per borehole was about 20 million (approximately USD 7700), springs were about 2.5 million (USD 960) and wells about 6 million (USD 2300). These sums include software costs of establishing and giving initial training to the water committees, technical supervision and initial water quality testing. The study captured detailed information on each technology. Maximum and minimum averages per source were calculated and direct and indirect support costs were allocated to the different technologies using the percentages of the technology distribution where detailed information did not exist. For example, the minimum average cost to construct a shallow well (software and hardware) was approximately 6 million, while the maximum was over 9 million (USD 3460). Software costs for the initial installation ranged between 1.2 million and 2.6 million (USD 460-1000) for a shallow well. The average cost per source for the rehabilitation of a shallow well was 1.6 million (USD 615). The study calculated that, if all non-functional sources in Kabarole were to be rehabilitated, using the average rehabilitation cost per technology, it would cost the district approximately 540 million Uganda shillings (USD 207,000). As a comparison, the entire conditional grant for 2012/13 is 465 million (USD 180,000), out of which 70% should be used on new sources. In total, approximately 66 million (USD 25,000) was spent per year on major repairs and rehabilitation over the three-year period, and sources are continuously breaking down. Although not all sources are viable to rehabilitate; some are abandoned or replaced by new ones, the backlog in large repairs is still a pressing problem for the district water office. One of the participants in the workshop noted as a concluding remark that this shows clearly that the district needs more for rehabilitation than for new sources at the moment.

1.8 Recurrent costs

Recurrent costs consist of all expenditures related to a source over its lifetime except the initial investment. Recurrent costs include operations costs (normally covered by the community), larger repairs and rehabilitations, support costs at local level and support costs at central level. They are normally expressed per year, and the major repairs (CapManEx) are distributed over the years with the assumptions that a major repair takes place every five years for a point source and every three years for a piped scheme. The relatively short period for piped schemes is based on historic data from Kabarole, where schemes often suffer damages due to heavy rains and landslides in the mountains where the source captures are normally located.

Approximately 900,000 shillings (USD 350) in spent on average on every spring and shallow well per year in overall recurrent costs, and slightly more on a borehole due to higher rehabilitation costs once it is due. The higher expenditure on direct support for springs is due to the fact that there are many NGOs active in Kabarole that conduct post-construction activities in areas where there are predominantly springs and some shallow wells. Recurrent costs on piped schemes are on average approximately 13 million shillings (USD 5000) for gravity flow schemes (out of which 5.8 million, USD 2230, is on direct support), and approximately 6.8 million (USD 2615) on pumped schemes per year. Although operations expenses are higher for the pumped scheme, which is due to the need for fuel (5.9 million, USD 2270), they are still relatively high for GFS (about 5 million, USD 1920, per scheme per year on average). CapManEx is high (2.3 million, USD 885, on average per year) on GFS due to the reasons mentioned above with frequent major problems at the source.

In order to compare the different technologies, it is necessary to have use figures per capita. For the calculations, the standard populations used by the Ministry of Water and Environment (MWE 2010) were used. Not surprisingly, piped schemes are significantly cheaper per person (approximately 1500 shillings, USD 0.57, per person per year) than point sources (between 3800 and 4400, USD 1.46-1.69, per person per year), merely because of the large number of people they supply. It is, however, generally accepted that whereas piped schemes are high in demand, they are not suited for all areas, especially areas with low population density.

1.9 Life-Cycle Costs

Recurrent costs per capita per year are useful when calculating the life-cycle costs of different technologies. Every time a borehole is constructed, it will require another 10 million (USD 3850) over its life-cycle at current expenditure levels, when the life-cycle is estimated to be 10 years. This equals approximately 3.1 million (USD 1190) per year over 10 years if the investment is included, or 1064 Uganda shillings (USD 0.4) per Water-Person-Year (Koestler et al 2010). If the lifespan is extended to 20 years, it only comes to 406 Uganda shillings (USD 0.15) per Water-Person-Year at current expenditure levels.

1.10 Service Levels

When analysing expenditures it is important to compare with the service levels provided at these costs. For example, more water points makes it more expensive per capita because less people use a point, but at the same time people are receiving a higher level of services since distances to the households are shorter. Triple-S conducted a study based on household surveys to map service levels in Kabarole district, and found that 97% of the households surveyed were provided with services below “fair” (Triple-S forthcoming). Fair service levels are considered the benchmark based on national guidelines, and provides “Good quality water supply of at least 20 lppd within a distance of 1 km from a water source that is reliable 95% of the time” (Triple-S forthcoming). However, this study was only conducted in two sub-counties, and rural growth centres (and piped schemes) were not included. It was not within the scope of the cost analysis study to collect detailed service level information, but stakeholders and water users at the sources were asked, both for piped schemes and point sources. It was found that whereas most stakeholders at district level considered the service level in the district as predominantly “fair”, most users at source level considered it “low”. The lower service level was mostly due to unreliability (long down-times) and quantity, often due to hilly terrain. It is therefore safe to assume that what is currently spent in Kabarole is not sufficient to meet the minimum benchmark for fair services for the population.

1.11 Comparison with Benchmarks

WASHCost developed benchmarks of what should be spent on the different categories in order to achieve a “fair” level of service (Burr and Fonseca 2013). The findings show that spending is way below benchmarks in all categories except investment expenditures per capita for piped schemes. The study calculated that, if Kabarole was to spend according to benchmarks, it should spend between 1.6 and 6.1 billion (USD 615,000-2.3 million) per year in recurrent costs. As a comparison, the government, partners and the community together only spend approximately 900 million (USD 346,000) on average per year currently.

1.12 Conclusions

The study highlights a number of important conclusions for the Ugandan water and sanitation sector:

- Significant amounts go into initial software and post-construction support, yet results are not felt on the ground and functionality is a challenge
- Piped schemes are cheaper per capita in recurrent expenditures and provide higher levels of service, however in Kabarole they are frequently down and people return to point sources
- Service levels are below the benchmark at current expenditure levels
- Expenditures on operations are almost non-existent for point sources, especially for springs. This points to poor contributions by water users.
- The district needs more for rehabilitation than for new sources, which is contrary to the conditional grant guidelines

Other conclusions of the study are;

- National coverage figures do not change whereas a number of new sources are constructed each year and population growth is low (<1.53%)
- When direct and indirect support costs are high, they may outweigh gains made by long durability of systems
- Contributions by water users are extremely low in Kabarole, both for point sources and piped schemes. This leads to long down-times.

1.13 Discussion Points

The following discussion points were identified by the study and in particular at the stakeholder workshop:

- How can the conditional grant guidelines be adjusted to fit the needs of individual districts?
- How to deal with the transition in demand from point sources to piped schemes?
- Who should cover recurrent costs, and especially rehabilitation costs?
- Should there be a selection of point sources around piped schemes that should be rehabilitated and maintained, in order to provide an alternative service when the piped schemes are down?
- We need to re-think the management model for point sources due to lack of availability of funds for operations and poor functionality
- How can the sub-county water supply and sanitation board model increase spending on operations and rehabilitation, and optimize the spending on support through a better coordination of institutional support at sub-county level?

1.14 Way Forward

The next step is to conduct a similar analysis for a different district, in order to allow for comparison. In addition, benchmarks for Kabarole or Uganda could be developed, and the information used for budgeting and planning purposes.

2 Introduction

Sustainable Rural Water Services at Scale (Triple-S) is a six year learning Initiative with the overall goal of improving sustainability of rural water services and bringing about greater harmonisation through increased sector capacity. It is an Initiative of International Water and Sanitation Resource Centre (IRC) in The Netherlands.

Triple-S seeks to pilot and test new ways of improving the delivery of rural water services in Uganda and to successfully identify and understand the key challenges and bottlenecks that are currently confronting rural water service delivery. The rural water sector in Uganda is struggling to extend services in pace with population growth, something that can be seen from the overall monitoring framework known as the Sector Performance Reports. Coverage has been relatively stable around 60% since 2002, and functionality is stagnating around 80%. Another important constraint is posed to the government by a stagnating or even declining budget for the sector (MWE 2012b).

Population growth in Uganda is 3.6% and fourth highest in the world. Another problem more specific to Uganda, is that new districts are created at a rapid pace, and large proportions of budgets for new water sources are spent on setting up new offices, buying vehicles and hiring new staff (MWE 2012b). In addition, local government employees report that areas that are easy to provide with services have already been covered, and the remaining populations are expensive and complicated to serve (Biteete and Jangeyanga 2013).

At the same time, the government has recently made a commitment to achieve universal coverage by 2015 (MWE 2012a), and there is an increased demand by the population for piped water schemes, especially in rural growth centres. In this context, the Ministry is promoting the set-up of Water Supply and Sanitation Boards (WSSB) to mange piped water schemes. This approach was originally designed for small towns, but has now been extended to rural growth centres and gravity flow schemes covering rural areas as well (Koestler and Jangeyanga 2012). For point sources, there is an increased awareness that the community management model, which has been promoted for the last 20 years, is not yielding the desired results in terms of functionality and durability, which the findings of this report confirm. The rural water sector is therefore in the process of testing new approaches that can improve the management of both piped schemes and point sources, and in this context the work of Triple-S is highly relevant.

The Life-Cycle Cost approach has a huge potential to support the different trends mentioned above, and to provide guidance on how to face the challenges, as also previously mentioned in Biteete and Jangeyanga 2013 and Biteete and van Lieshout 2013. First, cost data can help the government and the districts set priorities for the financing, for example, which technologies to spend on or what cost category to focus spending on. The expenditure figures from Kabarole can also help the districts in their budgeting and planning exercises, especially as they are in a transition from point sources to piped schemes. For example, how many point sources should be rehabilitated and where, and where does it make financial sense to do a piped scheme? Another benefit is that the life-cycle cost data provides information to monitor the cost-effectiveness of different management models such as the community management model and the water board model. It can also help to inform local management decisions, such as how to calculate the price per jerrycan for a piped scheme.

Triple-S is conducting relevant research on all these trends, and this study is part of two of the initiatives conducted by Triple-S. One is the piloting of the "Sub-County Water Supply and Sanitation Board Model" (Sub-county WSSB model) in Kabarole district, which is one of the new management models proposed for rural areas. The second is to promote the Life-Cycle Cost Approach (LCCA) in Uganda, in order to provide the above mentioned benefits.

Fontes Uganda Ltd conducted a study in early 2012 focusing on the different management models for rural water supplies in Uganda (Koestler and Jangeyanga 2012). The study outlined the existing management models in Uganda, a description of the model promoted by the government for small piped schemes (the WSSB model) and a comparison between this model and the management model for small towns. In addition, the study mapped the different monitoring initiatives taking place currently and the actors and indicators involved. In addition, it proposed service delivery indicators (SDI) for monitoring the performance of management structures of small piped schemes.

Fontes Uganda Ltd conducted a second study in line with this process (Biteete and Jangeyanga 2013). For IRC Uganda, a mapping exercise was conducted depicting the funding and expenditure flows in the entire water, sanitation and hygiene (WASH) sector in Uganda. The goal was to investigate the different funding flows and mechanisms, and show the different actors involved in the different expenditure categories according to the WASHCost methodology (see below). The study also looked at existing budgeting and planning tools which involved cost data used in the sector.

Based on the tools and methodologies developed by the last mentioned study, the next step was to carry out a tracking exercise of the actual expenditures in the rural water sector, starting with one district. This report provides the findings of this process, which was carried out for Kabarole district in Western Uganda. The goal was to get a picture of the expenditures in the rural water sector in Kabarole over the last three years, sub-divided into the WASHCost categories. Secondly, the expenditures were compared to international benchmarks developed by IRC and WASHCost.

This study is another step in the process of improving rural water service delivery in Uganda (Biteete and van Lieshout 2013). It is hoped that, through the better understanding of expenditures in the sector, it is possible to inform policy development and plan how to use the limited resources effectively. The study also provides a baseline for future analysis of the performance and cost-effectiveness of the Sub-county WSSB model mentioned above. The next steps in the process would be:

- Carrying out the expenditure tracking exercise in a second district for comparison
- Improve the methodology and develop guidelines for future use
- Gain a better understanding of the connection between expenditures and service levels, and carry out further studies on service levels
- Integrate the LCCA into the budgeting and planning framework in Uganda at central level, district level and community level
- Develop a service delivery model for the Ugandan rural water sector and analyse with regards to expenditures and service levels
- Develop a business model including financial projections for the Sub-county WSSB model
- Develop benchmarks for Uganda for the different cost categories

3 Methodology

Before explaining the methodologies of the current study, it is necessary to gain a better understanding of the WASHCost Life-Cycle Cost Approach (LCCA) methodology, on which the study is based.

3.1 LCCA Introduction and Overview of Categories

The Life Cycle Costs Approach (LCCA) is a flexible approach to show what is needed to sustain, repair and replace a water or sanitation system through the whole of its cycle of wear, repair and renewal, and what is needed to support the various institutions engaged in organising and providing water services at local (direct support) and national levels (indirect support). Life Cycle Costs (LCC), therefore, "represent the aggregate cost of ensuring delivery of adequate, equitable and sustainable water, sanitation and hygiene (WASH) services to a population in a specified area" (Fonseca et al 2010). Based on this, the LCCA "seeks to raise awareness of the importance of LCC in achieving adequate, equitable and sustainable WASH services, to make reliable cost information readily available and to mainstream the use of LCC in WASH governance processes at every level" (Fonseca et al 2010).

LCCA is actively being promoted by the WASHCost[2] project under IRC Water and Sanitation Centre in the Netherlands, and is gaining pace as an accepted framework to analyse cost data and service level criteria in the rural water and sanitation sector. One of the main strengths of the approach is that it looks beyond the initial investments and includes post-construction costs of water systems and the software aspects related to follow up, capacity building and support to the sector as a whole (institutional support). In addition, it compares the expenditures and costs with the level of service delivered, which focuses on the experience of service delivery by the user and not on a supply-based indicator such as coverage or functionality. It is hoped that by raising awareness of the costs related to keeping water systems running and institutions functioning over time and providing acceptable service levels, sustainability and functionality could be massively improved.

The WASHCost project conducted in-detail research in India, Burkina Faso, Ghana and Mozambique, and a number of publications were produced explaining the methodology, data collection, understanding of service levels and results. Based on the findings in these countries, international benchmarks were developed and presented as ranges in which costs in the different categories should ideally be found in order to provide a fair level of service (Burr and Fonseca 2013).

3.2 Cost Categories

The WASHCost project has outlined a set of cost categories especially adapted for the water and sanitation sector (Fonseca et al 2011). One of the objectives of WASHCost was to develop a universal methodology so that datasets could be comparable at an international level. The data collection in the four countries mentioned above follows this methodology, and this study is also using the same framework, making it possible to compare the results to other studies and the international benchmarks.

3.2.1 CapEx

Capital Expenditure is composed of both hardware (construction materials and engineering works) and software components. The software part includes the studies done prior to implementation

[2] See www.washcost.org for more information

(such as feasibility studies, assessments and willingness to pay surveys) and also the initial interaction with stakeholders and water users, as well as the establishment of management structures such as water user committees (WUC)[3] or water supply and sanitation boards (WSSB)[4]. CapEx also includes new investments for extensions that can be added on further down the road. The unit cost of investment is given per capita to avoid having to make assumption on the life expectancy of each type of systems. The population for each type of system is the targeted number of users. Ideally it is also given based on the effective population using each type of systems.

3.2.2 OpEx

Operating and minor maintenance expenditure covers the costs of daily operation of the water system as well as minor repairs. For a handpump, this means the replacement of fast moving spares such as bolts and chains, and for small piped schemes and gravity flow schemes (GFS) it means replacement of taps and valves as well as expenses on fuel and chemicals. OpEx also includes the payment of allowances for the people involved in running the systems. In Uganda, this can mean paying sitting allowances for committees or boards, or paying pump caretakers or scheme plumbers[5]. This expenditure is normally reflected per person, per year.

3.2.3 CapManEx

Capital maintenance expenditure includes asset renewal, replacement and rehabilitation costs. These are expenses on work that goes beyond the daily running of the systems, but that is required to keep them running. The expenditures are often beyond the capacity of the community, and are normally irregular events that do not occur every month or even every year. Examples in Uganda are borehole rehabilitation, major repair on a pump or storage tank in a piped scheme or the replacement of a faulty generator. This expenditure is normally given per person per year, and the assumptions made to annualise rehabilitation costs is give in section 3.6.

3.2.4 ExpDS

Expenditure on direct support includes institutional support as well as post-construction support related to each individual scheme or community. This includes the running of local institutions, as well as the cost of carrying out the actual follow up or capacity building activity in the community, such as transport and field allowances, as well as the running costs of the supporting structure such as office rent, vehicle repair and salaries of staff. Activities in Uganda include district water office running costs, refresher trainings and follow up of WUCs and WSSBs, technical back-stopping and other activities such as helping WUCs to make operation and maintenance (O&M) plans or to establish a revolving fund with the household collections for the handpump. Expenditures any institutional support are normally expressed per person per year.

3.2.5 ExpIDS

Expenditure on indirect support include macro-level support, planning and policy-making which is essential to an enabling environment but where it is not possible to break down costs for each specific water system or community. In Uganda, this also involves capacity building of government

[3] In Uganda, WUCs are established for point water sources.

[4] In Uganda, WSSBs are established for some piped water schemes in rural growth centres (RGCs) and small towns, especially under the development facilities. See Koestler and Jangeyanga 2012 for a detailed description of this management model

[5] WUC members normally work on a voluntary basis, but sitting allowances (paying people to attend meetings) are becoming increasingly necessary to keep people motivated

entities at different levels, research, knowledge management and developing guidelines, manuals and maintaining good sector coordination.

3.2.6 CoC

Cost of capital refers to the cost of financing the programme or project. In Uganda this mainly means the payment of interests by Government to multilateral lending agencies, as well as payment of interest for loans taken by other stakeholders such as households or WSSBs.

The Information Scan (Biteete and Jangeyanga 2013) provides a detailed overview of which stakeholders are involved in providing funding for the different categories above, and where the funding comes from.

3.3 Tools Used

The data collection was carried out using the following methodologies:

1. Desk study of documents; end of project reports, ministerial schedules, budgets and financial reports
2. Interviews with 4 key informants at central level
3. Interviews with 18 key informants at district and regional level
4. Focus group discussions in three sub-counties with members of the water boards, government officials and hand pump mechanics, 24 people in total
5. Site visits to different types of technologies in three sub-counties. In total, 3 protected springs, 4 shallow wells, 2 boreholes and 3 taps of piped schemes were visited
6. Validation workshop with 30 participants from government, NGOs, sub-counties, communities and handpump mechanics

Please see a full list of respondents in appendix 1, and a full list of the participants of the validation workshop in appendix 2. All questions were limited to the rural water sector (including rural growth centres and small towns, but not small towns with private operators) and excluded rainwater harvesting. The tools provided for collection of cost information for the last 3 financial years (2009/10, 2010/11 and 2011/12). The survey covered the following technologies:

- Borehole with handpump: boreholes of all types of depths with handpumps, normally of the type U2 in Kabarole
- Shallow well with handpump: hand dug wells with handpumps, normally U2 or Nira pumps
- Protected spring: simple protected springs with a spring wall and a pipe for collection
- Gravity Flow Scheme (GFS): piped scheme where all the water is distributed solely by gravity
- Pumped Scheme: piped scheme which includes at least one pumping cycle, pumping water to an overhead tank from which water is distributed by gravity

3.3.1 Interview Guide

This consisted of open ended questions. The first part of the guide was used to collect information from the local support institutions like district, NGOs, Umbrella organisation and handpump mechanics associations. This facilitated the collection of information on service delivery models and technologies employed, population served, and water quality testing under each of the support mechanisms. It included both questions on the support they provided, as well as an assessment of cost data and service levels of all the specific water schemes they were covering or involved with.

The second part of the guide was used to collect information from communities, water user committees and water supply and sanitations boards. This facilitated the collection of information on the population served, age of the scheme and cost of the construction, household contributions, accessibility, quality, and reliability, community contributions towards repair and maintenance and functionality of the water supply structures.

The last part of the guide presented scenarios about the service delivery levels. This helped to determine the respondents rating of the water service level in their communities or the communities they serve (see section 5).

3.3.2 Cost Framework Sheet

This tool clearly disintegrated data in different classifications of all likely costs that could be incurred under each major cost categories in the section above for each technological option. All the responses from same institution/organization whether given by different people were extracted and entered onto one cost sheet and categorized as a unit respondent. The tool was developed based on examples from Ghana, however serious revision is recommended before future use.

3.3.3 Data Collection

All the organizations/institutions that were active in the rural water supply sector for the last three financial years in Kabarole district were captured.

Data collection at community level was done in three sub-counties, however cost data from user and scheme level was also collected from a number of other sources, such as from the Umbrella organization, DWO, NGOs and the handpump mechanic association. All these stakeholders were able to give at least some detailed cost data from the areas where they have been conducting activities. The community visits were therefore not the only “samples” where user-level data was obtained, but a complementary method in order to verify data and increase the variety of respondents.

The three sample sub-counties were chosen based on an informed judgement by locally knowledgeable personnel such as the District Water Officer, on where we would find the highest and lowest extremes of costs. For example, a remote, sparsely populated area of the district with poor roads and infrastructure would probably result in higher levels of all types of costs. An area close to the urban municipal area of Fort Portal town would probably result in low cost levels. Consequently, Hakibale was chosen which is near Fort Portal municipality, with a population of 47,000 (DWO 2012). Kasenda (population 24,000), on Kamwenge road, was chosen which faces high operation and maintenance costs due to lack of power supply and long distances on poor roads to access spare parts. In addition, Buheesi sub-county (population 42,000) was chosen because this was one of the two sub-counties where the Sub-county WSSB model is being piloted, and where the development of the model had reached a point where it could start affecting cost data. Hakibaale has no piped scheme but a large number of shallow wells (147) and springs (35). Kasenda has a pumped scheme, which is the only one in the district. It takes water from a spring and pumps it up to an overhead tank, after which water is distribute by gravity to 11 taps. Buheesi is connected to a gravity flow scheme that also serves a different sub-county, and which has its source in a stream in the Rwenzori Mountains. The scheme covers a large area and has 65 taps only in Buheesi. In each sub-county or area, a few water points (point sources or taps of piped schemes) were visited in order to talk to communities about their OpEx and CapManEx costs, as well as service levels and fees. In total, 3 protected springs, 4 shallow wells, 2 boreholes and 3 taps of piped schemes were visited. The selection of these was done based on advice from the local leaders and water board members. Although not all sub-counties had the full range of technology options, an attempt was made to cover all above listed technology options over the three sub-counties.

3.4 Assumptions in Data Analysis/ Entry

Due to the differences between different stakeholders in record keeping and reporting, it was necessary to make a number of assumptions during the data collection and data entry.

A total of 1,315 **water sources** in Kabarole as per the list provided by the District Water officer were considered. Based on this the different percentages of each technology options were calculated (see Table 1). These percentages include both functioning and non-functioning sources, and were used to distribute direct and indirect support costs that were reported for the entire district. This is based on the assumption that, even if a source is not working, the stakeholders will still spend money on direct support especially in terms of attempts to mobilize the community to carry out a repair, or doing assessments for rehabilitation. This might not be entirely accurate as there are many sources that have been abandoned in favour of piped schemes that provide higher service levels, and will therefore never be considered for repair. It was, however, not possible to have data on how many of the non-functional sources were abandoned and how many were awaiting repair.

Table 1 Overview of water sources in Kabarole. Source: District water office, 2013

Technology	Total number	Percentage	Number not working
Boreholes	88	6.69%	53
Protected springs	562	42.73%	110
GFS	6	0.46%	1
Shallow wells	658	50%	189
Pumped scheme	1	0.07%	1

In order to determine indirect support by **UWASNET**, a total running cost was subjected to the proportion of active members in Kabarole district which was 3.75 %, compared to the rest of the country (UWASNET 2012).

For the **Mid Western Umbrella Organization for Water and Sanitation** (MWUWS), only 6% of the total ExpDS was considered proportionate to the 4 schemes under the umbrella in Kabarole, compared to the total number of schemes which are members of the umbrella.

For the **Ministry of Water and Environment**, only departments that have a strong connection to rural water supply were considered. These include: rural water supply, water resources management, urban water supply (under which piped schemes in RGCs fall) and policy, planning and support services. Total running costs were considered for each department, excluding the costs for sanitation activities, infrastructure development and individual projects outside Kabarole. The cost was divided by the number of districts i.e. 79 districts for FY2009/10 and 112 for FY 2010/11 and FY2011/12. In addition, only the cost of motor vehicles, furniture and computers that were purchased in the three years was considered. The interviewers could not find out the cost of the assets that were acquired in the previous years.

The **population** of Kabarole considered excluded the population of Fort Portal municipality since this is being served by National Water and Sewerage Corporation (NWSC). The population served by rural water supply is at 90% according to the Ministry of Water and Environment (MWE 2012b) and the population out of this population served by piped schemes was estimated at 23% according to the Water Atlas (MWE 2010b). It was then assumed that the remaining 77% are served by point sources. For the populations used for CapEx and CapManEx, the standard population for the different technologies were used, which are 300 people for boreholes and shallow wells, 200 people for protected springs and 150 people for a public tap. Only the population served by a rural water source (90%) was considered for support per capita expenditures. This is arguable, because services provided by the government must run anyway, whether there is access to a service or not. However, the majority of support costs were incurred by NGOs that carry out actual activities with the populations already accessing some sort of service. In order to provide figures for future budgeting for such support services, the analysis made more sense in this way.

The costs were subjected to **GDP deflators** and averages were 1.1203949911 FY 2009/10, 1.0718309791 FY 2010/11 and 1.0244780000 FY 2011/12.

Technical Support Unit (TSU) **6** covers 10 districts. Hence, the costs for TSU 6 were divided by 10 districts and then allocated to the diff by the number of water sources in Kabarole. Since the office of the TSU is in Fort Portal, and according to the staff, they regularly carry out activities directly in the communities, their expenditures were considered as part of direct support expenditures.

Yerya GFS was considered as one scheme and 2/3 of it was considered to be in Kabarole district. This scheme previously consisted of 4 independent schemes, however the construction of the large scheme was completed in 2010. It then kept operating with different water boards for each of the five towns until the entire scheme was contracted to a private operator in August 2012.

At **district** level, other staff from different departments contributed to the work of rural water supply and their time spent was estimated as district planner 30% and district community development officer 40%.

For **FORUD**, only sources constructed in 2010/11 were considered as the other data was not accessed.

Mugusu GFS scheme was estimated to be approximately 2/3 of Kichwamba GFS in size and expenditures.

The activities of **Triple-S** at national level were considered indirect support and hence divided by total number of districts, except for the expenditures directly related to outcomes at Kabarole district level.

In order to provide a picture of OpEx and CapManEx of **point sources**, information was collected from the three sub-counties. However, the findings of the report are not only based on the points and sub-counties that were visited, but cost data, all the way down to user level, was collected from a number of sources where this information is centralized, such as from the handpump mechanic association and the district water office. The points visited were more an additional way to verify and collect data than included to represent the entire district. Subsequently, informed estimates were made on how much communities averagely spent per year per sub-county, based on the data from the communities, discussions with practitioners with experience from different areas of the district, discussions with stakeholders and discussions during the stakeholder workshop. It was differentiated between the sub-counties which are served by piped schemes and by the ones that are not, because it was assumed that communities with access to piped schemes would not spend on CapManEx to fix point sources.

For the seven **piped schemes** in Kabarole, data on operations expenditures and major repairs handled by the water boards was collected in the following way: two schemes were visited by the survey team, two schemes were visited by the Triple-S representative in Kabarole and detailed reports on two more were obtained from the Umbrella organisation. For the last scheme, an estimate was made by the district water officer and the Triple-S representative in Kabarole. For data on major repairs, extensions and rehabilitations, data was collected from NGOs, the district water office and the Umbrella, and in some cases the water boards.

3.5 Methodology for Service Levels

Four methods were used to determine service levels in Kabarole:

- Stakeholders who are active in Kabarole district such as NGOs, district, TSU and handpump mechanic association were asked to make an assessment based on the service level table (see section 5)
- Stakeholders active at sub-county level such as sub-county officials, handpump mechanics and water board members were asked to make an assessment based on the table in the three sub-counties visited
- Service levels were assessed by the consultants for all water points visited, by observation of distance and through discussing with users found at the water point about crowding, reliability, quality and quantities
- The findings during the interviews were presented during the validation workshop and discussed again, in order to get a picture for the district as a whole

3.6 Methodology for Estimating Life-spans

In order to calculate life-cycle costs, it was necessary to estimate the lifespan of the different technologies and the frequency with which large repairs would be needed. First, an estimate was made by the consultants, which was then presented during the validation workshop and slightly changed. Estimates were made for three scenarios; one where no preventive maintenance is carried out at all, one where preventive maintenance is carried out all the time and an estimate for the current situation of Kabarole. The participants felt that the duration of a point source with poor preventive maintenance should be increase from three to five years, since many springs and shallow wells last this long despite not being taken care of. Also, they reduced the lifespan of a piped scheme where no preventive maintenance is done from seven to five years, due to the frequent small breakdowns of the gravity flow schemes in Kabarole and the need to constantly de-silt tanks and fix intakes in the mountain rivers. For Kabarole, the lifespan for point sources was set to only 10 years, mainly because there is a tendency to abandon point sources once piped schemes providing higher service levels become available. The frequency of large repairs on piped schemes for Kabarole was set as low as three years, because there are a number of natural hazards in Kabarole such as earthquakes, landslides and overflowing rivers that regularly break the infrastructure. These might not be related to preventive maintenance, however, for point sources proper preventive maintenance is still a major driver for durability.

Table 2 Estimates for lifespans for the different technologies shown in three scenarios

Life Cycle Estimates - years	Poor preventive maintenance	Ideal maintenance	Estimate for Kabarole
CapEx			
Point Sources	5	20	10
Piped Schemes	5	50	20
CapManEx			
Point Sources	2	10	5
Piped Schemes	2	10	3

3.7 Challenges

During the data collection, a number of challenges were encountered. These included:

- For software activities, the water supply and sanitation activities could not be clearly differentiated. Hence, their costs were hard to separate. The interviewer had to judge whether it was more of water supply and include or more of sanitation and leave it out.
- Some NGOs were working in consortia with a complex structure of financial management and work distribution. Hence, such NGOs could not determine the costs of the water activities. The respondents were asked to estimate based on the cost of related activities. In case the respondents were unable to estimate, such costs would be left out.
- Conflicting data exists with regards to the number of water sources in the district, and the number of sources that are functional. The consultants decided to use the latest figures provided by the district office, because they are likely to be more reliable than the figures kept by the ministry at a central level. The district keeps updating these figures through different water point mapping initiatives, as well as through the cooperation with the handpump mechanics.
- Most of the NGOs in Kabarole also work in neighbouring districts. Hence, the determination of some costs was a problem. For, example, the salary of some officer working in a project that covers 2 or more districts. In such a situation, the person would be asked to estimate on the time spent for work in Kabarole.
- Due to limited resources for this study, the study relied on information given by the different partners working in the district, as well as observation by the consultants and discussions with water users for service levels. Only three sub-counties were visited, and systematic household surveys or water point surveys (where users of a water point are interviewed over time) were not carried out. This made it hard for the consultants to obtain statistically reliable results on the service levels.

4 Kabarole District

Kabarole district is located in the central-western part of the Western Region of Uganda. The district has 2 counties and a municipal council, 13 sub-counties and 6 town councils. Kabarole has a projected population of 415,700 (District Population Office 2013). Kabarole District reportedly has a poor ground water potential especially in Rwimi, Kasenda and Kibiito sub-counties (MWE 2010b). Each sub-county has 2-3 handpump mechanics, normally 1-2 per parish. In areas with piped schemes, they often also act as scheme plumbers or attendants. They are organised in a handpump mechanic association which has approximately 30 members.

Access to safe water is 90% compared to the national of 64%, with water source functionality of 80% which is slightly lower than the national water source functionality source of 83%. The water sources with active water user committees were 30% compared to the national average of 72%, while water sources with women in key positions were 54% compared to the national of 82% (MWE 2012b).

Kabarole district has relatively good access to markets and communication, situated on the main highway between Kampala and Kasese. Fort Portal municipality is a fast-growing and dynamic town, with a fast-growing tourism industry in addition to tea and other agro-businesses such as vanilla processing. Major markets such as Rwimi serve areas far beyond the district borders, including the Democratic Republic of Congo (DRC). The western part of the district covers in the foothills of the Rwenzori Mountains, with steep slopes and challenging terrain. Most gravity flow schemes have their source capture here, either from a spring or a river, and water is then piped to the more populated areas of the district to the east. To the south east, a number of crater lakes can be found. Being part of the Albertine Rift Valley, the region is experiencing quite frequent seismic activity, and inhabitants complain these disturb the water tables with often makes shallow wells, protected springs and boreholes turn dry.

Table 3 Population Kabarole District (Sources: district population office, MWE 2010, 2011 and 2012)

Year	2009/10	2010/11	2011/12
Total district population	403,100	409,400	415,700
Population Fort Portal Municipality	81,602	84,862	88,144
Rural population	321,498	324,538	327,556
Rural population with access to an improved water source (90%)	289,348	292,084	294,800

5 Service Levels

The following scenarios were used to assess the service levels in Kabarole district. The table has been developed by Triple-S Uganda and is based on national standards.

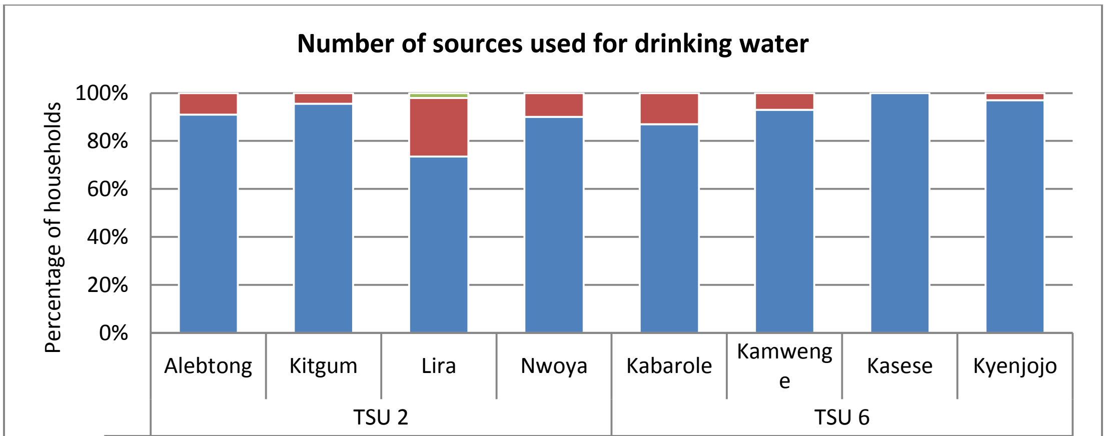
Table 4 Service Level scenarios table

Scenario	Level water service
Good quality water supply of at least 40 lppd within a distance of 0.5 km from a water source that is reliable 95% of the time	Excellent
Good quality water supply of at least 30 lppd within a distance of 0.75 km from a water source that is reliable 95% of the time	Good
Good quality water supply of at least 20 lppd within a distance of 1 km from a water source that is reliable 95% of the time	Fair
Users access a service that doesn't meet one or more of the following standards: quality, quantity and reliability	Low
Community doesn't have an improved water source within a walking distance of 1 km.	Very low

In 2012, Triple-S carried out a detailed study on service levels in 8 districts in Uganda, out of which Kabarole was one. 200 household surveys were carried out in two sub-counties in the district (Busoro and Buheesi), as well as discussions with eight water user groups/committees in each sub-county (Triple-S forthcoming). The next section will show extracts from this study in order to shed light on the service level situation in Kabarole, due to the limited data on service levels which the cost analysis study was able to collect.

5.1 Sources of water

The Triple-S study took into account that a number of households use more than one source. This can be due to seasonal variations (some shallow wells or springs have lower yields in the dry season), or to the fact that people return to other sources when the primary source breaks down. The Triple-S study shows that 87% of households surveyed only use one source for drinking water, whereas 13% used two. This data was not collected for the present cost analysis survey, but the data is relevant in for the discussion on theoretical and practical coverage figures (see section 8.5).

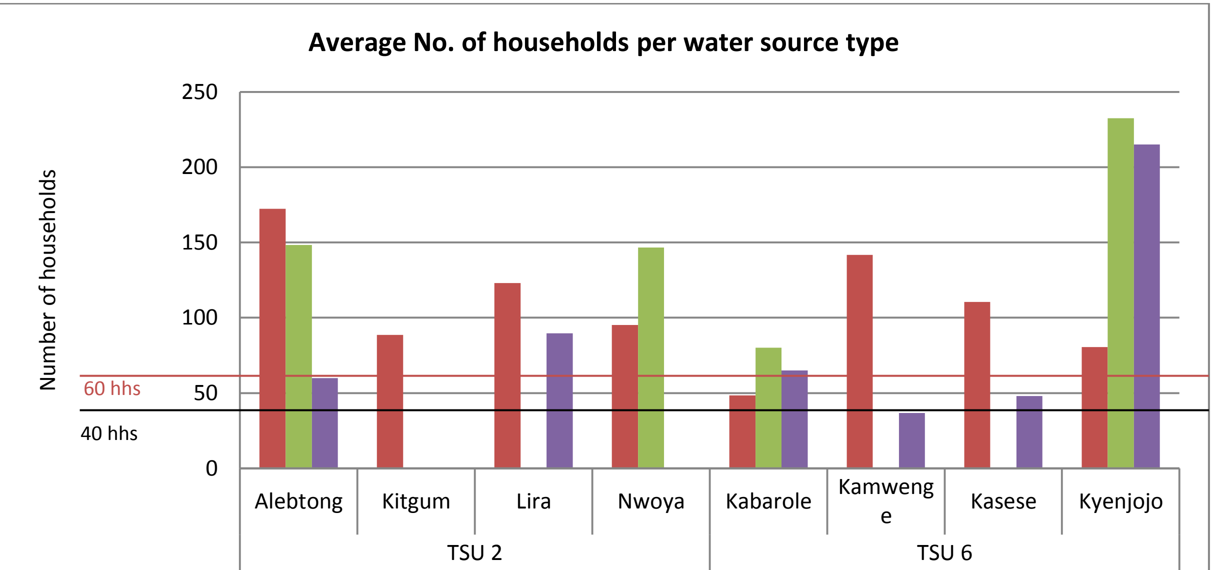


	Alebtong	Kitgum	Lira	Nwoya	Kabarole	Kamwenge	Kasese	Kyenjojo
	TSU 2				TSU 6			
3	0%	0%	2%	0%	0%	0%	0%	0%
2	9%	4%	25%	10%	13%	7%	0%	3%
1	91%	96%	74%	90%	87%	93%	100%	97%

Figure 1 Number of sources used for drinking water (source: Triple-S forthcoming)

5.2 Crowding

An important indicator for service levels is crowding, because it directly affects the time spent to fetch water and therefore the accessibility of the water at the source. Although queuing or time of collection was not part of the service level scenarios in table 4, it was still recorded for the water points visited by this study. The Triple-S study shows that the average number of households per source was low compared to other districts, actually it was the lowest for all districts surveyed for boreholes. However, 80 households (approximately 400 people) for a protected spring is still relatively high, and is twice the national standard figure for protected springs. The average number of people per point water source of the sources visited during the Triple-S study was 381, which is about 76 households.



	Alebtong	Kitgum	Lira	Nwoya	Kabarole	Kamwenge	Kasese	Kyenjojo
	TSU 2				TSU 6			
Borehole	172	89	123	95	48	142	111	81
Protected spring	148			147	80			233
Shallow well	60		90		65	37	48	215

Figure 2 Average No. of households per water source type (Source: Triple-S forthcoming)

The Triple-S study also revealed that 81% of the people surveyed had to line up in a queue to fetch water, which could be between 27 and 70 minutes long (Triple-S forthcoming). Of the 13 water points visited by the current survey, 4 had queues shorter than 30 minutes, 5 had queues between 30 and 60 minutes and 4 had queues more than 60 minutes long. No sources visited had no queues at all in the peak periods.

5.3 Quality

The water quality of the water sources in Kabarole is generally good. There are few problems with hard water, salt or silting. The Triple-S study confirms this, and found that 40% of respondents said water quality was good all the time (Triple-S forthcoming). Of the water points and systems surveyed during this study, only the two boreholes had poor quality; both had smell and colour. The shallow well found with poor quality was partly broken down; the bolts holding the pump on the slab were gone and contamination could easily enter the well. It was not possible to obtain more records on systematic water quality testing, as testing is only done for point sources at the time of commissioning and not repeated after.

5.4 Quantity

The national standards set say that each person should have access to at least 20 litres of water per day from the different sources. In Kabarole, where the regular household has five people, this would mean about 100 litres or 5 20-litre containers (jerrycans) per household per day. The Triple-S study found that water consumption in all districts was below this standard. In Kabarole, only 12% of households consumed 20 litres per person per day, and the average litres per person per day was 11 (Triple-S forthcoming). This is confirmed by the findings of the present study, where only at two of the water points visited people said they were using more than 20 litres per person per day, and these were taps of a gravity flow scheme.

5.5 Distance to Water Point

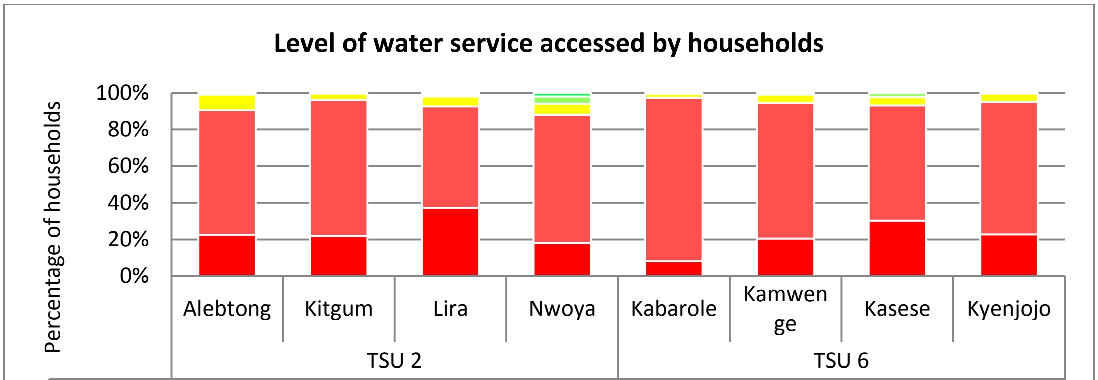
An important limitation to quantity is the distance to the water point. Once the distance exceeds a few hundred meters, very few households make the effort of fetching one jerrycan per person per day. The national minimum standard was recently reviewed from having access to a water point within a distance of 1.5 km to 1 km. The Triple-S study found that 95% of the people surveyed had a water point within a distance of 1 km, and the average distance to a water point in Kabarole was 530 metres (Triple-S forthcoming). All water points visited during the present study were within 1 km of most households, although that still means that someone has to walk for 2 km for a round trip. Out of the 13 water points visited, five were within 0.5 km for a round trip, two were between 0.5 and 1 km for a round trip and six were more than 1 km for a round trip. It has to be noticed that a number of sources in Kabarole, especially point sources such as protected springs and shallow wells, are located in steep slopes that make it a large effort to fetch the water, even if the distance is not so far.

5.6 Reliability

There are different ways of assessing functionality. For the sector performance framework, the government uses the indicator "not functional at time of spot check". This means that if the source is temporarily down it is still counted as non-functional. At the same time, sources that are beyond repair or abandoned still feature as non-functional, even if nobody wants to use them. The methodology used by the Triple-S study was to ask people about the latest interruption in supply. According to the service levels table (Table 3), the water source should be reliable at least 95% of the year. This means that the source cannot be down for more than 14 days in a year. 93% of the households surveyed in Kabarole said their source had experienced an interruption that they could remember. After further questioning, it was revealed that in Kabarole, in 44% of these cases the interruption was due to a breakdown, in 50% of the cases it was due to seasonal yield problems and in 6% of the cases the cause was both. In Kabarole, in 28% of the cases of a breakdown the interruption lasted 1-2 months, and in 27% of the cases it lasted more than 6 months. Only 25% of cases were fixed within two weeks. For seasonal interruptions, 61% of the interruptions lasted 1-2 months which is consistent with the dry seasons. This data reveals that only 26% of the sources in Kabarole would be considered reliable (Triple-S forthcoming). It was difficult to collect data on reliability for the present study due to the few respondents. Generally, both boreholes visited had been down for a period between 8 and 10 years, before they had been recently rehabilitated. Two shallow wells were found with pumps that were already broken, but still giving water. However, with no repair it will only be a matter of time until they break down completely. Only one shallow well and one borehole reported to have a functioning water committee collecting regular household contributions, and both sources had been constructed or newly rehabilitated within the last two months. Both piped schemes visited were not functional. One had been down for 3 months and the second for 7 months. The pumped scheme had experienced a problem with the generator, and was struggling to access the spare part and did not have enough money to make it work again. The gravity flow scheme had experienced a major breakdown at the intake during the last rainy season, which partly washed away the intake. The water board did not have the required funds to repair it, but finally, while this study was being conducted, the district water office started works to fix the problem. However, it could clearly be seen how people returned to the point sources further away from the households when the piped schemes did not have water.

5.7 Service Level in Kabarole

In order to get a clear picture of expenditures, it is crucial to be able to link them to service levels. However, service levels can vary from household to household, from source to source and from area to area. It is not possible to compare the expenditures of each water point with the level of service it provides within the scope of this study, so some generalisations have to be made. Based on a combination of the study carried out by Triple-S before and the findings during this study, we have attempted to make an assessment of the service level in Kabarole district as a whole.



	Alebtong	Kitgum	Lira	Nwoya	Kabarole	Kamwenge	Kasese	Kyenjojo
Excellent	1%	0%	1%	2%	0%	0%	0%	0%
Good	0%	0%	1%	4%	1%	1%	2%	1%
Fair	9%	3%	5%	6%	2%	4%	5%	5%
Low	68%	74%	55%	70%	89%	74%	63%	72%
Very low	23%	22%	37%	18%	8%	20%	30%	23%

Figure 3 Level of water service accessed by households (source: Triple-S forthcoming)

Based on the findings from the household surveys and the benchmarks provided by the assessment table, the above figure shows the overall findings of the Triple-S study. It shows that in Kabarole district, 97% of the households surveyed only had access to low service levels (Triple-S forthcoming). It has to be taken into account that the Triple-S forthcoming study does not consider the rural growth centres and small towns, which are areas served by piped schemes which often provide higher levels of service in terms of distance and quantity.

When stakeholders at district level were asked to give an assessment of the general situation in the district based on the table, all stakeholders assessed the service level as “fair”. However, when service levels were assessed at source level, all sources were assessed as “low” except two, but only if they had been working. In fact, three of the points visited were providing no service at all because the piped schemes were down. There were two main reasons why most water points did not meet the benchmark to be considered fair:

- Quantity: like mentioned before, many sources in Kabarole are situated in valleys where people have to descend steep slopes to access them. This makes it rare to fetch one jerrycan per person in the household. Even for households close to gravity flow scheme taps, usage above 20 litres per person per day was rare.
- Reliability: Higher quantities are more likely for people using taps from piped schemes, but both pipes schemes had been down for several months at the time of the study.

These observations were confirmed during the stakeholder workshop. When this issue was discussed with the district water office, it was confirmed that sources normally experience long down times. According to the district, this is mostly due to the poor collections by the water committees and water boards of contributions from the water users, leaving them with no funds to deal with repairs. Consequently, it takes time to mobilise sufficient resources in the community. Many times, this is not achieved and the source is reported to the district water office. The district water office said that if there was no backlog, sources could be fixed within 3 months. However, due to the limited resources for repairs and rehabilitation and the backlog, it can take from 1-2 years from a source is reported to the district until it is fixed.

Based on the above analysis it can therefore be assumed that the majority of households in Kabarole district are experiencing low service levels.

6 Cost Data Findings

This chapter will summarise the findings from the cost analysis study. Based on an extensive dataset, it is possible to show a large number of graphs. The following sections are a selection of these, based on what is considered as interesting for sector stakeholders, policy makers and researchers. All figures are shown in 2013 Uganda Shillings.

6.1 Overall Expenditures

The graph below shows the overall expenditures in Kabarole district over the last three financial years.

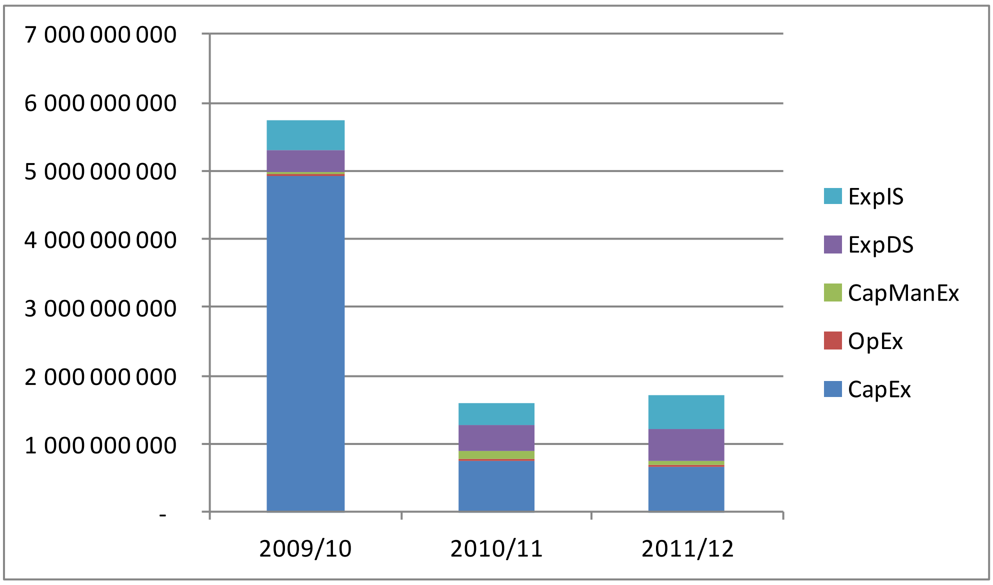


Figure 4 Total expenditure for Kabarole district last 3 financial years by cost category

We see that spending in 2009/10 is much higher than the other years. This is mainly due to a large gravity flow scheme (Yerya) covering five towns, three in Kabarole district and two in Kasese district, with a total cost of 5.2 billion Uganda shillings. Only two thirds of the costs were included in the Kabarole cost analysis but it still shows a much higher spending on CapEx than the other years. This scheme was funded by the regional Water and Sanitation Development Facility (WSDF), which receives funds directly from central government and donor basket funds (Biteete and Jangeyanga

2013). Whereas the total expenditure for the district was more than 5.7 billion in 2009/10, in 2010/11 and 2011/12 this figure is between 1.5 and 1.7 billion (between 560,000 and 640,000 USD). It is also possible to see from the graphs that the majority goes to CapEx, although not as much as what is required by the conditional grant guidelines (70%) (Biteete and Jangeyanga 2013). This is because a number of other stakeholders such as NGOs are also contributing to the total spending of the district. It is also possible to see that the expenditure increased slightly by around 200 million Uganda shillings from 2010/11 to 2011/12, although the period is too short to draw any conclusions.

It might seem surprising that OpEx remains relatively constant even if a large number of new people gained access to a piped scheme, which normally has higher OpEx costs. There can be two reasons for this. One is that many people already had access to a piped scheme before the Yerya investment, because this investment actually connected a number of already existing schemes. The second is that the management of the new Yerya scheme was relatively disorganised until August 2012, when it was contracted to a private operator. It is likely that operations expenditures will increase once the management becomes more professional. However, this period falls outside the scope of this study.

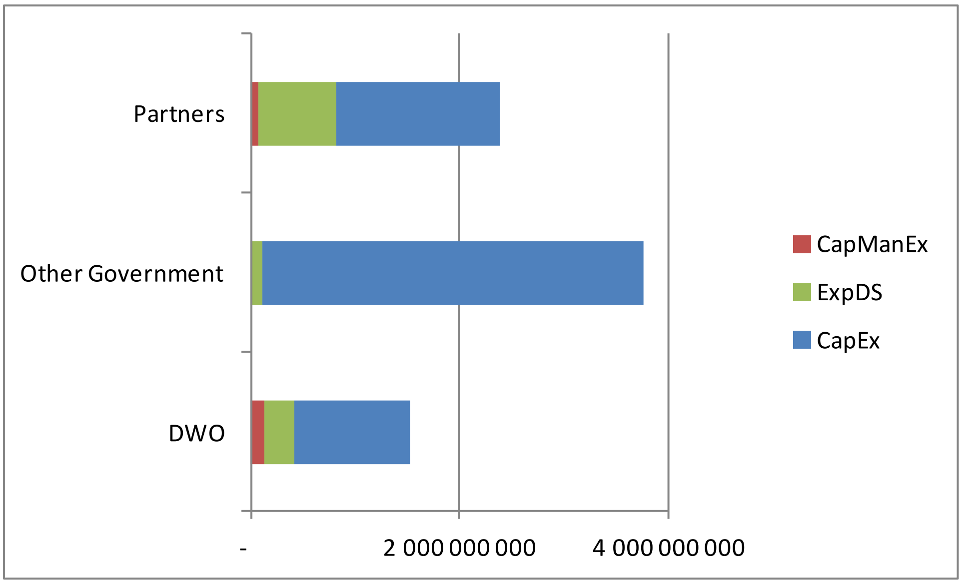


Figure 5 Expenditures over all three years by stakeholder group

The figure above shows to what extent other stakeholders are spending in Kabarole, apart from the district. It shows a breakdown of Figure 4 by source of funds, over the entire period and not per year. Partners, including NGOs and international organisations such as UNICEF, are still spending more than the district water office, especially on CapEx but also on ExpDS. Other government institutions involved are the TSU, the Umbrella and the WSDF, which accounts for most of the CapEx due to the construction of the Yerya scheme. It can also be seen that the district spends more than the two other categories on CapManEx. In total, NGOs and partners spent more than 2.3 billion Uganda shillings over three years in Kabarole, and this excludes the donor funds that are put in the basket fund (Joint Partnership Fund JPF, which funds part of WSDF, TSU and Umbrella) and directly given to the government as bilateral aid. OpEx is excluded from this graph, since this is mostly covered by the communities. Part of CapManEx is also covered by the communities and is included in the “partners” category, however these amounts are insignificant. For more information on the different funding mechanisms in Uganda for the water sector, please see Biteete and Jangeyanga 2013.

The cost data was analysed by cost category and by technology. For technology it is possible to look at two main categories, point sources and piped schemes. The expenditures were also separated between one-off expenditures (CapEx and CapManEx), and yearly expenditures (OpEx, ExpDS and ExpIS). This was in order to make the calculation of life-cycle costs easier. For each technology group a summary table was developed, and there is also a summary table for each individual technology which is shown by the example of the shallow well below.

Table 5 One-off expenditures for point sources over three years

	Point Sources		
One-off Expenditures	Overall total	Average per year	Average per source
CapEx Hardware	907 374 850	302 458 283	3 451 407
CapEx Software	108 934 436	36 311 479	414 357
CapEx Extensions Hardware	-	-	-
CapEx Extensions Software	-	-	-
Total CapEx	**1 016 309 286**	**338 769 762**	**3 865 764**
CapManEx Management	-	-	-
CapManEx Maintenance	155 351 378	51 783 793	919 239
Total CapManEx	**155 351 378**	**51 783 793**	**919 239**

The table shows that in total, all stakeholders spent approximately 1 billion on CapEx and approximately 150 million on CapManEx over all three years. This means approximately 300 million on CapEx per year, and approximately 3.4 million per source on hardware costs. On average, approximately 1 million was spent on each rehabilitation of a point source. This data is only based on the sources where rehabilitation expenditures were found (see section 6.3). For piped schemes the same table is more difficult to interpret, mostly because each scheme is so different in size and cost that averages per scheme do not make much sense. In addition, averages are skewed by the extremely expensive Yerya scheme.

Table 6 One-off expenditures on shallow wells over three years

	SW - Point source				
One-off Expenditures	Overall total	Average per year	Average per source	Minimum average per source	Maximum average per source
CapEx Hardware	492 766 540	164 255 513	4 253 079	3 564 270	6 966 450
CapEx Software	51 958 523	17 319 508	1 745 711	1 212 189	2 640 678
CapEx Extensions Hardware	-	-	-	-	-
CapEx Extensions Software	-	-	-	-	-
Total CapEx	**544 725 063**	**181 575 021**	**5 998 790**	**4 776 459**	**9 607 128**
CapManEx Management	-	-	-	-	-
CapManEx Maintenance	53 013 024	17 671 008	1 606 305	1 527 804	1 787 010
Total CapManEx	**53 013 024**	**17 671 008**	**1 606 305**	**1 527 804**	**1 787 010**

The table shows the breakdown for shallow wells, which is the technology with the largest number of sources in Kabarole. 50% of all sources are shallow wells. A number of NGOs are active with shallow wells, and it was therefore possible to get a large amount of data. Overall, almost 550 million was spent on the construction of new shallow wells over the three years (155 in total). 50 million was spent on software activities alone, which is more than 1.7 million per source. This shows that there is a large investment in software activities for new sources; with 1.7 million it is possible to do a lot. The cheapest shallow well was 3.5 million and the most expensive one was 7 million, which is realistic according to the stakeholders during the workshop. In addition, rehabilitation costs on average 1.5 million, which was also considered realistic.

Table 7 Yearly expenditures on shallow wells over three years

	SW - Point source				
Yearly Expenditures	Overall total	Average per year	Average per source per year	Minimum average per source	Maximum average per source
OpEx Management	13 471 604	4 490 535	6 899	6 984	7 591
OpEx Operations	48 251	16 084	24	15 367	16 806
OpEx Maintenace	12 731 760	4 243 920	6 450	45 302	150 621
Total OpEx	**26 251 614**	**8 750 538**	**13 373**	**67 654**	**175 018**
ExpDS capacity building & Monitoring	411 400 584	137 133 528	263 207	1 179 068	4 049 130
ExpDS Running Costs	85 125 129	28 375 043	46 348	465 896	2 053 064
Total ExpDS	**496 525 713**	**165 508 571**	**309 554**	**1 644 964**	**6 102 194**
ExpIS Running costs	614 503 136	204 834 379	311 298	311 298	311 298
ExpIS Assets	3 499 965	1 166 655	1 773	1 773	1 773
Total ExpIS	**618 003 101**	**206 001 034**	**313 071**	**313 071**	**313 071**

Table 6 shows the breakdown of yearly expenditures for shallow wells. Similar breakdowns exist for all the other technologies. It can be seen that on district level, not more than 13,000 is spent each year for each shallow well on operations and maintenance. This number has to be treated with caution, as well as the maximum and minimums per source, due to the fact that it is based on estimates. Interestingly, more than 1.6 million is spent per year per source on direct support, including on the 189 shallow wells that are not functioning. In total, more than 160 million is spent each year on direct support expenditures, which includes capacity building of water committees, communities and handpump mechanics, as well as water point mapping, general stakeholder meetings and the running of support offices. During the workshop it was discussed whether it makes sense to distribute direct support expenditures per source. In one way it can give a wrong picture, because obviously this money is not spent at source level. Most of it is spent on running costs such as salaries and vehicles (see section 6.4.4). However, it still gives the stakeholders an idea of how much is theoretically available per source. The same can be said for indirect support costs, where the money is spent at national level. At the same time, for budgeting and planning purposes, these figures could still be interesting.

6.2 Investment Expenditures

Investment expenditures cover new water systems, both the hardware component, surveys such as feasibility studies and geophysical surveys and the cost of the initial training and mobilisation of the community. In addition, this category covers the extensions made on existing piped schemes. It is quite frequent that extensions are made in Kabarole, and only in the three year period, three extensions were done (Kichwamba, Kiguma and Bukuuku). In total, 20 new boreholes, 88 new protected springs and 155 new shallow wells were constructed in the three year period considered by this study. In addition, the Yerya scheme was completed in 2010, as well as Mugusu GFS.

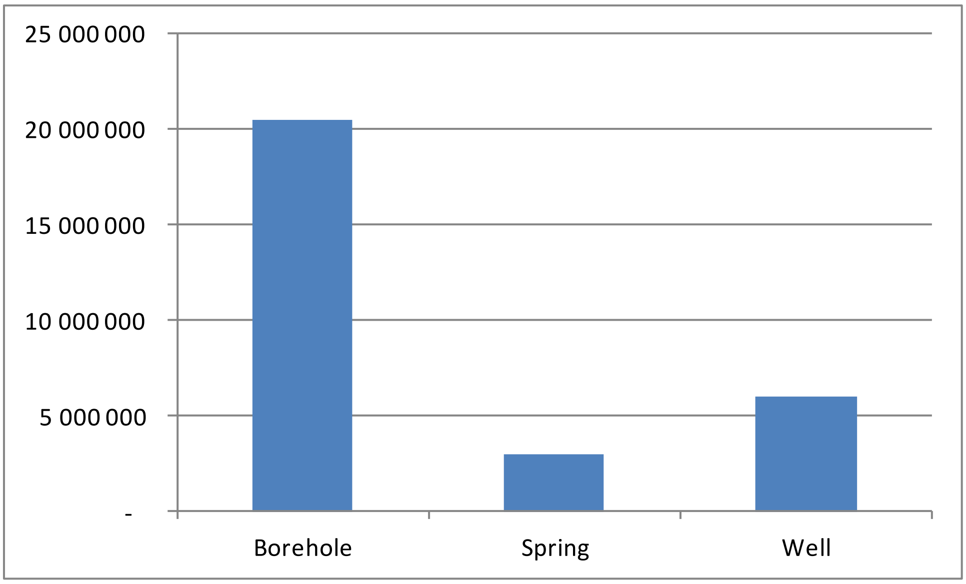


Figure 6 Average capital expenditure per source for point sources

The study was able to give a picture of the average investment cost per unit for the different technologies in the district. On average, slightly above 20 million is spent per borehole, approximately 6 million for each shallow well and approximately 3 million per protected spring. Note that these costs include software expenditures as well. Without the software, it would be approximately 19 million for a borehole, 4.2 million for a shallow well and 2.7 million for a protected spring. These numbers were discussed during the validation workshop and after an error was discovered in the borehole figure, they were accepted as realistic.

6.3 Capital Maintenance Expenditures

These are costs related to rehabilitations of existing water sources, as well as major repairs. The district water office does a number of borehole rehabilitations, and as shown above, is the stakeholder that spends the most on rehabilitation. In total, 29 boreholes were rehabilitated in the three year period, as well as 66 springs and 74 shallow wells. This represents 32% of all boreholes in the district, 11% of springs and 11% of shallow wells. Major repairs were also carried out on Kichwamba, Bukuuku, Buheesi, Mugusu and Kasenda piped schemes, which are 71% of all piped schemes. In total, 198 million was spent on CapManEx in the entire district over the three years, which is an average of 66 million per year. 50 million was spent on boreholes, 53 million on protecte springs, 41 million on gravity flow schemes, 53 million on shallow wells and 1,3 million on the pumped scheme. CapManEx is on average only 2% of all average expenditures per year.

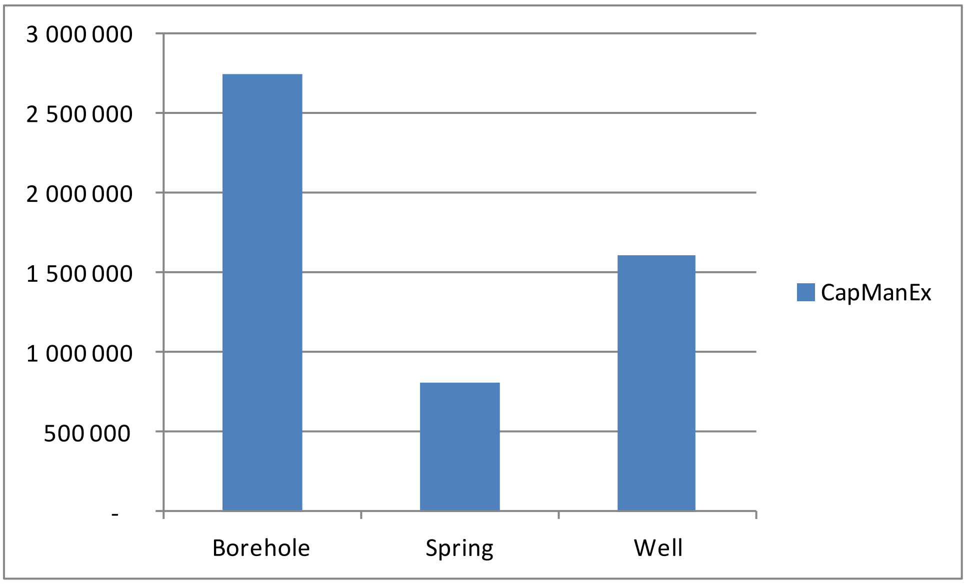


Figure 7 Average expenditure on rehabilitation per source

The graph above shows the average expenditure on rehabilitation for the different types of point sources. Not surprisingly, borehole rehabilitation is the most expensive of 2.7 million on average per borehole. On average, rehabilitating a spring cost 800,000 Uganda shillings, and rehabilitating a shallow well 1.6 million. Interestingly, none of the stakeholders reported any software component in the rehabilitation cost. This might be because this is often interpreted as being part of expenditures on direct support, since it can be difficult to differentiate between what activities are directly linked to the rehabilitation and what activities are general follow up activities.

6.4 Recurrent Expenditures

Recurrent expenditures, according to WASHCost, are all the expenditures except for the capital investments (Burr and Fonseca 2013). This includes OpEx, CapManEx, ExpDS, CoC and ExpIS. CapManEx needs to be converted to a yearly figure, making assumptions on the frequency of the large repairs. Note that during this study, no information was found on cost of capital. In addition, in the WASHCost analysis that developed the benchmarks based on their findings in India, Burkina Faso, Ghana and Mozambique, ExpIS is not included. In our study, however, ExpIS was included through using data from three stakeholders at national level primarily involved in policy development and research. There are probably many more, but at least the main players such as the Ministry of Water and Environment and UWASNET, the umbrella organisation for NGOs, were included.

6.4.1 Life-spans

In order to calculate recurrent costs, it is necessary to develop assumptions on the life-spans of different technologies. The table below outlines the assumptions used, and the methodology is described in the methodology chapter.

Table 8 Estimates for life-spans of different technology groups in three different scenarios

Life Cycle Estimates - years	Poor preventive maintenance	Ideal maintenance	Estimate for Kabarole
CapEx			
Point Sources	5	20	10
Piped Schemes	5	50	20
CapManEx			
Point Sources	2	10	5
Piped Schemes	2	10	3

Based on the durations above, recurrent costs and life-cycle costs can be calculated using the estimates for Kabarole.

6.4.2 Point Sources

The graph below shows the average recurrent cost per source for point sources. Not surprisingly, boreholes are the most expensive technology mostly due to the high costs of rehabilitation. Springs cost less in capital maintenance but have more support costs attached to them. This is mainly because there are a number of stakeholders that only work in areas with protected springs and/or shallow wells, and the support costs of these organisations were therefore allocated to these technologies only. Indirect support costs are the same, since the total was distributed evenly over the number of source in the district. OpEx is negligible, and on springs it is only 5000 Uganda shillings per source per year. This was confirmed during the workshop, however some participants argued that normally water users carry out operation works on springs that is based on voluntary work and therefore not paid for, such as slashing grass and maintaining fences.

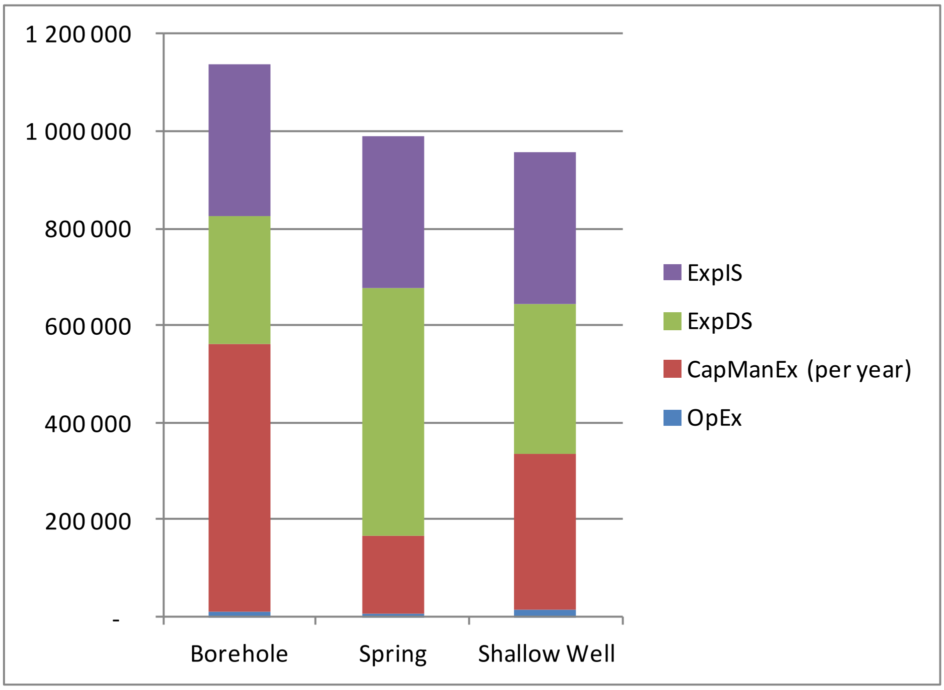


Figure 8 Average recurrent costs per year for point sources by technology and cost category

6.4.3 Piped Schemes

A similar analysis can be done for piped schemes. In the case of Kabarole there are only 6 gravity flow schemes with very variable sizes, and only one pumped scheme. The limited sample makes it difficult to draw conclusions from the findings compared to the point sources, where the sample is much larger.

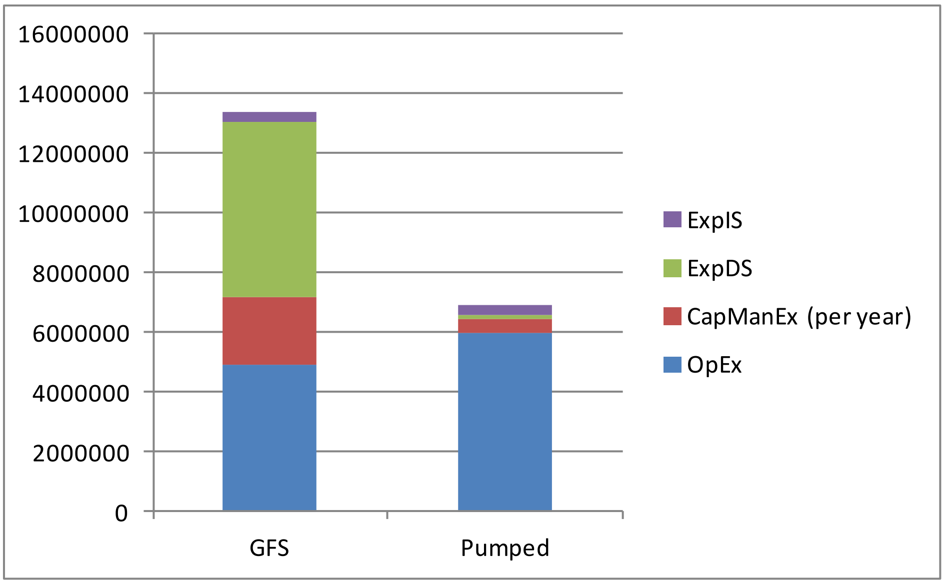


Figure 9 Average recurrent costs for piped schemes by technology by cost category

The graph above shows the same analysis for piped schemes. Not surprisingly, the pumped scheme has higher operations costs due to the need to procure fuel and service the generator. However, the gravity flow schemes still have quite high average operations costs per scheme, almost 5 million per scheme per year. This is due to the length of most gravity flow schemes in Kabarole, which often have pipelines of 30-50 km or more leading water from the mountains to the populated areas. Long pipelines and many tanks lead to high costs of labour and transport for the people working on the scheme to constantly supervise it, fix small breakages and clean. Due to the distance to the source, most schemes also need to pay a guard full time just to guard the intake. In addition, water boards and scheme attendants also complained of frequent small repairs, especially the replacement of poor quality or vandalised taps, or fixing pipe bursts. It can also be seen that despite two recent large breakdowns of the pumped scheme, CapManEx is higher on the gravity flow schemes. This is related to the frequent large breakdowns mentioned earlier in connection with disturbances at the source due to heavy rains or other natural hazards. The difference in direct support expenditures is mainly due to the fact that the only pumped scheme is not yet a member of the regional Umbrella organisation, which provides most of the direct support to piped schemes.

6.4.4 Expenditures on direct support

Workshop participants were surprised by the findings on expenditures on direct support. Most of them had the assumption that not enough money is being spent on community mobilisation, training and follow up, something that is also a recurrent theme in the sector performance reports (MWE 2012b). However, the study shows that more than 380 million Uganda shillings per year is spent on direct support alone, which is almost as much as the entire conditional grant given to the district each year. The findings on direct support raised two questions: how is the money for direct support spent? And, what are we doing wrong since we are not achieving acceptable results in terms of functionality and sustainability? The first question will be dealt with here, whereas the second question will be discussed in section 7.1.

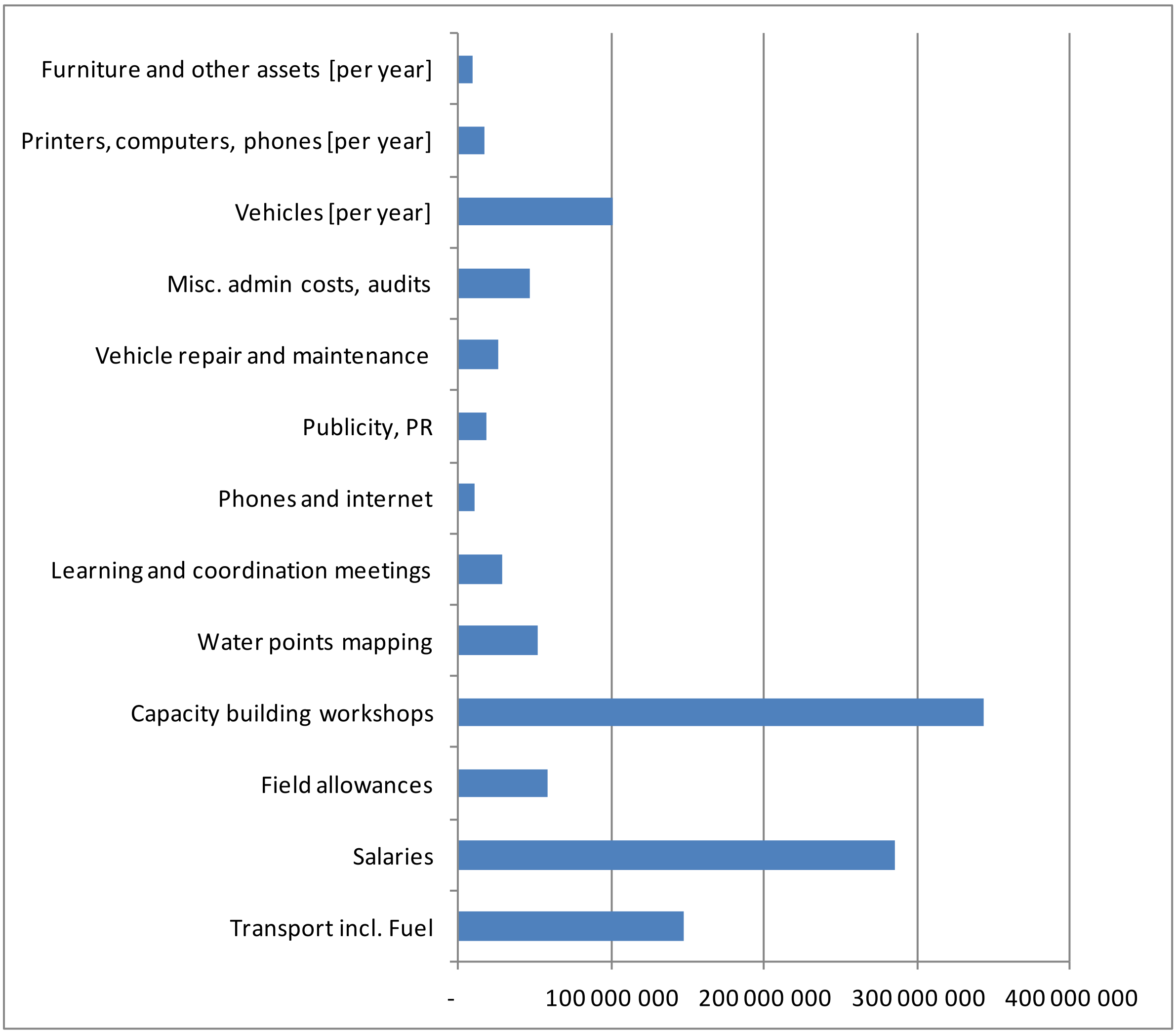


Figure 10 Breakdown of direct support costs over all three years

The figure above shows the direct support costs by sub-category. It can be seen clearly that most money goes into capacity building workshops, salaries and transport. It has to be mentioned that sometimes it was difficult to disaggregate the information provided by the stakeholders, for example the total figure for a capacity building exercise was quoted without a breakdown in personnel costs, direct costs etc. The expenditures on assets, electronics and vehicles were divided by the estimated life-span of the asset in order to get the price per year.

6.4.5 Population Data

It is not possible to compare the recurrent costs between point sources and piped schemes with expenditures expressed per source or per scheme, due to the large difference in people the infrastructure serves. For example, according to the government, boreholes and shallow wells should serve 300 people, and a spring should serve 200 people. By contrast, the Yerya scheme serves approximately 45,000 people alone. In order to compare recurrent costs it is therefore necessary to express recurrent costs per capita. For that analysis, it is necessary to look closer at the population figures used.

Table 9 Population data (Sources: District Population office Kabarole 2013, MWE 2010b, MWE 2012b)

OpEx and ExpDS populations	2009/10	2010/11	2011/12	Average
Population served Kabarole	289 348	292 084	294 800	292 078
Population served piped	66 550	67 179	67 804	67 178
Population served by point	222 798	224 905	226 996	224 900

For OpEx and ExpDS purposes, where it was impossible to estimate exactly how many sources the different activities covered, it was assumed that the costs cover the entire population served by rural water supply services currently. The methodology used is described in the methodology chapter. For CapEx (populations covered by new sources) and CapManEx (populations re-gaining access due to a rehabilitation or major repair), the standard populations per technology provided by the Ministry of Water and Environment was used. It would be more correct to use the actual numbers of users for each water point, however, this was not available for the present study.

Table 10 Populations for CapEx and CapManEx

CapEx Populations	Number	Standard pop	Total pop
Boreholes	20	300	5 970
Protected Springs	88	200	17 600
GFS (taps)	158	150	23 700
Shallow Wells	155	300	46 500
Pumped Scheme	-	150	-
Total			93 770
CapManEx Populations	Number	Standard pop	Total pop
Boreholes	29	300	8 700
Protected Springs	66	200	13 200
GFS (taps)	206	150	30 900
Shallow Wells	74	300	22 200
Pumped Scheme	11	150	1 650
Total			76 650

The table shows that using the standard populations, a total of 93,770 people gained in theory access to an improved water source over the three years that the survey covered. In addition, 76,650 people benefited from large repairs that put their water systems back in use after an interruption.

There are a number of problems with the population figures above. The total population of the district being 415,700 in 2012, the CapEx table shows that one fourth of the population of the entire district theoretically gained access to a new water source over the last three years. This means that every 12 years, the entire district completely renews its assets in terms of rural water supply. At the same time, according to the Ministry of Water and Environment, the coverage figure for Kabarole has remained stable on 90% over the last three years (MWE 2010a, MWE 2011 and MWE 2012b).

Despite the concerns outlined above, for lack of better data, the current study used the population figures above in order to calculate the per capita costs for the different technologies.

6.4.6 Per Capita Costs

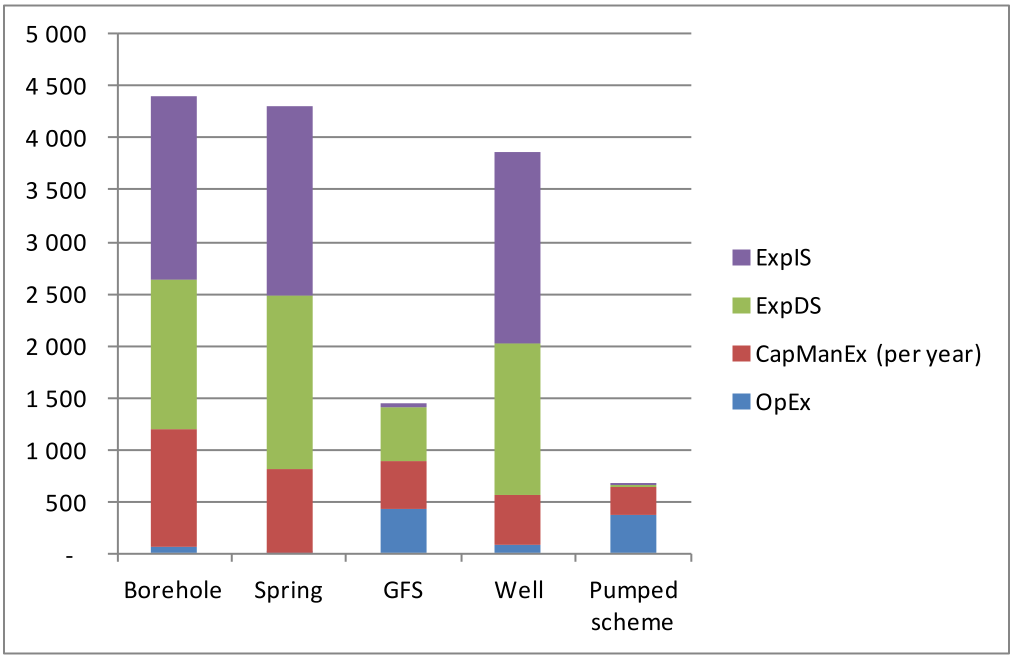


Figure 11 Average per capita recurrent costs per year

The graph above shows the average cost per capita per year in 2013 Uganda shillings. Note that it only shows recurrent costs and not the investment expenditure. Not surprisingly, the point sources are more expensive per capita than the piped schemes, simply because they serve less people. The borehole is the most expensive, mostly due to the high rehabilitation costs, followed by springs and shallow wells. The costs range between 4300 and 3800 shillings per person per year (USD 1.62 – 1.43). Note that this includes the expenditures on national level for policy development and maintaining the enabling environment, which is not directly felt at community level but is still important to take into account. By technology, each user pays 59 shillings per year for a borehole, 0 shillings per year for a spring, 435 shillings per year for the gravity flow scheme, 78 shillings per year for a shallow well and 370 shillings per year for the pumped scheme. This is an equivalent of about 300 shillings per household per year for a borehole, 2200 shillings per household for GFS, 390 for a shallow well and 1850 per household per year for the pumped scheme. This is way below the standard of between 200 and 500 per household *per month* for point sources and between 500 and 1000 per household *per mon*th for piped schemes. These numbers assume of course that all users contribute, which is hardly the case in practice and this issue is further discussed in section 8.2. The graph also shows that contrary to common belief, GFS is more expensive in recurrent costs than the pumped scheme. Even if the direct support costs are removed (see section 6.4.3 above), GFS still costs more per capita than the pumped scheme mostly due to the high OpEx and CapManEx. Per capita costs for the piped schemes range between 700 and 1500 shillings per person per year (USD 0.26 – 0.56). However, due to the small sample of the piped schemes, especially the pumped scheme, these figures should be treated with some caution.

6.5 Life-Cycle Costs

If the investment expenditure is added to the above figures, this would give us the life-cycle cost of the different technologies.

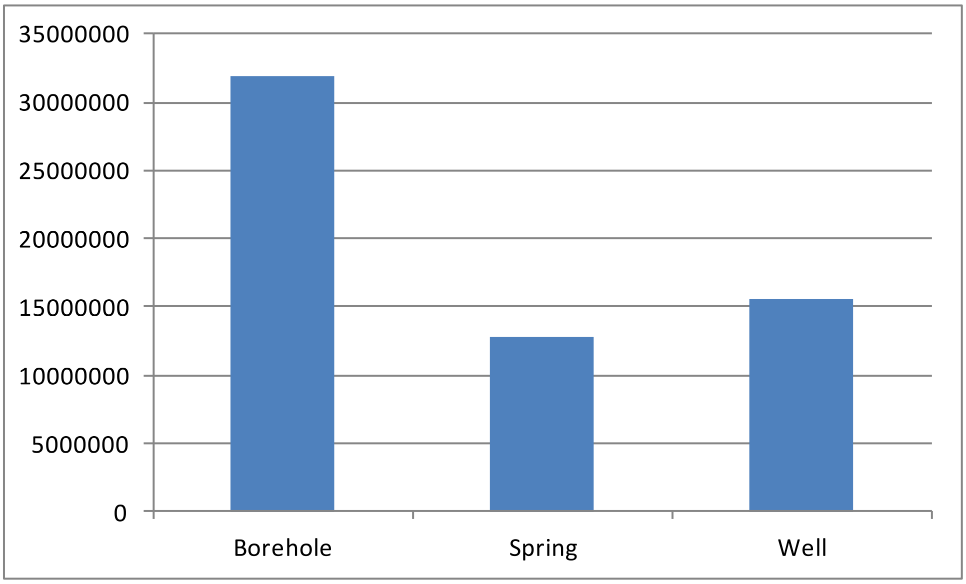


Figure 12 Total Life-Cycle Cost based on averages per source

The graph above shows the total life-cycle cost of different point sources. The figures are based on averages per source, and use the estimates for life-spans for Kabarole shown in Table 7. The cost of a borehole over its entire life-cycle is just above 30 million, whereas the costs for springs and wells are between 13 and 15 million Uganda shillings. As a comparison, the life-cycle cost for the average gravity flow scheme in Kabarole, based on average expenditures per scheme, is approximately 850 million shillings. These figures are interesting for planning and budgeting purposes, and are used regularly by utility managers in developed countries to estimate the life-cycle costs of different assets and when is the optimal time to carry out rehabilitation or replacement. It has to be noted, though, that these are the costs based on the current expenditures and not an ideal situation, knowing that service levels in Kabarole are low and functionality is a challenge.

However, in the context of Kabarole it is more interesting to look at the initial investment compared to the recurrent costs over the rest of the life cycle of the infrastructure. This is shown in the graph below:

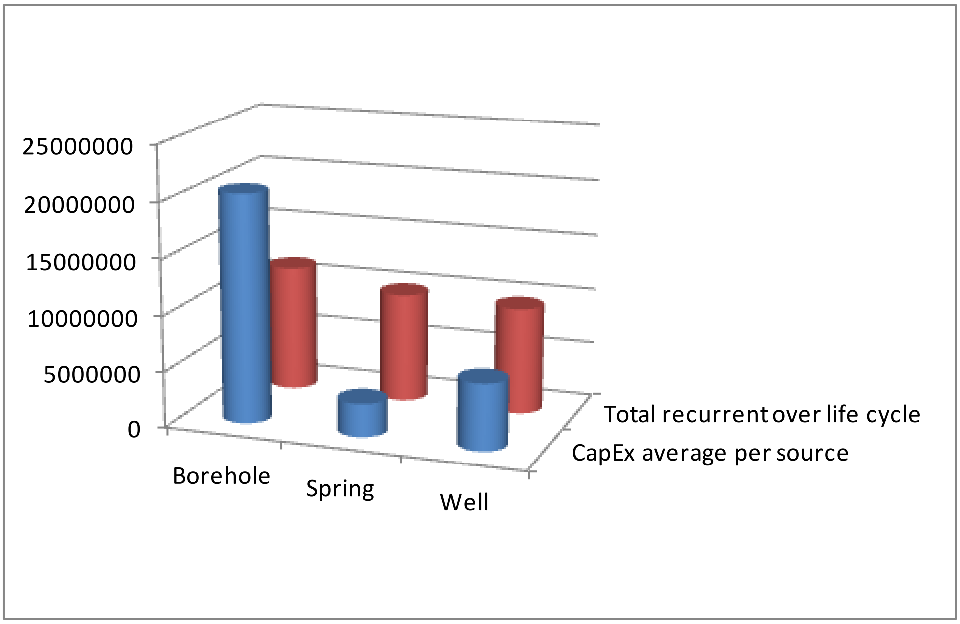


Figure 13 Initial investment compared to recurrent costs over life-cycle for point sources

It is evident that every time someone constructs a new source, which is represented by the blue column, a red column also appears. In order for the infrastructure to be useful, someone needs to pay for the red column as well, and in practice this means that every time a donor or an NGO constructs a new source, they give the community and the government a "burden" in the size of the red column to keep the system running. Again it is important to remember that the red column is not based on the ideal situation, but rather the current situation in Kabarole where functionality is a problem. In an ideal situation the red column would therefore probably be much higher.

One of the ways to show the ideal situation is by using longer life-spans, as shown in Table 8 (assuming recurrent costs remain equal). The table below shows life-cycle costs per year using the life-spans for three different scenarios; poor preventive maintenance, ideal maintenance and the scenario for Kabarole.

Table 11 Life-cycle cost per year

Total Life-Cycle Cost per year (UGX)	Poor preventive maintenance	Ideal maintenance	Estimate for Kabarole
Borehole	6 618 272	2 438 981	3 190 570
Protected Spring	1 984 792	1 214 267	1 283 538
GFS	133 020 590	25 667 219	42 410 606
Shallow Well	2 960 170	1 417 830	1 557 139

It was not possible to calculate the life-cycle cost of the pumped scheme since it was constructed outside the period considered by this study (2007) and the total construction cost was not available. The table above shows what it would theoretically cost all stakeholders (most concerned are the communities and the government) per year for each borehole, spring, GFS and shallow well. It includes the recurrent costs, as well as the initial investment and the major repairs distributed over the years. It can be seen clearly that it is much more expensive per year if the systems are poorly maintained and therefore last for a shorter period of time. For example, a borehole costs about three times as much per year if it is not well maintained compared to an ideal situation. What can also be seen from the table is that the difference between Kabarole today and the ideal situation is not so big. Especially for the protected spring and for the shallow well, the differences are minor. The reason for this is that the share of the one-off expenditures compared to the recurrent expenditures is low, so therefore there is not a large difference when the one-off expenditures are distributed over different numbers of years. On the other hand, for the GFS where CapEx is a major share of the total life-cycle cost, the difference is much more significant.

The analysis per source can be misguiding, especially since piped schemes serve many more people (and often provide a higher level of service too). It is therefore necessary to do the analysis per capita.

Table 12 Cost per Water-Person-Year

Cost per Water-Person-Year (UGX)	Poor preventive maintenance	Ideal maintenance	Estimate for Kabarole
Borehole	4 412	406	1 064
Protected Spring	1 985	304	642
GFS	2 376	46	189
Shallow Well	1 973	236	519

The table above shows the cost per person per year (Water-Person-Year, see Koestler et al 2010) to recover the initial investment and keep the systems running, according to three different scenarios (assuming recurrent expenditures remain equal). For example, a borehole could only cost about 400 Uganda shillings per person per year, whereas the estimate for Kabrole is more than 1000. For a household of 5 people this means 5000 Uganda Shillings per year, which is not much but still more than what most water committees are able to collect. The GFS is not surprisingly cheaper per person than the point sources, due to the large number of people it serves. The table shows that if the scheme is poorly maintained, it would cost each household approximately 12,000 Uganda shillings per year, whereas it could cost as little as 250 shillings per household per year. These numbers are useful for policy makers and planners, and they also provide a wake-up call to water committees and water supply and sanitation boards. With only 12,000 Uganda shillings per household per year, it would be possible to provide ideal maintenance for the GFS as well as recover its initial investment (assuming no population growth and that design and user population is the same). However, it has to be mentioned that whereas the one-off costs (CapEx and CapManEx) were considered close to reality, the recurrent costs are not based on ideals but on current expenditures, which are not resulting in the desired service levels.

6.6 Comparison with Benchmarks

Burr and Fonseca (2013) developed international benchmarks for expenditures on rural water supplies based on the work WASHCost did in four countries. The benchmarks were developed by engaging stakeholders in discussions of what the desired levels of expenditures would be through participatory workshops. There is therefore no proof that these benchmarks will lead to the desired outputs, and the method and allocation of funds obviously also plays a role. However, it can be useful to compare the actual expenditures in Kabarole with the international benchmarks.

Table 13 Comparison of Kabarole expenditures with WASHCost benchmarks CapEx and recurrent costs

Comparison with benchmarks [USD per person, per year]		WASHCost Benchmark	Kabarole
CapEx [per capita]	Borehole with handpump	20-61	12,8
	Piped schemes*	30-131	85,8
Recurrent [per capita per year]	Borehole with handpump	3-6	1,7
	Piped schemes*	3-15	0,6

*only GFS considered, in USD per person, per year[6]

When comparing the benchmark ranges with the results from Kabarole, it can be seen that only in the CapEx category for piped schemes are the expenditures within the range. All other expenditures are below. Even the CapEx expenditure for boreholes is way below the benchmark, which could call for increased software expenses, or other countries have considerably higher CapEx expenditures than Uganda.

Table 14 Comparison with benchmarks, recurrent costs

Recurrent costs, USD per person, per year	Borehole and handpump		Piped schemes*	
	WASHCost benchmark	Kabarole	WASHCost benchmark	Kabarole
OpEx	0,5-1	0,02	0,5-5	0,2
CapManEx (per year)	1,5-2	0,4	1,5-7	0,2
ExpDS	1-3	0,6	1-3	0,2
ExpIS	-	0,7		0,01
Total recurrent excl ExpIS	3-6	1,0	3-15	0,5
Total recurrent	3-6	1,7	3-15	0,6

*only GFS considered

Table 13 shows the breakdowns of recurrent costs. Since the WASHCost benchmarks did not consider ExpIS, a line was included to show recurrent costs excluding ExpIS. However, it can be seen from the table that, even if ExpIS is included, the expenditure levels in Kabarole are still way below the international benchmarks. The closest figure to the benchmark is the expenditure on direct support for boreholes with a handpump, but it is still 0.4 USD short.

7 Cost Data Analysis

The above findings outline a number of issues that are part of a much larger picture. Issues regarding accurate monitoring, functionality, expenditures on software activities, unit costs for hardware construction and service levels have been discussed in the Ugandan water and sanitation sector over many years (MWE 2010, MWE 2011, MWE 2012b). These findings, however also provide a unique opportunity to shed new light on these issues, as well as providing the discussion with real cost data from one sample district. The following sections will show some examples of how the data can be

[6] The rate used was 2600 Uganda shillings to 1 USD

used by practitioners, policy makers and planners. Chapter 8 will deal with how the data can influence the discussion on some of the cross-cutting issues mentioned above.

7.1 Clearing the Backlog

According to the district water officer, the district is struggling to clear a backlog of rehabilitations and large repairs. The district is only allowed to use 8% (Biteete and Jangeyanga 2013) of its conditional grant on rehabilitation, yet the demands from the communities and water boards greatly outnumber the capacity of the office and its budget. In addition, when looking at the average costs per source for new investments and rehabilitations (Figures 6 and 7), it would make much more sense to invest in CapManEx than in new CapEx for point sources. On the other hand, CapManEx for point sources is still higher than what is considered within the range of what the community can handle, especially considering that regular collections and savings are rare. The poor capacity for rehabilitation leads to the fact that the district will focus on the most pressing needs such as gravity flow schemes which serve large numbers of people, and most point sources are just shelved and stay in the backlog until the district is able to allocate some money for the repair. According to the district water officer, this can take as long as three years. Based on the findings above, how much would it cost to clear the backlog of the entire district? If standard population figures were used, this would provide access to an additional 94,600 people, which is theoretically more than twice the rural population in the district that is still considered without access to an improved source.

Table 15 Cost of rehabilitating all non-functional sources in the district

Point sources	Number	Average CapManEx per source	Total
Boreholes	53	2 749 322	145 714 066
Springs	110	803 873	88 426 056
Shallow Wells	189	1 606 305	303 591 690
Total			**537 731 812**

Only point sources were considered, since the piped schemes are normally prioritised and repairs were already underway on the two non-functioning schemes while the study was taking place. Based on the average figure per source for rehabilitation of the different technologies, the total cost for the district to rehabilitate all non-functional point sources would be approximately 540 million Uganda shillings. As a comparison, the total conditional grant for the financial year 2012/13 is 465 million Uganda shillings, out of which only 8% (37.2 million) is earmarked for rehabilitation and large repairs. It would therefore take the district 14 years to clear the current backlog, assuming no new sources break down over that time. If contributions from communities, NGOs and other partners are included, it would take 10 years if the current average of about 51 million on CapManEx on point sources per year would be maintained.

However, a different discussion, in line with the points outlined in section 6.4.4, is whether all these sources should be repaired. Especially, if they are abandoned or out of use due to a change in the water table, or because people prefer to use a piped water scheme instead. It would therefore be interesting to have more realistic numbers on the backlog minus the sources that could be decommissioned. However, the table above shows how the figures from the study can easily be used to achieve this.

7.2 Implementing the Policy Directive

In 2012, the Ministry of Water and Environment issued a policy directive that all villages (LC1 zones) in Uganda should have access to at least one improved water source by 2015 (MWE 2012a). The average figures per capita can be used to estimate how much it would cost to implement this policy directive in Kabarole in order to achieve full coverage.

Table 16 Cost of achieving full coverage

Cost of achieving full coverage		Cost per capita	Total CapEx
Unserved population	32453		
Boreholes	1 681	33 156	55 742 060
Springs	10 737	15 548	166 934 819
Piped schemes	7 464	223 164	1 665 738 513
Wells	12 571	11 715	147 261 433
Total			**2 035 676 825**

The calculations assume that 10% of the rural population is not served, and that the same "technology mix" will be applied to the population not served as the one that is in place now[7]. Based on the per capita average CapEx costs calculated using the current expenditures both for software and hardware for the different technologies, it is possible to get a figure. For simplicity, it is assumed that only gravity flow schemes will be used and not pumped schemes. The table shows that it would cost the district approximately 2 billion Uganda shillings to implement the policy directive. The high cost is mainly due to the high per capita investment on gravity flow schemes, however this is likely to be realistic as the population increasingly demands for piped schemes which provide a higher level of service. These numbers are based on averages of what has been spent in the past, and they do not take into account the fact that the areas without access to improved water services are mostly more difficult and expensive to serve. They also do not take into account the economies of scale in support activities resulting from an increase in number of people supplied by piped schemes. The numbers also do not take into account the fact that many stakeholders think not enough money is spent on "software" aspects of CapEx. The table above shows how averages per capita can be used for planning and projecting purposes.

7.3 Calculating Yearly Recurrent Costs

When doing the calculation above it is important to remember that it is not sufficient to put in place the new infrastructure alone; it is as important to cater for recurrent costs so that it can be maintained and service delivery can continue over time. Similarly, it is necessary to cater for recurrent costs for all existing water sources in the district. The findings in this study are based on existing expenditure, however, based on the findings in terms of service levels, they are not sufficient to maintain a minimum standard of water service delivery. How much money should the stakeholders spend to achieve this?

[7] We calculated 10% of the rural population (total population minus Fort Portal municipality), and then assumed that 23% want to be served by piped schemes (MWE 2010). Then we applied the same percentages as existing sources to the remaining 77% (7% boreholes, 43% protected springs and 50% shallow wells)

Table 17 Recurrent costs for Kabarole based on benchmarks

Recurrent costs according to benchmarks, costs per year		From	To
Point Sources	224 900	1 169 478 710	3 508 436 131
Piped Schemes	67 178	523 987 214	2 619 936 072
Total	292 078	1 693 465 925	6 128 372 203
Conditional Grant 2011/12	398 451 000		
Average recurrent expenditure per year Kabarole	900 089 408		

The table above shows how much Kabarole district should spend annually on recurrent costs (CapManEx, OpEx, ExpDS and ExpIS) to maintain fair service levels. This figure is based on 90% coverage, which is the current coverage in the district. It would of course increase if full coverage (100%) was achieved. The numbers used are based on the WASHCost benchmarks per capita on recurrent costs (Burr and Fonseca 2013). The table shows that the district should spend between 1.2 and 3.5 billion per year in recurrent costs on point sources, and between 500 million and 2.6 billion per year on piped schemes. In total, this means between 1.7 and 6.1 billion Uganda shillings per year. As a comparison, the total spent on recurrent costs by all stakeholders in Kabarole together was approximately 900 million per year on average. The conditional grant to the district of 2011/12 was approximately 400 million, out of which 70% was used on CapEx. This leaves the district with approximately 120 million per year for recurrent costs, which is less than 10% of the lowest benchmark.

However, the benchmarks show a large range and were developed based on studies in only four countries, and the data was not enough to be statistically representative for any one country. Experiences with similar cost studies carried out in other countries, for example by WaterAid in Ethiopia (Aboma 2013), shows that each country has unique cost structures. For example, in Ethiopia protected springs had the highest CapManEx, whereas in Kabarole springs had the lowest average CapManEx compared to the other point sources. This shows it is necessary to develop benchmarks for different countries individually. In addition, increased expenditure does not automatically lead to increased impact. During the stakeholder workshop it was discussed that there is apparently more expenditure on CapEx software and direct support than stakeholders were aware of, however, results in terms of functionality and sustainability are not seen. This indicates either misallocation or inefficiency of expenditures on support. The participants agreed it is therefore necessary to engage in a discussion of how resources are used and what approaches are chosen as well.

8 Conclusions and Recommendations

This cost analysis study goes beyond just looking at the outcomes of the cost analysis, but has also highlighted a number of other issues related to the general challenges in the Ugandan rural water sector. This chapter tries to summarise some of these issues and also outline the way forward.

8.1 Poor Service Levels

The findings show that the current expenditure levels are only providing below-standard service levels. This means that at least one of the benchmarks in terms of quality, quantity, reliability and accessibility are not met. It is important to keep this in mind when comparing expenditures with benchmarks and other studies, in order to make sure it is taken into account that these results are actually far from the ideal. Service levels are however difficult to measure, and this study only used a simplified method to determine the service level for the majority of the rural households in the district. More careful studies could show different outcomes, and it would be interesting to establish further the following points:

- Which criteria is most often the reason for failing to reach the benchmark? The observations of this study suggest it is quantity and reliability, can this be confirmed with more reliable data?
- What technology is more likely to provide a fair level of service?
- How can these specific points be addressed? For example, larger storage containers at household level could increase quantity and improved management models and user fee recovery could improve functionality.
- What is the best way to measure service levels at community, sub-county and district level? Triple-S is in the process of developing a new approach, and WASHCost has tried out other methods in Burkina Faso. These should be further tested and developed.
- What are the real differences between the standard populations/design populations and actual users? How does this affect the cost data analysis?
- Specific studies could target OpEx more in detail, per capita and per type of technology in order to find out the potential revenues and profits if everyone would pay

8.2 Issues affecting sustainability

8.2.1 Few functioning water committees

The study shows that very few water committees or water boards are able to enforce the collection of user fees. Examples are given in chapter 9. During the field visits, only two water committees reported they were regularly collecting household fees, and both had been established within the last 2-3 months. For protected springs, OpEx was almost not existent at all. This confirms reports from handpump mechanics, NGO practitioners and government workers who report that the water committees often work in the beginning but then stop working after some months due to lack of motivation, organisation, follow up and capacity building. A non-functioning committee also leads to no collection of user fees, which again leads to no money available once something breaks down. This finding also confirms a problem that has been repeatedly discussed in the water sector in Uganda, and is reported in the sector performance reports (MWE 2010, 2011 and 2012).

8.2.2 Lack of enforcement of collection of user fees for piped schemes

For the piped schemes the main problem seemed to be the lack of meters at the taps, as well as a lack of understanding in the water boards and communities that it is necessary to pay for water. Many people assume that gravity flow schemes are extremely cheap to operate because they do not involve expenses on fuel or chemicals. However, this study shows that the gravity flow schemes were spending at least 4.2 million on average per scheme per year on OpEx, and approximately 2.3 million on average per scheme per year on CapManEx. This shows that operations expenses for gravity flow schemes should not be underestimated and therefore payment structure should be put in place and enforced like for other piped schemes. In Kabarole, most schemes do not have meters at the taps and also do not sell water on a jerrycan basis, which makes payments difficult to enforce. Taking into account the low reliability of the water sources and the long down-times, it is clear that the collection of water user fees is not adequate. It is therefore necessary to think of how to strengthen the management models and systems in order to enforce water user fees, or to test a completely different approach altogether.

8.3 Expenditures on Software Activities

As mentioned before, one of the findings of the study was that a significant amount of money goes into software activities, both at the initial stage of construction (approximately 100 million annually on average) and as post-construction capacity building and follow up (approximately 380 million annually on average). Partners such as NGOs are the biggest spenders on post-construction software (approximately 250 million annually on average), followed by the district water office (approximately 90 million annually on average) and other regional government bodies (approximately 40 million annually on average). The participants in the workshop were surprised to see the figures and expressed they had not expected them to be so high. There has been a general message from the sector for many years that not enough is spent on software activities, both from the government, NGOs and other stakeholders such as handpump mechanic associations. There was a common belief that if the resources for software activities could be increased, there would also be an increased output in terms of higher functionality. This might be a result of the doctrines of the community management model, which is the most common management model for rural water supplies and still promoted and practiced in the country. The community management model is largely based on voluntarism, and therefore requires a substantial effort on constant mobilisation and follow up in order to achieve the goals. One of the participants at the workshop mentioned it is also important to take into account the benefits of the expenditures on software activities, which can go far beyond a functional water point. This is because continuous mobilisation and follow up provides the communities with organisation skills and other skills that they can apply in their daily lives, and often there are positive spin-offs from the water system such as community savings and credit circles or income generating activity groups (Koestler and Koestler 2011). At the same time, however, it has to be taken into account that the expenditures are still far below the international benchmarks developed by WASHCost. Without having developed national benchmarks for Uganda it is difficult to say how high the expenditures should be to achieve higher service levels, however it can safely be said they should be much higher than they are now. In any case, the study and the stakeholder workshop raised important questions that should be taken up for discussion at a national level too;

- What is the best approach to achieve higher service levels?
- What expenditure levels are needed for this approach and who should cover the cost?
- How can software activities be “regulated” and “quality assured” so that the investments have a higher impact on functionality?

8.4 Inadequate Funding of Recurrent Costs

The analysis of the cost data shows that Kabarole is spending far below the benchmark on recurrent costs. This can also be felt in the field, with many non-functioning sources, long down-times and a huge backlog for the district to repair. One of the participants at the stakeholder workshop mentioned that, given the situation of Kabarole with 90% coverage, the district actually needs more for recurrent costs than for new sources at the moment. However, the district is still subject to the conditional grant guidelines which stipulate that at least 70% must be used for new sources. For a district like Kabarole it would make much more sense to spend 8% on new sources and 70% on recurrent costs than the other way around. The calculation of life-cycle costs is a powerful tool to show stakeholders how much money is required over the life-cycle of an asset to keep it working compared to the initial investment. This means that government, donors and communities alike should be aware of recurrent costs and find ways of covering them on a sustainable basis. For example, as it would cost approximately 2 billion Uganda shillings to reach full coverage, Kabarole should already be spending between 1.6 and 6.1 billion shillings per year just in recurrent costs. This shows that there is a pressing need to move focus from raising funds for new investments to raising funds for recurrent costs. Some points to take forward are:

- How can the conditional grant guidelines be adapted to fit the situation of each district?
- How can governments raise funds for recurrent costs? Who should cover recurrent costs; water users, international donors or local governments?
- How can recurrent costs be allocated in a cost-effective way with maximum impact on functionality?

8.5 What Coverage Figures Do Not Tell

A secondary outcome of this study is that it raises problems with the current way of calculating coverage figures. This problem was outlined in section 6.4.5. Most strikingly, despite the construction of 421 new water points (point sources and public taps) in the three years of this study, which should theoretically have served 93,770 new people, the coverage figure of 90% did not change. Population growth in Kabarole district has been less than 1.53% annually the last three years (District Population Office 2013). This shows that there are inconsistencies in the way the government does reporting and the calculation of coverage data. The problem was discussed at length during the stakeholder workshop and although no real explanation came forward, the following are discussions raised around the coverage figures:

The Ministry uses standard populations to calculate the theoretical coverage figure for a district. The methodology is quite simple: the number of water points reported by the district water officer is multiplied with the standard populations (like done in section 6.4.5). Then the total is controlled by the population of the sub-county (so that not more people can be covered than people in the sub-county) and then this is added up to get the overall coverage figure of the district. However, coverage is not the same as access. Although an area might be “covered” by a water source, which, according to Ministry standards is one within 1 km, this does not mean that people have access to it. It could be hard to reach or not even functional and sometimes there may be inequity in the distribution of the sources in the same sub-county.

Some might also say that population figures are slightly inflated, and that in many cases only a handful households are using a protected spring and not 200 people. An important addition to this point is the difference between “design population” and “actual users”, which is also outlined by Burr and Fonseca (2013). Due to expected population growth, water systems are often over-designed. This leads to high per-capita costs per user compared to the per-capita cost per designed user. For example, a piped scheme that has a life-span of 20 years could be serving only half of the population it was designed for in the first 10 years, and this leads to high recurrent costs per capita.

In addition, functionality records are not regularly updated. This is because of a lack of resources to visit water sources and establish their functionality. Kabarole has done a great effort here with the help of the handpump mechanics and several NGOs paying for "water point mapping", but even district figures might not be entirely updated. This means that sources that are non-functional are still counted to contribute to the coverage figure. As a comparison, according to the district figures the total coverage figure, only considering functional sources, is 81%.

Another reason pointed out by the sector performance report (MWE 2012b) is double counting due to the parallel reporting system through UWASNET. NGOs report to the district which reports on the new water points through its quarterly and annual reports to the Ministry. Then, the NGOs also report the new water points to UWASNET, which collects data every year which feeds into the sector monitoring framework.

Another issue pointed out by the workshop participants is the fact that many of the sources captured by this study are not in government records. Therefore we are seeing no increase in the official coverage figures. However, the construction of the Yerya scheme provided access to a number of new people and should be included in government figures.

The main explanation, however, is probably that many sources are constructed in areas that already have a source. This could be due to two reasons, either the existing source is non-functional or seasonally unreliable, or people prefer the higher level of service provided by the new source. It seems to be a general trend in the district that people abandon point sources near the municipality and where piped schemes are extended to. For example, the Yerya scheme was constructed in a way to combine several existing gravity flow schemes, and even in the new towns covered people already had point sources they were using. Obviously, this leads to double counting because the same populations that were using a point source now use a public tap. The study carried out by Triple-S on service levels somewhat contradicts this conclusion because it found that only 13% of households use more than one source (Triple-S forthcoming). On the other hand, this could be confirmed through the field visits, and since both visited piped schemes were not working people showed us the point sources they had returned to, which were normally shallow wells and protected springs. If the piped schemes is working, it increases the level of service for the users, so this could justify the investment. The district said that there is a need to carry out a decommissioning exercise so that at least the sources that are completely abandoned can be removed from all records. However, as seen through the field visits, it is still important to keep the point sources working due to the long down times of the pied schemes. What is necessary is a way to cater for this in the calculation of the coverage figure.

As a conclusion, district stakeholders see this as a huge problem, since the coverage figure does not take into account concerns about equity. There are several areas such as Rwimi that have no accessible ground water or surface water, and where access to water is a huge problem. In addition, such areas are generally very expensive and technically complicated to serve.

8.6 The Importance of Recurrent Costs in Life-Cycle Costs Analysis

An interesting finding of this study appeared when life-cycle costs of different technologies were compared for three different scenarios; poor preventive maintenance, ideal maintenance and the case of Kabarole (section 6.5). Even if stakeholders agree that the maintenance in Kabarole is far from ideal, the annual life-cycle cost of springs and shallow wells were strikingly close to the figures for the ideal scenario. This phenomenon is due to the fact that, when recurrent costs are high and investment expenditures low, it might outweigh the gains of having CapEx and CapManEx distributed over more years. This is because CapEx and CapManEx are only a small share of the annual life-cycle cost. However, for technologies like gravity flow schemes and boreholes where CapEx and CapManEx are higher shares of the total life-cycle cost, the differences are more significant. It is difficult to draw any conclusions of this finding at this point, because in theory they suggest that it might be cheaper to let springs and shallow wells fall into disrepair and then build new ones instead of maintaining them. Another option could be to use this to carefully calculate how to have facilities that are cheaper to operate as back-up solutions when for example piped schemes are down.

8.7 Recommendations and Way Forward

Based on the above conclusions, this report sheds light on a number of issues at hand in the Ugandan water and sanitation sector, and also offers a contribution in terms of real expenditure data which can lead do a more informed discussion. From this point, several next steps could be taken in order to expand the work on the LCCA in Uganda:

- The data can be used and applied to develop income and expenditure projections for new management models such as the Sub-county water supply and sanitation board model (see chapter 9)
- A cost analysis survey from a second district can provide a point of comparison and it would be possible to start drawing national conclusions
- The dataset and methodology could be adjusted and improved, in connection with the development of the Cost Calculator of IRC in order to make it accessible and easy to use for other stakeholders in the sector
- Further studies could be carried out to map the actual service levels in order to tie them to the expenditures to run specific systems
- Further studies into OpEx could guide on how to manage the transition from point sources to piped schemes, which sources to maintain and which sources to decommission and where to concentrate the investment into piped schemes. Based on the findings of this report, an investment plan could be developed for Kabarole district, not only to achieve full coverage but also how to improve service levels
- Benchmarks could be developed for Uganda for the different categories. For this, an in-depth discussion is necessary about the approaches used and the way funds are allocated, because there is currently no consensus in the sector of what is an “ideal” way to spend funds in order to achieve results in terms of functionality and acceptable service levels

9 The Sub-County Water Supply and Sanitation Board Model

One of the approaches currently piloted by Triple-S and Kabarole district is the Sub-county WSSB model. Based on the existing structures of WSSB management of small piped schemes and small towns water supplies, the approach seeks to extend the role of the WSSB to cover all types of technologies for rural water supply in a certain sub-county. The advantage when working with a specific model is that the question as to “how” the resources should be spent is already answered. This study does not suggest that the Sub-county WSSB is the solution to the challenges in functionality and enforcement of user fees, but it shows how cost data can be used in order to improve the model and make decisions that are financially sound.

This type of cost analysis can contribute to the development of the model in several ways. First, it provides a baseline of how much approximately is spent on point sources and piped schemes in terms of operations and maintenance currently. For example, it can be seen that at a district level, only approximately 9.6 million is spent per year on OpEx on point sources, which means 740,000 Uganda shillings per sub-county. In total, the district has more 1308 water points, which would mean 7400 shillings per water point on operations and maintenance per year. This is clearly not even enough to do the minimum required maintenance, such as greasing the chain of the handpump regularly. Normally, water committees set user fees between 200 and 500 shillings per household per month. At district level this would be revenues between 54 and 135 million Uganda shillings per year, an equivalent of between 5.1 and 10.4 million per sub-county per year. These calculations are based on only the population served by point sources, and an assumption is made that only 50% of households actually pay.

Similarly, for piped schemes, expenses on operations and maintenance stand averagely at approximately 30 million per year, which is approximately 4.4 million per scheme per year. This is less than 400,000 per month, and not enough to pay for allowances and transport of scheme attendants, water board members, guards and mechanics in addition to cater for fuel in some cases, and the replacement of taps or small repairs. Most water boards cite a lack of income as a reason for the low expenditure and acknowledge it is a problem. At the same time, many of the piped schemes have a huge potential. For example the Buheesi scheme, which has 40 operational taps. If each of the taps serves about 20 households and they collect 1000 per household per month (which is their policy), they should be able generate a revenue of at least 20,000 per tap per month[8]. If the policy was enforced, this would give the scheme a monthly income of 800,000 per month, and including revenues from private connections and schools, it could reach 1 million per month, which is 12 million per year. Similarly, Kasenda piped scheme produces a minimum of 20,000 litres per day (the maximum capacity is over 40,000 litres per day). The WSSB is currently selling this at 200 shillings per jerrycan[9], however the taps are not metered and only little money is recovered. If all the money was collected, the WSSB should be able to recover at least 5.2 million per month, which is more than 62 million per year. Even if the price was reduced to 50 shillings per jerrycan, their revenues would still exceed 1.3 million per month, which would be 15.6 million per year. However, currently they are struggling to cover their fuel expenses of 340,000 per month.

The data shows there is a huge potential of revenues that could be generated from user fees, if policies were effectively enforced.

A second benefit of the cost analysis is that it can create a basis for developing benchmarks. Based on the Sub-county WSSB model, it could be possible to develop benchmarks to what would be required by the sub-county WSSB in order to carry out adequate monitoring and preventive maintenance of all sources in the sub-county, as well as putting aside savings for large repairs. This could be compared to the actual expenditure in order to get a picture of reality, as well as to the projected income if policies were enforced. Building service delivery model where the level of service targeted is the starting point should be the goal, and then design a sound financial strategy, using the cost

[8] The current policy includes that the tap committee keeps a share of the monthly revenue to cover small repairs, but in this analysis it is not relevant who manages the funds, but the total income/expenditure
[9] It is assumed one jerrycan is 23 litres to cater for spillage

data, which specifies what to build, what to maintain, rehabilitate and extend in the district, and then identify potential sources of funding.

Third, this study shows which actors are already investing in operations and maintenance and large repairs, and how much. It has to be assumed that even if user fee policies were entirely enforced, the Sub-county WSSB model would need an outside subsidy of some sorts, either in terms of support for large repairs or as capacity building, follow up and direct support. The study could provide clues as to who is currently spending on direct support and major repairs, how much, and whether some of this money could be re-directed to fund the sub-county WSSB model. At the same time, the information could also identify potential benefits of economies of scale, especially for support costs, by concentrating the service provision at sub-county level.

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11 Appendix 1: Full List of Respondents

SN	Name	Designation	Organisation
1	Godfrey Rugumayo	WASH Program Leader	Joint efforts to save the Environment
2	Kyohairwe Ann	program Manager	Joint efforts to save the Environment
3	Pius Mugabi	Sen. Water officer	Kabarole District Local Government
4	Katusabe john Baptist	ACAO / Focal Person UNICEF	Kabarole District Local Government
4	Robert Mulema	Team leader	Technical support unit 6
5	Ajello Grace	Public health specialist	Technical support unit
6	Birungi Kobusinge annet	Deputy program Engineer	HEWASA
7	Pamela Kabasinguzi	program officer	HEWASA
8	Doreen kabasindi Wandera	Executive Director	UWASNET
9	Hilary Azaarwa	Finance & Adminstration manager	UWASNET
10	Kabasiguzi Kisembo Margaret	Program assitant	Human Rights and Democracy Link Africa(RIDE)
11	Blick Arthur Sanyu	Assisntant wayter Coordinator	Alliance for Youth Achievement(AYA)
12	Mary Abigaba	Director	Alliance for Youth Achievement(AYA)
13	Tumusiime Jane	chairperson SWSSB	Kasenda SWSSB
14	Katwesige Milton	member	Kasenda SWSSB
15	Nyanduru Peter	Parish chief	Kasenda Subcounty
16	Byamukama Richard	tap attendant	Kabata tap/kasenda
17	Sabbiti chris Ronald	secretary	Kasenda SWSSB
18	Kyojo Wilber	member	Kasenda SWSSB
19	Clever Frugence	Hand Pump mechanic	Kasenda Subcounty
20	Asiimwe oliver	treasurer	Kasenda SWSSB
21	Twebaze Emily	Midwife /tap care taker	Kasenda SWSSB
22	Masa Robert	chairperson LCIII	Buheesi subcounty
23	Nyakoojo Paul	NAADS Coordinator	Buheesi subcounty
24	Alleluya leo	Youth councillor	Buheesi subcounty
25	Masiko Sylus	AASP (crop)	Buheesi subcounty
26	Stella Rwabukuku	secretary	Buheesi subcounty
27	Kutambaki Wilson	scheme attendant	Buheesi subcounty
28	Emmanuel kasiaja	treasurer SWSSB	Buheesi subcounty
29	Kedreth Mwesige	chairperson SWSSB	Buheesi subcounty
30	Lucy Kisembo	care taker	Hakibale subcounty
31	Ategeka Joseph	Hand Pump mechanic	Hakibale subcounty

31	Atwirenabo Elias	chairperson LCII	Kabenda
32	Kenneth Bajenja	Ag. Subcounty chief	Hakibale subcounty
33	Nyakojo Vicent	Chairperson	Chairperson kabarole District Hand Pump mechanic & scheme attendants Association
34	Mwanguhya Bonny	publicity	Chairperson kabarole District Hand Pump mechanic & scheme attendants Association
35	Kabyanga Vicent	Vice Chairperson	Chairperson kabarole District Hand Pump mechanic & scheme attendants Association
36	Tugume Mark	social mobilizer	Midwestern umbrella
37	Gilbert Byamugisha	Tecnical Engineer	Midwestern Umbrella
38	Alex Mugyisha	Branch manager	Uganda redcross society Kabarole branch
39	Grace Kyagaba	Program officer - Water and sanitation	Uganda redcross society Kabarole branch
40	Paul Nyeko		MWE
41	Ivan Biiza		MWE

12 Appendix 2: List of Participants Validation Workshop

Sno.	Name	Organization	Contact
1	Kyaligonza charles	HPM Hakibale	0773354159
2	Mpanga james	Buheesi Subcounty	0772603793
3	Kabyanga Vicent	HPMA Kabarole	0782563752
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9	Katorotorwa Andrew	HEWASA	0772649190
10	Balyebuga Stephen	Karambi Subcounty	0752379723
11	Musabe betty	JESE	0772931140
12	Rene van gieshut	IRC	0787350083
13	Kutambaki Wilson	Buheesi subcounty	0782776799
14	Watsisi Martin	IRC triple S	0782341167
15	Businge pascal Bylon	FORUD	0700503771
16	Bafaki Betty	Hakibale Subcounty	0772315892
17	Kabaraali Doreen	Kisomoro Subcounty	0782812999
18	Byakiyamba Peter	KANCA	0752842173
19	Bwango Godfrey	HPM Busoro	0772931161
20	Mugabi Pius	DWO Kabarole	0782451886
21	Nyakoojo Vicent	HPM Buheesi	
22	Mugume K Henry	HPM Busoro	0785506765
23	Kasaija charles	Kisomoro Subcounty	0772389559
24	Rwamwaro David	AYA	0772666439
25	Katusabe Grace	CDO Busoro	0772651425
26	Kisembo Robinah	RIDE Africa	0774053664
27	Mugarra Marvin	CDO Bukuku	0702816999
28	Byamugisha Gilbert	Mid western Umbrella	0774166906
29	Mulema Robert	TSU 6/ MWE	
30	Mortensen Grace	PROTO Uganda	