Draft Final Report

Client

Austrian Development Agency

Project title

Study on Real Cost of Water Supply ST & RGC with Focus on Actual Cost of Capital Maintenance

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LIST OF ACRONYMS

CapEx	Capital Expenditures
CapMainEx	Capital Maintenance Expenditures
GoU	Government of Uganda
MWE	Ministry of Water and Environment
NRW	Non Revenue Water
NWSC	National Water and Sewerage Corporation
OBA	Output Based Aid
O&M	Operation and Maintenance
OpEx	Operation Expenditures
PO	Private Operator
RGC	Rural Growth Center
ST	Small Town
WA	Water Authority
WSDF	Water and Sanitation Development Facilities^
WSSB	Water Supply and Sanitation Board
UO	Umbrella Organisation
USH	Uganda Shillings

1. INTRODUCTION

1.1. BACKGROUND

The background for this study was outlined comprehensively in the ToR of this assignment:

The increased capital investment for water supply and sanitation infrastructure for Small Towns and Rural Growth Centers (ST/RGCs) has boosted access to safe water in urban areas to 69%. MWE´s continuous decentralization policy is a big success of the Ugandan Water Sector as it has brought water service delivery close to the users.

While Government of Uganda and Development Partners focus on financing construction of new schemes (infrastructure investment) to achieve an increased coverage in order to comply with political goals and the increasing number of small towns needing water supply (the number has increased from 80 to 300 in the last 10 years) the existing schemes faces huge challenges in providing the required service levels. This challenge mainly comes from lack of skills at decentralized level and underestimation of the need for O&M support. In the worst case this could lead to systems collapsing or being abandoned, with the consequences of the initial investment wasted and users unable to access safe water.

At present daily O&M is implemented by private or scheme operators, supervised by the Water Authorities/Water and Sanitation Boards (WSSBs) and exclusively financed through tariffs.

In addition to that, O&M support structures (Regional Umbrella Organizations (UO) for Water Supply and Sanitation) support WSSBs where the individual scheme´s capacity is overburdened by the attempt to keep service and the technical standard of the schemes at required level. Further these support structures do not receive sufficient funding for proper maintenance of the invested capital. The OU is funded by the Joint Partnership Fund (JPF) and from a stagnant O&M Conditional Grant, which has not been increased for the last 8 years.

1.2. OBJECTIVE

The **overall objective** of this assignment is to assist the MWE – Directorate of Water Development in its efforts to enhance the quality and cost efficiency of RGC and Small Towns water supply schemes, to ensure sufficient levels of financing over the whole life-time of the schemes, and to assure efficient and effective service delivery

The **specific goals** of the assignment is to provide a basis for obtaining balanced financing of investment costs, capital maintenance costs and O&M costs for all small towns and rural growth centres water supply and sanitation infrastructure, between GoU, JPF and the schemes.

1.3. KEY CHALLENGES

The following key challenges were identified by the Consultant:

1. Within this study only a limited number of schemes can be looked at for primary data collection. Thus it can only be attempted to obtain results which are representative for all STs and RGCs of Uganda, but uncertainties will remain. The analysis of secondary data will be needed to reinforce the information received from the primary data collection within this study.
2. It is foreseen that different types of water schemes shall be investigated, i.e. with different types of source, power supply, predominant retail, water treatment requirements, and age.

In the course of the selection of schemes, which was conducted together with the UOs and the WSDFs it turned out however, that other criteria needed to be applied: data availability within the WSDFs and UOs on the one hand, and general representativeness of the respective schemes on the other hand. The actual selection of water schemes will thus be a trade-off considering all the above criteria.

3. Cooperation of NWSC was sought but so far the requested data were not received. While NWSC agreed to share their knowledge about performance indicators and other data for certain schemes which could have provided a valuable benchmark for this study, the actual data were in fact never provided to the Consultant.
4. Scheme related information about capital maintenance cost is not available at the UOs as the UOs don't allocate certain budgets or costs to the individual schemes under their authority.

1.4. SCOPE OF THE ASSIGNMENT

Based on the Ugandan Water Sector Policy, relevant documents, program reports and contracts with scheme operators, the Consultant shall discuss and analyse the existing cost structure and its reliability with all relevant stakeholders at the level of MWE, development partners, schemes and O&M support structures (UOs). In this context the study shall:

- Emphasize necessary adjustments of financing procedures to ensure permanent acceptable service level and reliability of water infrastructure for all schemes under the given situation of low economy of scale in ST and RGC and low human resource availability
- Consider the discrimination of direct O&M activities (costs funded by tariffs) and O&M support activities (costs to be funded by GoU as capital maintenance costs) taking into account the different types, size and complexity of schemes Assess the cost implications of underfunding capital maintenance (e.g. costs for emergency supply in case of break down, rehabilitation / reconstruction etc.)

1.4.1. Guiding Questions

A set of guiding questions provided in the ToR shall illustrate the priorities and required approach for the subject study:

1. What are specific investment costs of schemes (in relation to number of connection, to water delivery etc) depending on (i) type of source, type of power supply, others?
2. What are the specific O&M C, O&MSC and CapMC of these categories
3. How does quality of material and quality of workmanship influence these specific costs (IC, O&M C and CapMC)?
4. How does good quality of O&M and O&M support (as defined above) influence all consequential costs, reliability of schemes and life time of schemes
5. Which factors have impact on financial viability of a scheme (consumption paid for, no. of connections in relation to length of pipes, etc.) to be considered during design
6. Which costs should be covered by tariffs and which under CapMC and re-investment costs financed by owner of schemes

1.4.2. Expected Output

The expected output as per the ToR will be a study report containing:

1) A transparent delineation of all relevant O&M and capital maintenance costs in relation to the investment costs for the whole country, based on the experience of selected typical Small Towns (ST) and Rural Growth Centres (RGC)
2) A description of a realistic and effective arrangement for division of tasks/ cost between O&M at scheme level and the O&M support implemented by the UO
3) A rationale and recommendations on key considerations for a sound finance management strategy for ST and RGC water supply
4) A rationale and recommendations on key considerations for a sound finance management strategy covering direct O&M funded by tariffs and O&M support (capital maintenance funded by GoU) for ST and RGC water supply

1.5. DEFINITIONS

This study aims to find out aggregate expenditures needed by various actors to sustain, maintain and replace water supply or sanitation systems in STs and RGCs through their life cycles of wear, repair and renewal. Relating to the nomenclature used in the recently reviewed Design Manual and Design Guidelines for Water Supply Infrastructure in Uganda on the one hand, and international literature on the other hand, the following definitions are being referred to in this study (also see Chapter 2):

1. **Capital Expenditures (CapEx):** Capital expenditures are the costs arising from the construction and implemention of new infrastructure, the rehabilitation or extension of existing ones. CapEx include investment costs, mobilisation, general and detailed planning, implementation and test running
2. **Operation and Maintenance Expenditures (OpEx):** Expenditures for O&M include costs for daily operation and permanent daily maintenance, such as minor repairs implemented by operators and local management financed by tariff. They can be subdivided in
    a. Operation costs required for operating the system. These usually include:
        - Cost for staff (salaries, allowances, wages etc.)
        - Cost for energy (fuel, electricity)
        - Cost for chemicals (treatment, laboratory)
        - Cost for taxes, levies and other royalties
        - Office related costs (internet, telephone, mobile, office supplies)
    b. Costs for support of O&M in remote areas where operators and management cannot provide necessary skills, including
        - preventive maintenance (PM)
        - corrective maintenance (CM)
        - training of local operative and management staff
        - water quality monitoring according national standard

c. Maintenance cost covering the corrective maintenance (repair works) and proactive maintenance (ensuring technical lifetime expectations)

3. **Capital Maintenance Expenditure (CapManEx):** costs associated with of asset renewal and major repairs or replacements; typically larger sums which occur rather infrequently. CapManEx also include costs associated with indirect support towards capacity building, institutional support structures and post construction support; CMC are often beyond technical and financial capacity of individual scheme and include costs associated with institutional development

Please note that while this nomenclature differs from the acronyms used in the ToR for this assignment, the meaning of the acronyms used here is equivalent to those suggested in the ToR.

2. LITERATURE REVIEW

2.1. UGANDAN DESIGN GUIDELINES FOR WATER SUPPLY INFRASTRUCTURE

Definitions used here for CapEx and OpEx were synchronized with definitions provided in the Design Guidelines for Water Supply Infrastructure (MWE, 2013).

The design guidelines provide guidance on how to calculate:

- Investment Cost (Capital Expenditures),
- Reinvestment Cost
- Costs for O&M devided into
    - Operation Cost
    - Maintenance Cost

2.2. WATER SUPPLY DESIGN MANUAL FOR UGANDA

The Design Manual provides guidance for the determination of the financial viability of the proposed project. The following steps are suggested:

(i) Identifying and quantifying the costs and revenues;

(ii) Calculating the project net benefits;

(iii) Estimating the average incremental financial cost, Financial Net Present Value and Financial Internal Rate of Return (FIRR). The FIRR is the rate of return at which the present value of the stream of incremental net flows in financial prices is zero. If the FIRR is equal to or greater than the financial opportunity cost of capital, the project is considered financially viable. Thus, financial benefit-cost analysis covers the profitability aspect of the project.

2.3. SOUTH-WESTERN TOWNS - REVIEW OF THE RESULTS AND SUSTAINABILITY OF WATER AND SANITATION INTERVENTIONS SINCE 1996 (SEIDELMANN, 2013)

This ADA financed study aimed to conduct a “reality check” on the outcomes and sustainability of a long-term programme to improve access to safe water and sanitation in small towns and rural growth centres in South-West Uganda, the South Western Towns Water and Sanitation (SWTWS) programme. The review covered 46 towns in South-West Uganda with a population of mostly between 2,500 and 20,000 people. The average age of the 42 schemes implemented by

SWTWS/WSDF-SW is 9 years. In each town a technical and financial assessment was made and, amongst others, also operation and maintenance cost were evaluated.

Key findings – water supply

Of the 42 SWTWS towns investigated in this study, 39 water schemes (that is, 93%) were operational at the time of visit, including 14 of the 16 schemes (88%) that were constructed more than 10 years ago. Of the remaining schemes, 2 were temporarily out of order (since 2 weeks and 8 months, respectively) and 1 had been replaced as the original scheme has never had become fully operational due to management problems.

Of these 41 SWTWS towns with functional schemes,

- 6 were operated by a local company under a management contract (Ibanda-Kagongo, Kabwohe, Kihihi, Kisoro and Nyakagyeme, the latter together with Rukungiri MC)
- The remaining 35 were operated by individuals under the supervision of the respective water boards. Of these individuals, 28 had a formal management contract and 7 did not. Four of these were employed by the water boards or respective Town Council, whereas most scheme operators received a percentage of the revenue for their services.

The O&M responsibilities in these towns – as seen by the interviewees, not necessarily according to contracts or legal requirements – are as shown in Table 1. The presented figures indicate the percentage of SWTWS towns where the respective answer was given.

Reading example (fifth row): The Water Boards in 88% of the towns said that setting the water tariff is their responsibility; in 20% they stated that the Water Authority (Town Council) would be responsible or involved; 24% of the Water Boards said that the Umbrella would have a role, whereas only 2% said that the Ministry (central level) would be involved.

Table 1: Operation & maintenance responsibilities according to Water Board

	Scheme operator [1]	Water Board	Water Authority	Umbrella	MWE/DWD
Day-to-day O&M	100%				
Collection of fees	100%				
Fixing minor problems	100%	2%			
Major repairs (e.g. pump)	100%	44%	7%		
Setting tariff		88%	20%	24%	2%
Response to customer complaints	85%	78%	10%		
Water quality surveillance	5%			100%	2%

Source: South Western Towns – Review of the Results and Sustainability of Water and Sanitation Interventions Since 1996 (hydrophil iC, 2013)

Financial viability of the investigated water schemes

In general, the financial situation of the schemes was encouraging. The fact that 90% of the users were paying for the water was identified a result of SWTWS policies (water metering, contracted scheme operators) combined with managerial support and auditing by the Umbrella Organisation.

1 Can be a company or an individual, with varying contractual or employment arrangements.

Despite a high variability of O&M costs, the vast majority of the SWTWS schemes was able to cover these costs without subsidies. On average, revenue was 154% of the direct day-to-day O&M costs (pumping schemes: 143%). 30 of the 38 towns with financial data (79%) had a revenue exceeding 120% of the direct O&M costs, of which 19 above 200%.

Direct O&M costs as defined in this study included

- staff
- Energy
- administrative costs and
- the Umbrella contribution

but not depreciation or major repairs.

As a result, many investigated towns managed to save a percentage of their regular revenue for future investments and repairs. For 38 towns where this data was provided the average amount saved is 23% of the annual revenue. These funds were kept either in the Umbrella's credit scheme or in a bank account or both. The accumulated funds were found to be not sufficient to cover any substantial reinvestment. This is in line with Uganda's tariff setting guidelines for small towns where tariffs are not required to provide full cost recovery.

Seidelmann (2013) found out that water tariffs in the South Western region varied in an extremely wide range – from 800 UGX/m³ to 9000 UGX/m³ – which could not always be explained by differences of technology. Some tariffs were too low to cover the O&M costs, others created very high monthly excess revenue. There was evidence of abuse in some places, where water was being sold at several times its production costs despite low service quality. Also the percentages of how the revenue was shared between the scheme operator, the Water Board and how much was set aside in a savings account (for future extensions or major repairs) was found to be very variable.

It turned out that 79% of the SWTWS schemes had a revenue exceeding 120% of the regular O&M costs. However, the situation varied significantly as shown in Figure 1. In 50% of the towns (19 of the 38 SWTWS towns for which financial data were available) revenue exceeded 200% of the direct O&M costs. Direct O&M costs as defined here include staff, energy, administrative costs and the Umbrella contribution but not depreciation or major repairs.

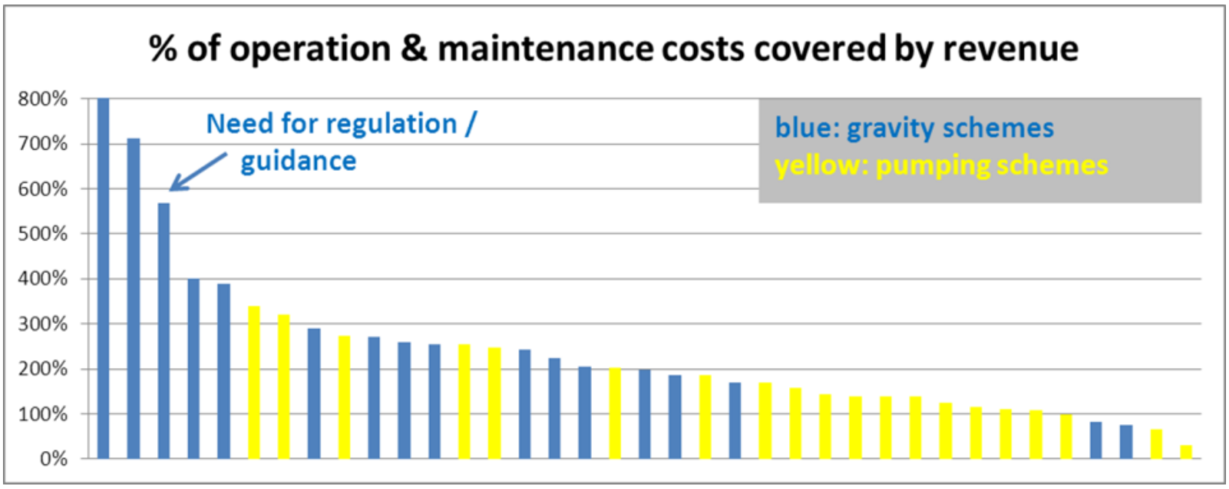

Figure 1: Percentage of operation & maintenance costs covered by revenue

2.4. TECHNICAL REVIEW OF THE COMPLETED DESIGNS FOR 16 SMALL TOWNS AND RURAL GROWTH CENTERS WATER SUPPLY INFRASTRUCTURE DEVELOPMENT (LEROCH, KATUKIZA, & ISAGARA, 2012)

This study reviewed the disigns of 16 ST and RGC water supply schemes in Eastern and northern Uganda. It was found that the quality of the reviewed design and tender documents was not according to the State of the Art in Uganda resulting also in inferior quality of the tender documents for the procurement of construction works. The lack of quality in the design also was identified to impair strongly the possibilities of the WSDF engineers to conduct a high quality construction supervision, as suitable reference documents were missing, which in turncan easily result in inferior quality and impaired funcionability of the implemented works.

2.5. INTERNATIONAL LITERATURE

The majority of available literature containing relevant cost data is the product of the WASHCost programme. WASHCost was a five year project executed by the IRC International Water Resource Centre in the Netherlands and funded by the Bill and Melinda Gates Foundation from 2008 - 2013. The purposes of the $14 million project were to develop a Life Cycle Cost Approach (LCCA) methodology; to increase access to knowledge on the costs of Water Sanitation and Hygiene (WASH) systems; and to influence WASH policy and budgeting operations worldwide (Cross, Frade, James, & Tremolet, WASHCost End-of-Project Evaluation, 2013) The program has produced expenditure data on water supply systems in Burkina Faso, Ghana, India and Mozambique.

The LCCA approach outlines the following expenditure categories (Fonseca, et al., 2011):

- Capital Expenditure (CapEx): investments associated with constructing and implementing the water supply scheme
- Operational and minor Expenditure (OpEx): regular running costs, including occasional small scale repairs
- Capital Maintenance Expenditure (CapManEx): costs associated with large scale repairs or replacements, typically larger sums which occur more infrequently
- Expenditure on Direct Support (ExpDS): local-level ongoing support costs, designed to ensure that local governments and communities are fully equipped to maintain the scheme's operation
- Expenditure on Indirect Support (ExpIDS): macro-level ongoing support costs, e.g. policy planning
- Cost of Capital (CoC): costs associated with obtaining the necessary resources for a project, e.g. interest payments on debts

Each category's inclusion and precise definition is tailored to the individual projects depending on available data, project scale and nature of the infrastructure.

WASHCost (WASHCost, 2012) also provides expenditure benchmarks for water services, designed to indicate the typical minimum annual cost ranges CapEx, OpEx, CapManEx and ExpDS per capita for sustaining basic water supply programs in developing countries. Benchmarks for water supply systems for populations ranging from less 500 to greater than 15,000 people are outlined in Table 2 and Table 3:

Table 2: Benchmark per capita expenditures

Cost Component	Primary formal water source in area	Cost range (US$ 2011)
Total capital expenditure / capita	Small schemes (serving less than 500 people) or medium schemes (serving 500-5,000 people) including mechanised boreholes, single-town schemes, multi-town schemes and mixed piped supply	30 - 131
Annual total recurrent expenditure / capita	All piped schemes	3 - 15

(WASHCost, 2012)

Table 3: Benchmark per capita recurring expenditures

Breakdown of recurrent expenditure	Annual cost ranges (US$ 2011) / capita
Operational and minor maintenance expenditure	0.5 - 5
Capital maintenance expenditure	1.5 – 7
Expenditure on direct support	1 – 3
Total recurrent expenditure	3 - 15

(WASHCost, 2012)

Asante et al (Asante, Nyarko, & Dwumfour-Asare, 2013) obtained expenditure data on several piped water systems in Ghana that are considered well run. Most of the towns had populations too high to be deemed relevant for the subject study; however the localities of Hwidiem and Kuntenase are both within the range of a small town. In several instances the report's data is presented only in graphs which made extraction of exact numbers challenging. Water supply expenditures are shown in Table 4.

Table 4: Water supply expenditures for Hwidiem and Kuntenase

Indicator	Locality			
	Hwidiem	per capita	Kuntenase	per capita
Population	2,822		3,024	
Total annual recurrent expenditure	Ca. $37,000	13.1	Ca. $18,000	5.95
Annual CapManEx	$1,680	0.60	Ca. $3,000	0.99
Annual recurrent expenditure / capita		$12.00		Ca. $5.50
Annual recurrent expenditure/m^3 water		$0.37		Ca. $0.61
CapManEx as % of total recurrent expenditure	Ca. 4.5%		Ca. 17%	

(Asante, Nyarko, & Dwumfour-Asare, 2013)

The report noted that these figures did not necessarily indicate adequate spending, but could be used for planning purposes and that the accuracy of the data relied on the appropriate recording of costs at each locality, which they consider a rarity.

Nyarko et al (Nyarko, Dwumfour-Asare, Appiah-Effah, & Moriarty, 2010) conducted an investigation into 31 rural communities in various locations throughout Ghana and used these values to calculate general indicators for Single-Village/Town Water Systems and Multi-Village/Town Water Systems. The report used both actual population figures and design figures for calculating per capita costs; however it is unclear whether either value is representative of the actual served populations. Table 5 shows average expenditures for the water supply systems. Average expenditure figures are presented in Table 5.

Table 5: Average water supply system expenditures

Indicator	Average(USD)
2008 CapEx / capita (design and actual populations)	441,390
2008 CapEx/ capita	83
Annual operational expenditure	12,000
Annual OpEx / capita	2.1
Total CapManEx / capita	22
Annual CapManEx / capita	3
Annual water cost / m^3 water (OpEx)	0.04
Annual water cost / m^3 water (CapManEx)	0.01

(Nyarko, Dwumfour-Asare, Appiah-Effah, & Moriarty, 2010)

The Integrated Social Development Centre's (ISODEC, 2011) report on the cost effectiveness of three small town water systems in Ghana outlined the costs associated with constructing and maintaining the schemes. The indicators recorded for the areas (with a population of 5940, 9082 and 12758) are somewhat more broadly defined than those of the *WASHCost* projects; however Operation and Maintenance costs are still indicated. Table 6 shows the expenditures for the three water supply systems.

Table 6: Water supply system expenditures for Oyibi, Abokobi and Pantang (all cost values are in Ghana Cedi)

Indicator	Locality		
	Oyibi	Abokobi	Pantang
Population	5,940	9,082	12,758
Construction Cost	780,395	987,780	909,420.9
Annualised Construction Cost	101,451.14	128,411.4	118,224.7
Community Mobilisation & Training	55,606.5	81,077.9	47,189.8
Personnel	11,955.7	8,411.1	40,396.1
Operation and Maintenance	30,432.8	66,511.3	99,226.1
Total Annual Cost	151,090.3	213,905.4	263,975.7
Per Capita Cost	25.4	23.6	20.7

(ISODEC, 2011)

Koestler et al (Koestler, Koestler, & Koestler, 2010) recorded the CapEx, OpEx, ExpDS, and CapManEx over the course of 7 years for three sites (Katunguru, Kazinga and Kisenyi) with small piped water schemes in the Rubiziri District in Western Uganda. The total population concerned was 2,360. The report displayed this information through graphs, so the following values are estimated values extracted from the graphical data. Table 7 shows the approximate values for the water supply system expenditures while Table 8 compares the per capita costs with *WASHCost* benchmarks.

Table 7: Approximate annual water supply system expenditures for Katunguru, Kazinga and Kisenyi

Locality	Approximate annual costs (USD)			
	CapExp	CapManExp	OpEx	ExpDS
Katunguru	13,200	2,900	1,300	5,400
Kazinga	10,300	800	4,000	3,900
Kisenyi	11,000	1,900	2,400	5,200

(Koestler, Koestler, & Koestler, 2010)

Table 8: Benchmark comparison with actual expenditures

		Approximate annual per capita costs (USD)			
Locality	Population	CapExp	CapManExp	OpExp	ExpDS
Katunguru	730	Ca. 18.1	Ca. 4	Ca. 1.8	Ca. 7.4
Kazinga	860	Ca. 12	Ca. 0.9	Ca. 4.9	Ca. 4.5
Kisenyi	1,040	Ca. 10.6	Ca. 1.8	Ca. 2.3	Ca. 5
Benchmark		Ca. 30-130	Ca. 1.5-7	Ca. 0.5-5	Ca. 1-3

(Koestler, Koestler, & Koestler, 2010) (WASHCost, 2012) – Small – medium schemes (500 – 5000 people)

For several indicators data was missing for at least one year in this study, reinforcing the impression that missing or unreliable data is a common theme throughout most expenditure studies.

Whinnery's Cost Benefit Analysis (Whinnery, 2012) demonstrated the costs incurred in the case of poor workmanship, construction or maintenance practices, using a Kenyan water supply project as a case study. The used example involved a well construction and operation project, and so the specific values used are not relevant to this study. The findings of the report are significant for the subject study's guiding questions (refer Chapter 1.4.1), showing that decreased or absent Operational & Maintenance funds and poor inferior construction practices leads to greatly depleted project value. The predicted cost and benefits of various scenarios as outlined by Whinnery are presented in Table 9, Table 10 and Table **11**.

Table 9: Summary of cost analysis

CBA Project Alternatives:		Proper Construction; With O&M	Inferior Construction; With O&M	Proper Construction; No O&M	Inferior Construction; No O&M
Costs	**Descriptions**	**Well Value Estimates**			
Capital Charges	well construction & development	$11,850	$8,888	$11,850	$8,888
	pump components & installation	$1,800	$1,800	$1,800	$1,800
O&M Cost	PDV, assumes 10% pump cost as proxy for annual O&M cost	$2,578	$669	$0	$0
Opportunity Cost	time spent for training (1 day per beneficiary)	$1,178	$1,178	$1,178	$1,178
Economic Externalities	negative economic impacts	$0	$0	$0	$0
Environmental Externalities	negative environmental impacts	$48	$48	$48	$48
Total PDV Costs		**$17,455**	**$12,583**	**$14,876**	**$11,914**

Table 10: Summary of benefit analysis

CBA Project Alternative	Total Benefits PDV
Proper Construction; With O&M	$670,651
Inferior Construction; With O&M	$206,445
Proper Construction; No O&M	$167,560
Inferior Construction; No O&M	$43,765
Inferior Construction; With O&M; Local GW Quality Compromised, Treatment Provided	$206,445
Inferior Construction; With O&M; Local GW Quality Compromised, No Treatment	$0
Inferior Construction; No O&M; Local GW Quality Compromised, Treatment Provided	$43,765
Inferior Construction; No O&M; Local GW Quality Compromised, No Treatment	$0

Table 11: Summary of cost-benefit analysis

CBA Project Alternative	Total Benefits PDV	Total Cost PDV	Total NPV	Benefit/Cost Ratio
Proper Construction; With O&M	$670,651	$17,455	$653,196	38.42
Inferior Construction; With O&M	$206,445	$12,583	$193,862	16.41
Proper Construction; No O&M	$167,560	$14,876	$152,684	11.26
Inferior Construction; No O&M	$43,765	$11,914	$31,851	3.67
Inferior Construction; No O&M; Local GW Quality Compromised, No Treatment	$0	$11,914	-$11,914	0
Inferior Construction; With O&M; Local GW Quality Compromised, No Treatment	$0	$12,583	-$12,583	0
Inferior Construction; No O&M; Local GW Quality Compromised, Treatment Provided	$43,765	$171,601	-$127,836	0.26
Inferior Construction; With O&M; Local GW Quality Compromised, Treatment Provided	$206,445	$765,845	-$559,399	0.27

(Whinnery, 2012)

PDV….. Present Discounted Value
NDV….. Net Present Value

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3. METHODOLOGY

The study involved a review of technical and financial reports and an assessment based on discussions and interviews with key stakeholders. The purpose of this was to ascertain the existing cost structures for individual schemes. Particular emphasis was being placed on establishing technical and operational efficiencies including unit running costs, O&M costs and revenue collection and expenditures authorized under specific management contracts. The objective of this being to establish the proportion of such costs covered by applicable tariff and O&M support funded by Government as capital maintenance cost. The study in addition sought to understand the effect of the quality of O&M support on consequential costs and reliability and lifetime as well as financial viability of the scheme.

The findings of this study are relevant to the Terms of Reference especially in regard to the need to ascertain the real cost of water supply and specifically to its objective of delineating O&M costs covered by water tariffs and the capital maintenance in Small Towns and RGCs. It is intended to provide a basis of understanding the cost of support services provided by Umbrella Organizations in providing O&M backup and Capital maintenance to water supply schemes.

3.1. MEETINGS WITH RELEVANT STAKEHOLDERS

Meetings were held with the relevant senior officers in MWE, the JPF staff, Water Sector Liaison Division and the Commissioners under the Ministry on the one hand, and with Umbrella Organisations on the other hand. During these meetings the expectations in this study were discussed. A brief inception note was prepared and presented by the Consultant.

3.2. SELECTION OF WATER SCHEMES

Different types of water schemes were investigated, i.e. with different types of source, power supply, predominant retail, water treatment requirements, and age. In the course of the first interviews with the UOs and the WSDFs it turned out, however, that also other criteria needed to be applied: data availability within the WSDFs and UOs on the one hand, and general representativeness of the respective schemes on the other hand. The actual selection of water schemes was thus a trade-off considering all the above criteria.

The selection of the sample schemes for the study was done in close cooperation with the WSDFs and the Umbrella Organizations. With the retrieved background information of the schemes, it will be attempted to select an appropriate number of suitable sample schemes to represent the different types of water supply technologies; by energy source, water treatment, design, and O&M characteristics.

3.3. DATA COLLECTION

Data were collected from all possible sources:

- MWE
- NWSC
- Umbrella Organisations (UOs)
- WSDFs
- Private Operators (POs)
- Water Boards (WSSBs)

3.3.1. Data Collection instruments

This study was guided by field visits, interviews, observation, documentary information, and consultations with stake holders as sources of information.

I. **Field Visits:** A first run of field visits was conducted between 30th January, and 24th February, 2014 to 7 piped water supply schemes. This first phase of the study covered six towns (Sironko, Budadiri, Budaka, Busembatya, Kayunga, and Luwero) and one RGC (Nakaseke). A second run of field visits was conducted between 2nd April and 9th April and included the town of Mpigi and the three RGCs Nakifuma, Kagulumira and Kasanje.

II. **Interviews:** During the field visits, semi structured face to face interviews were conducted. Complementary interviews with key informants such as the managers and staff of Central and Eastern WSDFs and Umbrella Organization were also conducted. Interviews were also conducted with Scheme Operators and POs for schemes covered in the study. Where appropriate, follow-on telephone interviews with directors of PO companies were made using a standard interview guide to obtain scheme specific data or to fill information gaps in situations where scheme managers were unable provide adequate information.

III. **Documentary Information:** Documents with relevant information for this study were also analysed. These included;
   a. Quarterly reports for the last 3 years for STs from the Regulation Unit.
   b. Reports for analyses from the Umbrella Organisations
   c. Minutes of WSSB meetings of the period under review were assessed
   d. Various studies including WSDF study, O & M conditional grant guide lines, PSP in Uganda Water Sector, and IRC study on life cycle costs were reviewed.

   Consultations were also conducted with NWSC. In addition a number of consultative meetings were held with staff at MWE particularly with the UO Coordination Office and the Regulation Unit.

IV. **Quality Control:** Inquiry was based on an interview guide that was developed by the Consultant. For purposes of obtaining standardised, reliable and comparable information for the study, the items in the interview guide were designed on the basis of guiding questions in the Terms of Reference of this study as provided by the Client (MWE). The Design Review 2012 (Leroch, Katukiza, & Isagara, 2012) and the Design Guidelines for Water Supply Infrastructure in Uganda (MWE, 2013) were also used to guide the study.

3.3.2. Database provided by MWE

MWE is maintaining a database with data from the water supply schemes of Small Towns. Data from the last 10 years were provided to the Consultant.

3.3.3. Interviews

Semi structured interview were not only conducted with managers of WSDF and UOs in Mbale and Wakiso. Interviews were but also with members of 11 WSSBs and their respective POs or scheme operators for all towns covered in the study.

3.4. DATA MANAGEMENT AND ANALYSIS

This study generally is using a comparative design as it is implicitly also concerned with evaluating the institutional set up and governance with particular emphasis on oversight responsibilities of WSSBs and the specific scheme performance. Emphasis is being placed on understanding how WSSB conduct their Oversight Mandate and how this transforms into O&M and the real cost of water supply.

Reports for 2010/11 to 2012/14 are being compared for performance trends with emphasis placed on operational characteristics and performance indicators relevant to the study. Work plans for 2012/13 and 2013/14 for UO are also being analysed against proposed implantation plans and budgets to establish the cost of institutional support to RGs and STs.

The acquired raw data and information are being analysed in the following way:

1. Rough statistical analysis
2. Financial modelling

3.4.1. Definition of relevant indicators

Referring to the ToR, a set of indicators was identified to be relevant and of general interest. These indicators were to be elaborated for all investigated schemes in order to generate a small database for integrative analysis. The set of indicators is presented in Table 12.

Table 12: Set of indicators as identified for this study

General Indicators	
Indicator N°	**Indicator**
	Total staff
1	Total no of connections
2	Active connections
3	% O&M covered by tariff
4	Collection efficiency %
5	NRW
6	Energy % of O&M cost
7	Water tariff [USH/m³]
9	Management fees%
Specific Indicators	
Indicator N°	**Indicator**
10	Capital expenditure / km network
11	Capital expenditure / household served
12	Total cost of operation / m^3 sold
13	Annual operation cost / km network
14	Annual operation cost / household served
15	Annual operation cost / m^3 water sold
16	Annual maintenance cost / km network
17	Annual maintenance cost / household served
18	Annual maintenance cost / m^3 water sold
19	Annual capital maintenance cost / km network
20	Annual capital maintenance cost / household served
21	Annual capital maintenance cost / m^3 water sold
22	Annual energy cost / km network
23	Annual energy cost / household served
24	Annual energy cost / m^3 water sold
25	N° connections / km network

3.4.2. Statistical analysis of data

Since the study is comparative in nature, and the fact that the Activity Based Model was being adopted for the study, analyzing data using excel spreadsheet was seen as the best option. All collected data were studied and the matrices between the different categories of data from different schemes over a period of three years were compared. Using recommended formulae based on performance indicators, simple statistical procedures like comparative graphs were used to analyze performance trends over the period.

3.4.3. Financial Model

An Activity Based Costing Model (ABC) was being adopted for this study. The model derives its relevance from the MWE Business Planning Tool for Water Authorities. This model was adopted in response to the need to obtain a better understanding of the cost of water supply. The model looks at activities within the schemes for service provision, and a link was made between water scheme activities and outputs by assessing costs incurred to run the activities and the revenue from the outputs.

The model was used to capture subsector O&M grants to institutional support organizations and allocations made by region. At the regional level, the model considers grants expended on O&M and capital maintenance support activities to individual schemes. Considering that the costs are spread out among the schemes, the model proportionally assigns institutional support costs to individual schemes within the region. Using the model, water supply activities can be categorized, and costs directly associated with each activity assessed.

This model was chosen because it allows to assess relevant costs and to delineanate O&M costs incurred by the Operator and O&M costs of support institutions. It is also important to note that the tabulation of costs on an activity-by-activity basis makes it possible to accurately identify cost centers (by assessing how much individual activities cost).

3.5. CONSIDERATION OF MANAGEMENT STRUCTURES

All towns covered in this study have management structures in place with an active WSSB. They all have management contracts with private operators (PO) or a scheme operator (SO) in the case of RGC (Nakaseke).

However, as it turned out during the first project phase that the performance of the WSSBs in providing oversight on O&M is not uniform across board, minutes and reports of board meetings were checked to ascertain the level of WSSB's involvement and efficiency in providing oversight in the management and operation of water supply schemes. The quality of minutes and reports was taken as an indicator of oversight efficiency of WSSB.

4. RESULTS

4.1. OVERVIEW

The study covered 11 piped water supply schemes commissioned between 2001 and 2012. The study involved interviews with key actors involved in providing technical support, development, management and operation of water supply systems to ascertain past and present operational performance of the selected schemes. In addition, interviews were conducted with staff of the Umbrella Organisations (UO) and the Water Supply and Sanitation Facilities (WSSDF).

All 11 schemes visited were operational and each of them seemed to be operating well with either a private water operator or a scheme operator with reasonable revenue collection from water users. However, performance parameters with implication to O&M and requirement for capital maintenance costs (and support) seem to vary widely from scheme to scheme even within similar water supply technology and operational characteristics.

4.1.1. Consideration of Management Structures

In the case Budaka, there is evidence of gross infractions of the performance contract and clear abuse of funds with actions of criminal nature being clearly apparent. Obligations to operators under the management contract had not been met for a period of two years. The scheme, despite of the involvement of Eastern Umbrella is still at a risk of collapse with no capacity at its current level of operation to cover O&M costs from its operating revenue. This finding validates a problem long identified and repeatedly discussed in the water sector in Uganda and reported in recent sector performance reports (2010; 2011; 2012).

4.2. KEY FINDINGS - GENERAL

Of the 11 schemes visited under this study, 4 were constructed under the Danida funded Eastern Centers Project and commissioned between 2001 and 2002 (Budadiri GFS, Budaka, Kayunga and Busembetya). The design horizon of these schemes was 10 years. Luwero and Town Water Supply Scheme on the other hand was constructed under the World Bank funded Small Towns Project and commissioned in 2001. Mpigi Town Water supply and Sironko GFS scheme were commissioned in 2008 and 2009 respectively while Nakaseke RGC and Kasanje schemes are fairly new having been constructed under WSDF and commissioned in 2012and 2013.

Some of the schemes covered in the study are past their design horizon and have largely not been improved over time. Others like Busembatya and Luwero town water supply schemes have in the recent past undergone refurbishments under World Bank funded OBA. Budaka and Kayunga schemes on the other hand seem to be grappling with O&M and capacity challenges in regard to meeting performance targets and achieving attendant service levels under their respective management contracts.

Smaller RGC schemes are facing unique challenges ranging from technical efficiency to management oversight. In the case of Kangulumira, the functions of WSSB have been usurped by the Council while Kasanje has NRW way out of tolerable levels. Many reasons were advanced to explain the anomalies however, the scheme is operating under the contractors’ defects liability period meaning that there is still scope for the defects to be addressed.

4.3. O&M COSTS AND FINANCIAL VIABILITY OF THE SCHEMES

Throughout the investigated water schemes, a high variability of costs was found (Table 13 and Table 14). However, in spite of this fact all towns covered under the study except Budaka TC are able to meet O&M costs from tariff without recourse to grants or subsidies. O&M costs are defined in this study to mean all costs incidental to service provision including energy costs, water treatment costs, staff costs, administration and other overhead costs but excludes depreciation and costs of major repairs. In towns where PO are contracted to provide services, these costs are embedded in management fees.

Table 13 and Table 14 show basic performance indicators for water supply schemes which were selected for the study by the Consultant.

Table 13: Basic performance parameters for Small Towns under study (collected by Consultant)

#	Variable / indicator	Sironko	Budadiri	Budaka	Kayunga	Busembatya	Luwero	Mpigi
1	Total no of connections	877	747	329	1374	578	1677	1350
2	% O&M covered by tariff	164%	181%	86%	128%	130%	175%	130%
3	Collection efficiency%	84%	87%	56%	94%	96%	99%	97%
4	NRW	10%	11%	49%	35%	13%	15%	18%
5	Energy% of O&M cost	5%	0	39%	35%	32%	52%	30%
6	Water tariff	1,212	900	1,830	2,124	1,850	1912	2300
7	Management fees%	80%	70%	85%	85%	95% (OBA)	95% (OBA)	90% (OBA)

Table 14: Basic performance parameters for RGCs under study (collected by Consultant)

#	Variable / indicator	Nakaseke	Nakifuma	Kagulumira	Kasanje
1	Total no of connections	250	302	319	215
2	% O&M covered by tariff	178%	150%	140%	123%
3	Collection efficiency%	80%	89%	85%	78%
4	NRW	18%	8%	23%	30%
5	Energy% of O&M cost	53%	36%	37%	38%
6	Water tariff	2,250	1,800	1,850	4,000
7	Management fees%	40%	78%	30%	30%

Whereas Budadiri and Sironko are gravity flow schemes, they have the main difference is in the type of water treatment requirements. Kayunga and Mpigi share similar design and operational characteristics in terms of energy source and water treatment regimen. The rest of the schemes are based on grid powered borehole abstraction with submersible pumps and only simple chlorination treatment.

Although each of the scheme covered in the study had salient scheme specific O&M cost drivers, aggregate data does not show one single factor to explain cost differentials. While GFS are generally perceived to have lower O&M costs, this study found no significant cost advantage over grid powered schemes in regard to the percentage of O&M covered by tariff. The advantage is generally offset in part by the relatively low tariff and high maintenance costs. Overall however, the main cost drivers for O&M are energy and water treatment costs. NRW was also found to be a cost driver influencing overall cost of water supply schemes.

It is worth pointing out that the numbers which were collected by the Consultant are not in line with the numbers which were provided to the Consultant by the MWE. Table 15 and Table 16 show a summary of the data provided by the MWE.

Table 15: Basic performance parameters for Small Towns under study (provided by MWE)

#	Variable / indicator	Sironko	Budadiri	Budaka	Kayunga	Busembatya	Luwero	Mpigi
1	Total no of connections	818	768	319	1,302	758	1,677	1,580
2	% O&M covered by tariff	123%	274%	85%	118%	166%	173%	125%
3	Collection efficiency%	75%	67%	48%	100%	95%	99%	97%
4	NRW	10%	8%	27%	41%	14%	12%	19%
5	Energy% of O&M cost	5%		40%	30%	43%	55%	30%
6	Water tariff	1,212	816	1,830	1,500	1,050	2,300	2,300
7	Management fees%	80%	70%	85%	85%	95%	95%	90%

Table 16: Basic performance parameters for RGCs under study (provided by MWE)

#	Variable / indicator	Nakaseke	Nakifuma	Kagulumira	Kasanje
1	Total no of connections	250	302	464	215
2	% O&M covered by tariff	178%	150%	210%	123%
3	Collection efficiency%	92%	86%	85%	78%
4	NRW	16%	2%	23%	40%
5	Energy% of O&M cost	53%	36%	33%	41%
6	Water tariff	2,250	1,800	1,850	4,000
7	Management fees%	40%	78%	30%	30%

Until the submission of the final report for this assignment it will be attempted to clarify how this discrepancy can be explained. For the time being it was decided to use the data provided by the MWE for further analysis as presented in the following subchapters.

4.3.1. Aggregated results

4.3.1.1. Average Specific Costs of investigated schemes

Table 17: Summary of specific costs of water schemes Sironko, Budadiri, Budaka, Busembatia, Kayunga, Luwero extracted from MWE reports for 2012/13

General Indicators		Sironko	Budadiri	Budaka	Busembatia	Kayunga	Luwero
Indicator N°	Indicator	Value	Value	Value	Value	Value	Value
1	Total staff	7	7	4	4	9	8
2	Total no of connections	818	768	319	758	1,302	1,677
3	Active connections	733	567	262	689	1,508	1,487
4	% O&M covered by tariff	123	274	85	166	118	173
5	Collection efficiency %	75	67	48	95	100	99
6	NRW	10	8	27	14	41	12
7	Energy % of O&M cost	5	-	40	43	30	55
8	Water tariff [USH/m³]	1,212	816	1,830	1,050	1,500	230
9	Management fees%	80	70	85	95	85	95
Specific Indicators							
Indicator N°	**Indicator**	**Value**	**Value**	**Value**	**Value**	**Value**	**Value**
10	Capital expenditure / km network	420,900	87,520	1,649,756	12,883	77,386	384,460
11	Capital expenditure / household served	7,089	6,095	2,459	214	670	3,906
12	Total cost of operation / m³ sold	975	850	2,422	1,219	1,533	1,034
13	Annual operation cost / km network	672,887	231,372	1,303,658	225,270	2,474,602	1,615,996
14	Annual operation cost / household served	11,338	7,520	1,943	3,751	21,417	16,418
15	Annual operation cost / m³ water sold	696	19	1,916	216	1,315	925
16	Annual maintenance cost / km network	269,890	204,221	344,024	225,270	411,023	190,475
17	Annual maintenance cost / household served	4,546	6,638	512	3,752	3,557	1,935
18	Annual maintenance cost / m³ water sold	279	171	505	216	218	109
19	Annual capital maintenance cost / km network	-	-	3,095,732	-	-	-
20	Annual capital maintenance cost / household served	-	-	4,615	-	-	-
21	Annual capital maintenance cost / m³ water sold	-	-	4,550	-	-	-
22	Annual energy cost / km network	42,270	-	659,390	552,365	856,420	997,897
23	Annual energy cost / household served	717	-	983	9,200	7,412	10,138
24	Annual energy cost / m³ water sold	44	-	969	530	455	571
25	N° connections / km network	21	20	39	30	37	31

Table 18: Summary of specific costs of water schemes Mpigi, Nakaseke, Nakifuma, Kagulimira, Kasanje, extracted from MWE reports for 2012/13

General Indicators		Mpigi	Nakaseke	Nakifuma	Kagulimira	Kasanje
Indicator N°	Indicator	Value	Value	Value	Value	Value
1	Total staff	9	4	5	3	4
2	Total no of connections	1,580	250	302	464	215
3	Active connections	1,350	230	283	319	203
4	% O&M covered by tariff	125	178	150	210	123
5	Collection efficiency %	97	92	86	85	78
6	NRW	19	16	2	23	40
7	Energy % of O&M cost	30	53	36	33	41
8	Water tariff [USH/m³]	2,300	2,250	1,800	1,850	4,000
9	Management fees%	90	40	78	30	30
Specific Indicators						
Indicator N°	Indicator	Value	Value	Value	Value	Value
10	Capital expenditure / km network	407,692	296,000	10,000	-	6,000
11	Capital expenditure / household served	2,585	1,578	80	-	150
12	Total cost of operation / m³ sold	1,820	1,139	1,005	510	1,605
13	Annual operation cost / km network	2,720,153	1,169,500	423,380	434,285	436,900
14	Annual operation cost / household served	170,249	10,915	3,420	1,842	10,922
15	Annual operation cost / m³ water sold	879	959	1,024	687	3,008
16	Annual maintenance cost / km network	307,692	-	79,523	-	-
17	Annual maintenance cost / household served	1,951	-	642	-	-
18	Annual maintenance cost / m³ water sold	99	-	517	-	-
19	Annual capital maintenance cost / km network	-	-	-	-	-
20	Annual capital maintenance cost / household served	-	-	-	-	-
21	Annual capital maintenance cost / m³ water sold	-	-	-	-	-
22	Annual energy cost / km network	1,495,384	596,986	307,414	342,857	540,000
23	Annual energy cost / household served	9,483	5,810	2,485	1,454	13,500
24	Annual energy cost / m³ water sold	483	607	744	200	1,239
25	N° connections / km network	40	18	14	33	11

Table 19: Average specific costs of investigated water schemes (arithmetic mean)

General Indicators		
Indicator N°	**Indicator**	**Value**
1	Total staff	6
2	Total no of connections	768
3	Active connections	694
4	% O&M covered by tariff	157
5	Collection efficiency %	84
6	NRW	19
7	Energy % of O&M cost	33
8	Water tariff [USH/m³]	1,901
9	Management fees%	71
Specific Indicators		
Indicator N°	**Indicator**	**Value**
10	Capital expenditure / km network	313,872
11	Capital expenditure / household served	2,257
12	Total cost of operation / m³ sold	1,283
13	Annual operation cost / km network	1,064,364
14	Annual operation cost / household served	23,612
15	Annual operation cost / m³ water sold	1,074
16	Annual maintenance cost / km network	184,738
17	Annual maintenance cost / household served	2,139
18	Annual maintenance cost / m³ water sold	192
19	Annual capital maintenance cost / km network	281,430
20	Annual capital maintenance cost / household served	420
21	Annual capital maintenance cost / m³ water sold	414
22	Annual energy cost / km network	580,998
23	Annual energy cost / household served	5,562
24	Annual energy cost / m³ water sold	531
25	N° connections / km network	27

4.3.2. Scheme Specific Results

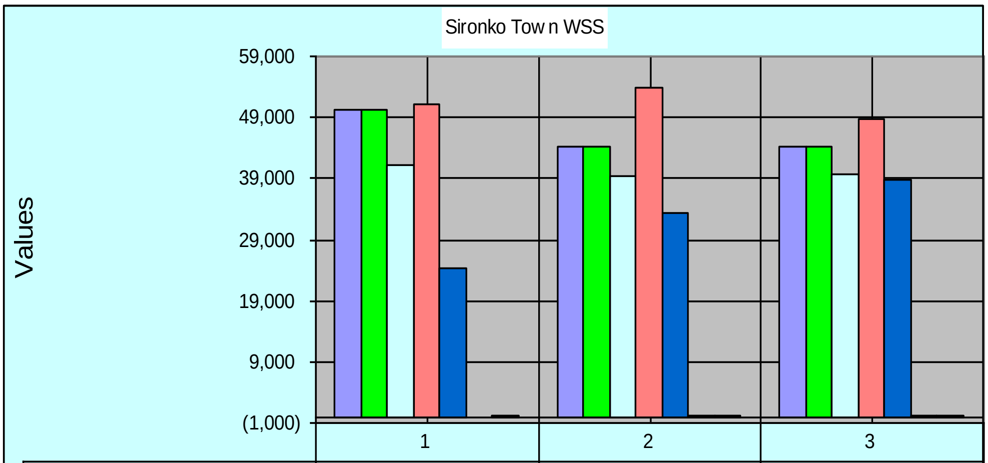
4.3.2.1. Sironko (ST)

4.3.2.1.1 Scheme specific information

Table 20: Scheme specific facts – Sironko

Town/RGC	Technology and age of scheme and operational status	Envisaged Umbrella intervention	Issues giving rise Capital maintenance costs
Sironko TC	Gravity Flow Scheme with Rapid Sand Filters Water treatment with Aluminum and chlorine. (2006 with technical commissioning 2009) Grid power utilization limited back wash. Run by a Private Water Operator under management contract. Scheme in relatively sound state of repair, management contract at 80% fee. Last quarter service level 98%	System prone to failure during rainy season due to clogging at the intake, relying on Eastern umbrella for technical assistance for water quality tests, supply of water meters, valves. Scheme appears to be financially and technically viable in regard to financing capital maintenance costs in medium to long term	No planned preventive maintenance plan for network assets available, Maintenance reactive and driven by failures on network. Intake structure and rapid filter system requires regular attention. System prone to silting and clogging.

4.3.2.1.2 Financial viability of the scheme (Sironko)



	1	2	3
w ater Produced	50,332	44,305	44,108
Water supplied	50,332	44,305	44,108
Water sold / billed	41,266	39,403	39,715
Total Revenue	51,221	53,759	48,646
O&M Running cost	24,417	33,461	38,748
Running costs as percenatge of revenue	48	62	80
Cost funded by revenue	210	161	126

Figure 2: Key data from 2010/11 to 2013/14 for Sironko

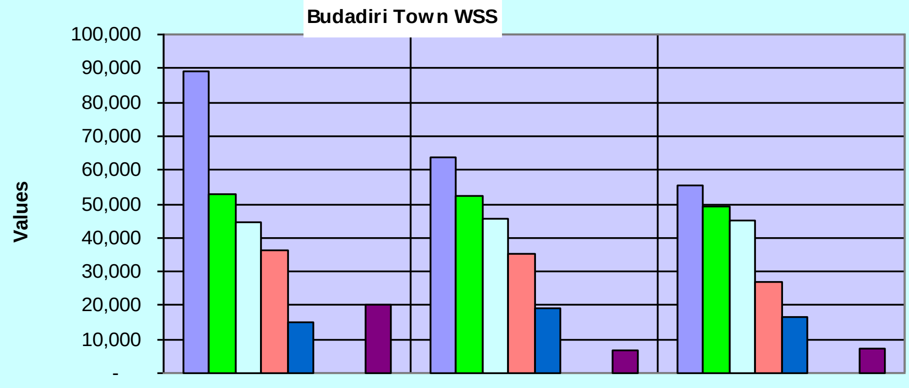
The data in the Table above does show trends in all measured parameters, however, it does not seem so logical when you analyze water produced and water supplied because of the consistency in figures. However, it is being subjected to further analysis using data from MWE to confirm its validity and reliability.

4.3.2.2. Budadiri (ST)

Table 21: Scheme specific facts – Budadiri

Town/RGC	Technology and age of scheme and operational status	Envisaged Umbrella intervention	Issues giving rise Capital maintenance costs
Budadiri TC	Gravity Flow Scheme with Slow Sand Filters. no additional water treatment. Technical commissioning 2001. Scheme in a fairly good state of repair, management contract at 70% fee. Collection efficiency 88% average. Last quarter service level 87%	Illegal connections rampant, Annual network expansion plans available however, not done in 2012/13/14. New customer connection stagnant and 23% of connections are either inactive or suppressed. NRW% is based only on estimates as bulk meters are lacking at reservoirs. Low tariff impairs capacity to meet capital maintenance cost on a sustainable basis	Scheme capacity utilization below 55% 12 years into design life. No scheduled preventive maintenance plan for network assets available. Customer upstream directly connected to transmission mains, 3 no. air valves not functioning. Rely on UO for water quality tests.

4.3.2.2.1 Financial viability of the scheme



	period 2010/11	2011/12	2012/13
w ater Produced m3	89,083	63,486	55,357
Water supplied m3	52,642	52,343	48,979
Water sold / billed m3	44,803	45,338	45,256
Total Revenue 000 Ush	36,293	35,106	27,143
O&M Running cost 000 Ush	14,828	19,425	16,509
Running costs as percenatge of revenue %	41	55	61
Cost funded by revenue %	245	181	164

Figure 3: Key data from 2010/11 to 2013/14 for Budadiri

The data in the graph above shows a consistent decline in water produced over the last three years. The amount of water supplied has only minimal variation but still exhibits a trend of decline. It can be observed that revenue realization from the scheme is in a consistent decline. The running costs are not picked by the graph. This being raw data, it shall be subject to further analysis using data from MWE database.

4.3.2.3. Budaka (ST)

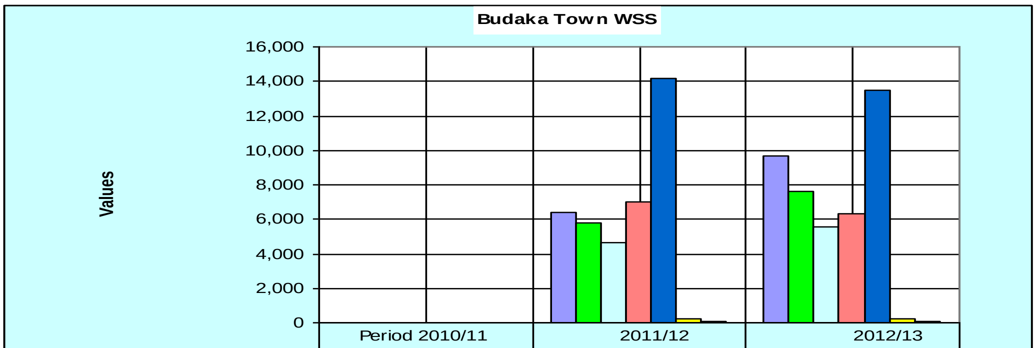
Table 22: Scheme specific facts – Budaka

Town/RGC	Technology and age of scheme and operational status	Envisaged Umbrella intervention	Issues giving rise Capital maintenance costs
Budaka TC	Grid power Submersible pumps, abstraction from 2 No boreholes. Design horizon of 10 years. Scheme commissioned in year 2002. Operated by Private Water Operator under management contract Design capacity 350	High NRW (49%), Illegal connections and suspected system leakages, poor or faulty metering system needs renewal, mismanagement of escrow accounts needs follow-up, inadequate oversight WSSB requires training and capacity building. Operator	No preventive maintenance plan for network assets; Low service level at 53%; inadequate yield from existing 2 No. water sources relative to demand. Scheme suffers regular breakdown of electromechanical

	cuM/day. Submersible pump abstraction, 12 years (2002) design horizon 10 years 89% metered connections (achieved with help of UO), operated by PO management contract at 85% revenue collection basis. Last quarter service level 53%, water rationing experienced.	fee claims unpaid	installations. Requires continuous 18 -20 hour pumping , Suspected system leakages, poor and faulty metering system.

The scheme has a poor O&M history with an inadequately oriented WSSB. Members of the board have got no idea of their role and responsibility in regard to execution of water supply and sanitation mandate. This, in addition to the ageing status of the scheme (and perhaps other reasons), combine to give the town some of the worst performance indicators of all the towns covered in the study.

4.3.2.3.1 Financial viability of the scheme



	Period 2010/11	2011/12	2012/13
water Produced m3	0	6,371	9,697
Water supplied m3	0	5,771	7,618
Water sold / billed m3	-	4,669	5,578
Total Revenue 000 Ush	-	6,988	6,301
O&M Running cost 000 Ush	-	14,140	13,511
Running costs as percenatge of revenue	-	202	214
Cost funded by revenue	0	49	47

Figure 4: Key data from 2010/11 to 2012/13 for Budaka

The bar chart shows that there was no recorded activity in Budaka in the period 2010/11 as the scheme had run down. However the graph above shows that the scheme is running on very high operations cost relative to revenue collection. The characteristics of cost and revenue indicate an unhealthy operational status of the scheme.

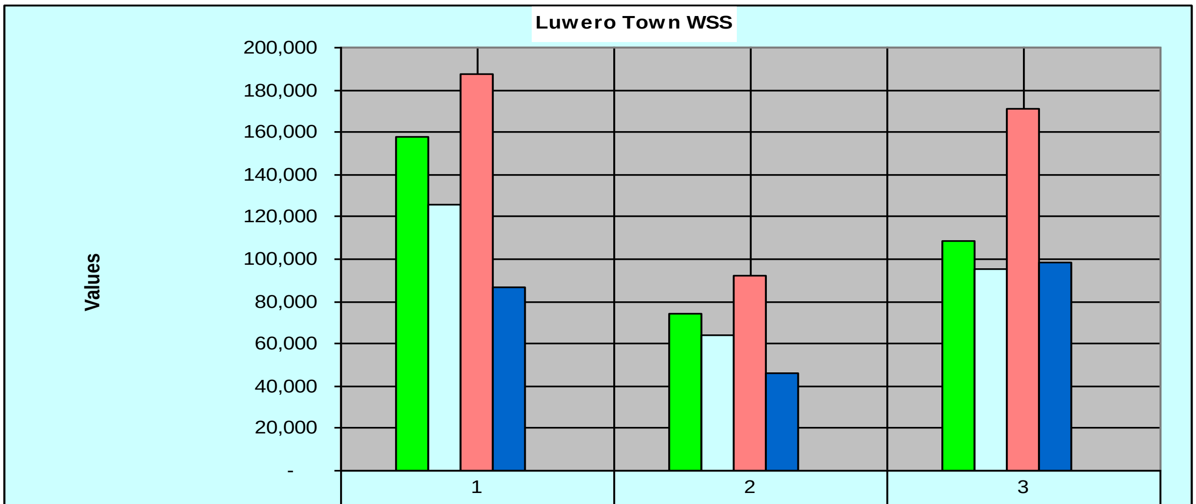
4.3.2.4. Luwero TC (ST)

The scheme was refurbished in 2011/12 under OBA and was managed by a PO until take over by NWSC in January 2014. The scheme is served by 4 grid powered boreholes with a central sump where basic chlorination treatment. At the time of take over the scheme had 320 paid up applications for service connection.

Table 23: Scheme specific facts – Luwero

Town/RGC	Technology and age of scheme and operational status	Envisaged Umbrella intervention	Issues giving rise Capital maintenance costs
Luwero TC	Borehole with 4No. submersible pumps (4No). Grid power. Simple chlorination at sump house. Scheme design horizon 10 years. Operator: National Water and Sewerage Corporation (NWSC) Submersible pumps (4No) 13 years (2001) design horizon 15 years. Last quarter service level 92%.	None (NWSC town)	System needs expansion to meet growing demand. Operating on 18 hours of pumping regime to meet current demand with 320 outstanding applications for service connection

4.3.2.4.1 Financial viability of the scheme



	1	2	3
w ater Produced	-	-	-
Water supplied m3	157,805	74,120	108,263
Water sold / billed m3	125,493	63,758	95,558
Total Revenue 000 Ush	187,311	92,487	171,373
O&M Running cost 000 Ush	86,456	46,268	98,814
Running costs as percenatge of revenue	46	50	58
Cost funded by revenue %	217	200	173

Figure 5: Key data from 2010/11 to 2012/13 for Luwero

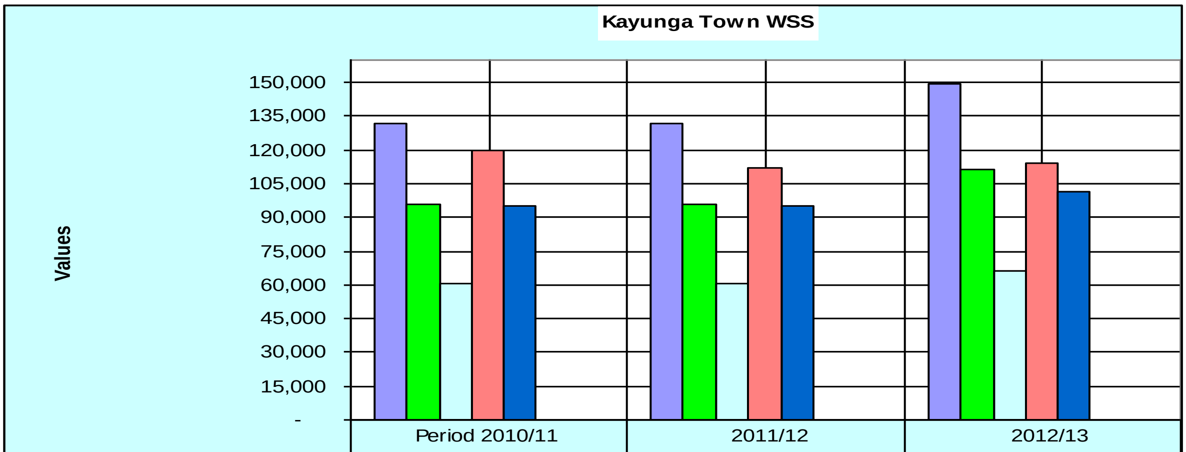
This scheme has been handed over to NWSC in the recent past. However the data reflects the operational status of the scheme prior to NWSC takeover.

4.3.2.5. Kayunga (ST)

Table 24: Scheme specific facts – Kayunga

Town/RGC	Technology and age of scheme and operational status	Envisaged Umbrella intervention	Issues giving rise Capital maintenance costs
Kayunga TC	Sub surface grid power abstraction, Full treatment plant with aeration, sand filters and chemical treatment; Commissioned in 2002); Design horizon 10 years operated by PO management contract; Design capacity 350 m³/day with Sub surface abstraction, 12 years (2002) design horizon 15 years 89% metered connections (achieved with help of UO), operated by PO management contract at 80% revenue collection basis. Last quarter service level 53%, water rationing experienced.	NRW 35%. Dysfunctional rapid filters, one pump out of function, treatment plant inadequate to meet current demand, no bulk meters at reservoirs, parts of transmission line submerged under wetland hence difficulty in detection of leaks , inadequate reservoir capacity (185CuM0, requires continuous pumping (relatively high energy costs) insufficient pressure to some water supply areas limits scope for extension).	No preventive maintenance plan for network assets available, Distribution; Static plant maintenance and repair maintenance reactive and driven by network and electromechanical failures Bulk meters not functional Current capacity 136% above design capacity.

4.3.2.5.1 Financial viability of the scheme (Kayunga)



	Period 2010/11	2011/12	2012/13
w ater Produced	132,050	132,050	149,112
Water supplied	95,870	95,870	111,315
Water sold / billed	60,529	60,529	66,230
Total Revenue	120,152	112,094	113,974
O&M Running cost	95,470	95,470	101,574
Running costs as percenatge of revenue	-	85	89
Cost funded by revenue	0	117	112

Figure 6: Key data from 2010/11 to 2012/13 for Kayunga

The graph above shows a comparison of parameters from raw data generated from the field study. Note that data reported for the periods 2011/12 and 2012/13 appears to be similar data. These figures will be cross checked with quarterly reports submitted to MWE, and cleaned up if need be.

Figure above does show trends in all measured parameters, however, it does not seem so logical when you analyze water produced and water supplied for 2010/11 1nd 2011/12 respectively. The apparent consistency in figures for water produced and water supplied. This is attributed to failure of bulk meters which would imply that data provided for water production and water supplied are based on the operators' estimates and cannot be entirely relied on for computing real costs.

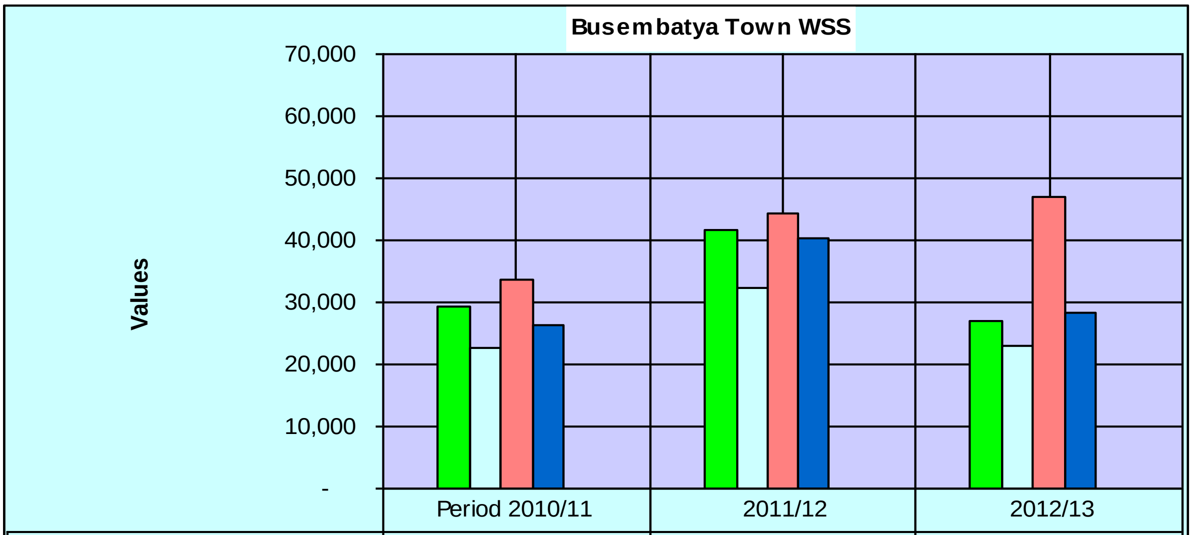
4.3.2.6. Busembatya (ST)

The scheme is operating under the PO under OBA model with a fairly with an accountable WSSB. The scheme has sufficient capacity to meet and exceed the current demand.

Table 25: Scheme specific facts – Busembatya

Town/RGC	Technology and age of scheme and operational status	Envisaged Umbrella intervention	Issues giving rise Capital maintenance costs
Busembatya	Borehole abstraction with submersible pump, No treatment. Commissioned in 2002 Design horizon 10 years operated by PO. management contract . The scheme has not got transmission mains and therefore does not suffer transmission losses.	No bulk meters.	No preventive maintenance plan for network assets available,

4.3.2.6.1 Financial viability of the scheme



	Period 2010/11	2011/12	2012/13
w ater Produced m3	-	-	-
Water supplied m3	29,168	41,725	27,048
Water sold / billed m3	22,729	32,476	23,131
Total Revenue 000 Ush	33,681	44,231	46,881
O&M Running cost 000 Ush	26,414	40,407	28,214
Running costs as percenatge of revenue	78	91	60
Cost funded by revenue %	128	109	166

Figure 7: Key data from 2010/11 to 2012/13 for Busembatya

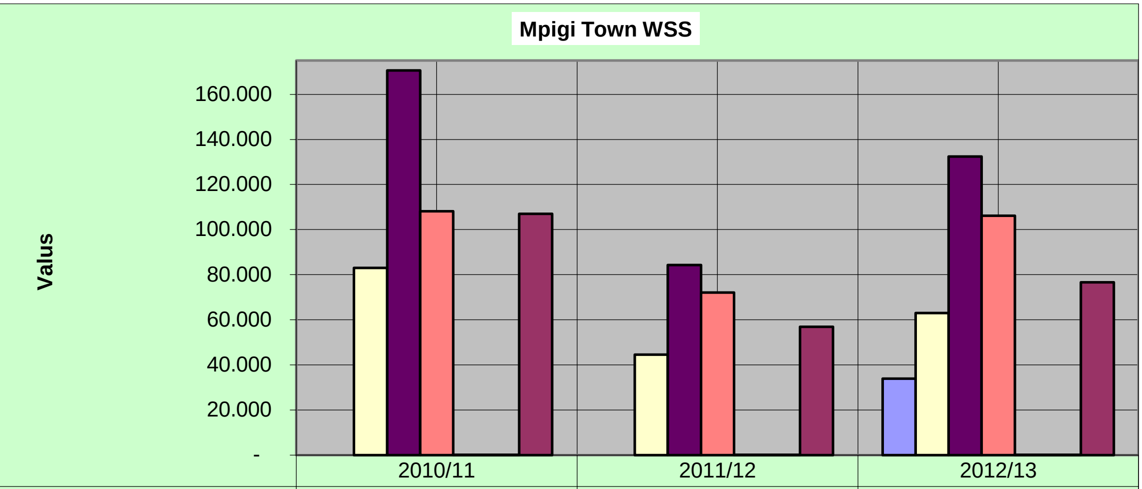
The spike in capital investment in 2010/11 arose out of the tail end of the system refurbishment under OBA grant mechanisms. There was no data for water produced. However the scheme does not experience any transmission losses and data for water produced and supplied is the same.

4.3.2.7. Mpigi (ST)

Table 26: Scheme specific facts – Mpigi

Town/RGC	Technology and age of scheme and operational status	Envisaged Umbrella intervention	Issues giving rise Capital maintenance costs
Mpigi	Sub surface grid power abstraction, Full treatment plant with Alum, Chlorine, sodium chloride and soda ash. Commissioned in 2008. Design horizon 10 years and refurbished 2011/12 under OBA. operated by a Private Water Operator under a management contract	Design inadequate to meet current demand, inadequate reservoir capacity (185Cu), requires continuous pumping (relatively high energy costs) insufficient pressure to some water supply areas limited scope for extension). No bulk meters at reservoirs, pipe bursts	Insufficient installed static plant and reservoirs requires continuous 18 hours per day pumping; high energy and water treatment cost; Pump efficiency to reduce energy costs; Joints failures regular common.

4.3.2.7.1 Financial viability of the scheme



	2010/11	2011/12	2012/13
water Produced	-	-	33.857
Water sold / billed	83.076	44.553	63.034
Total Revenue	170.558	84.257	132.456
O&M Running cost	108.208	72.017	106.086
Running costs as percenatge of revenue	63	85	80
Cost funded by revenue	158	117	125
Water supplied	107.067	56.921	76.694

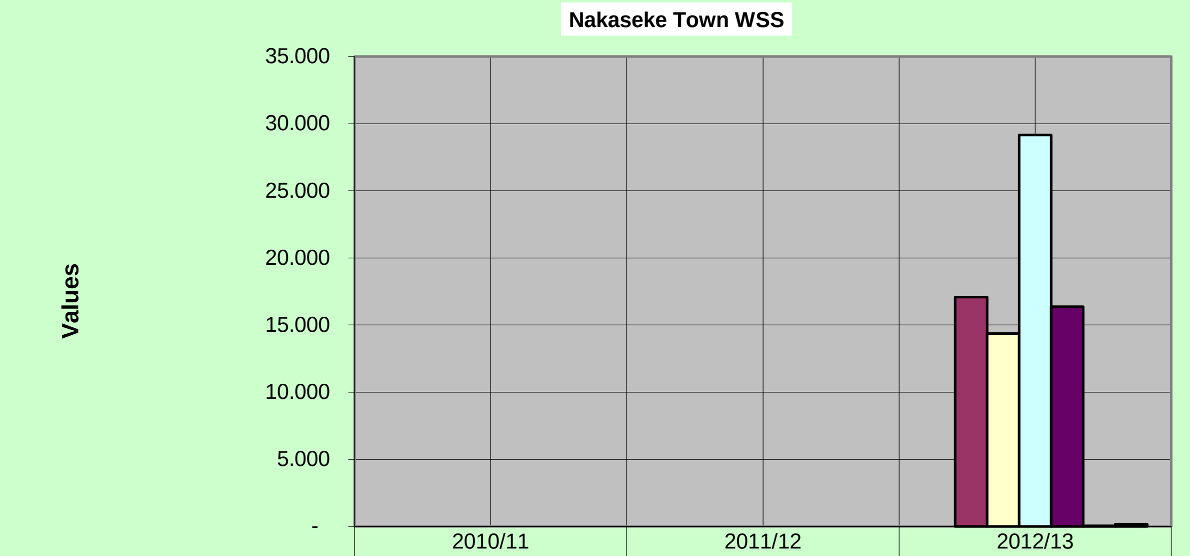
Figure 8: Key data from 2010/11 to 2012/13 for Mpigi

4.3.2.8. Nakaseke

Table 27: Scheme specific facts – Nakaseke

Town/RGC	Technology and age of scheme and operational status	Envisaged Umbrella intervention	Issues giving rise Capital maintenance costs
Nakaseke RGC	Borehole source with grid power pumping, submersible 3 no. pumps. Design capacity 200m³/day, 100% metered connections. Operated under scheme operator model on a 40% revenue collection fee basis. No water treatment. Collection efficiency 98%, Commissioned 2012 (2years old). Operated by scheme operator on a 40% revenue collection basis. Service level 92%	Operating on a two pumps at time of study the third submersible pump had collapsed into production well and needs removal. Replacement of circuit breakers and relays. High reliance on Central umbrella for technical support including minor repairs	Current revenue collections from scheme inadequate to meet capital maintenance costs on sustainable basis No preventive maintenance plan for network assets available, O&M at 138% above planned budget.

4.3.2.8.1 Financial viability of the scheme



	2010/11	2011/12	2012/13
water Produced	-	-	
Water supplied	-	-	17.077
Water sold / billed	-	-	14.369
Total Revenue	-	-	29.168
O&M Running cost	-	-	16.373
Running costs as percenatge of revenue	-	-	56
Cost funded by revenue	0	0	178

Figure 9: Key data from 2010/11 to 2012/13 for Nakaseke

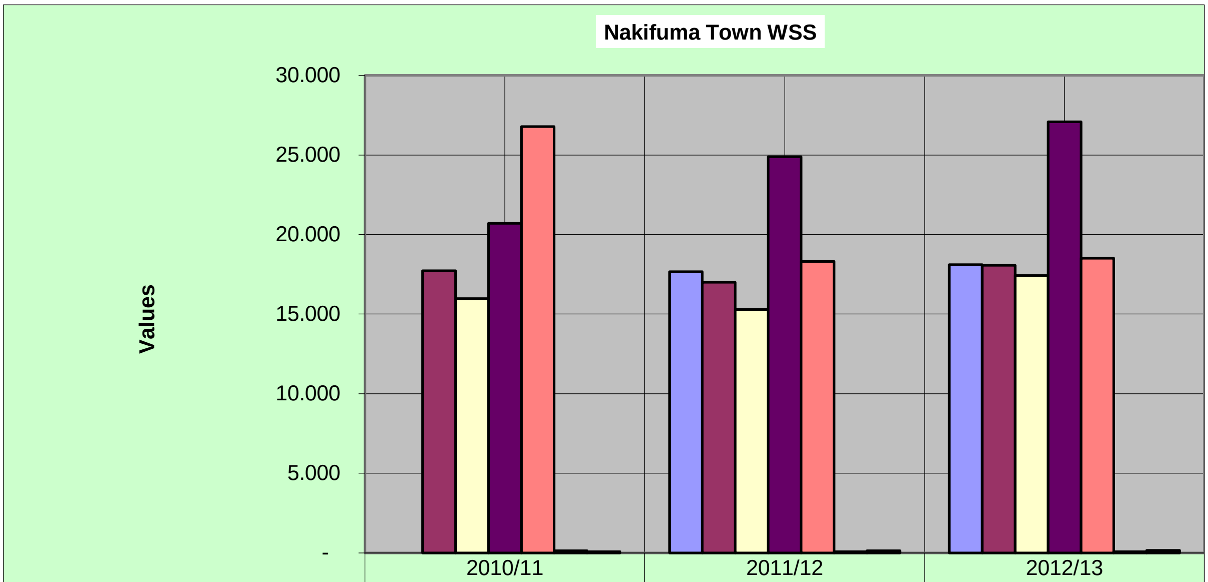
4.3.2.9. Nakifuma (RGC)

The scheme is operating under the PO model with a fairly knowledgeable WSSB. However the scheme suffers capacity shortfalls particularly during the dry season with service levels declining to below 40%. Water rationing regime implemented on a daily basis. Some areas in the water supply area do not receive water due to inadequate pressure.

Table 28: Scheme specific facts – Nakifuma

Town/RGC	Technology and age of scheme and operational status	Envisaged Umbrella intervention	Issues giving rise Capital maintenance costs
Nakifuma	Borehole with grid power pumping. No water treatment; Scheme under PO model. Capacity shortfalls during dry season.	Insuffient water yield from existing water source; Investigate status of second water source;	No capacity to fund capital maintenance; No prevententive maintenance schedule for network assets

4.3.2.9.1 Financial viability of the scheme



	2010/11	2011/12	2012/13
water Produced	-	17.668	18.117
Water supplied	17.727	17.009	18.064
Water sold / billed	15.980	15.291	17.423
Total Revenue	20.712	24.882	27.080
O&M Running cost	26.783	18.317	18.516
Running costs as percenatge of revenue	129	74	68
Cost funded by revenue	77	136	146

Figure 10: Key data from 2010/11 to 2012/13 for Nakifuma

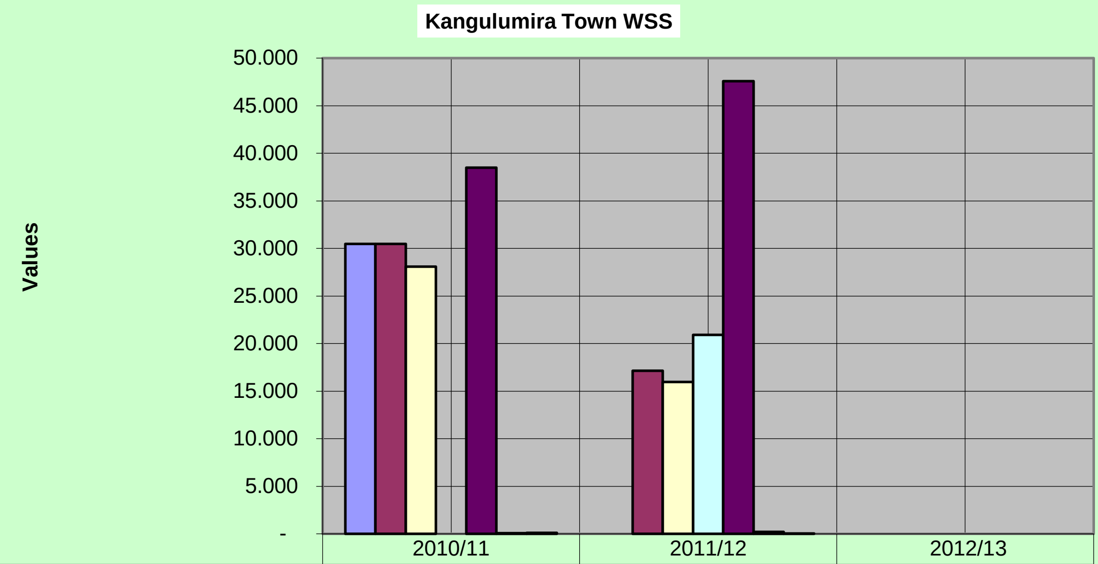
4.3.2.10. Kagulumira (RGC)

Kangulumira Water supply scheme is currently under SO model. However, the mechanism under which the SO is engaged is not clear. There is significant interference into the activities of the scheme by the council to the exclusion of the WSSB.

Table 29: Scheme specific facts – Kagulumira

Town/RGC	Technology and age of scheme and operational status	Envisaged Umbrella intervention	Issues giving rise Capital maintenance costs
Kagulumira	Borehole with grid power pumping; No water treatment; Scheme under Scheme operator	Support procurement of scheme operator; Train WSSB; Guide and sensitise technocrats and political leaders on sector regulations	No capacity to fund capital maintenance; No preventive maintenance schedule

4.3.2.10.1 Financial viability of the scheme



	2010/11	2011/12	2012/13
water Produced	30.487	-	-
Water supplied	30.487	17.153	-
Water sold / billed	28.104	15.969	
Total Revenue	-	20.920	-
O&M Running cost	38.504	47.589	-
Running costs as percenatge of revenue	82	227	-
Cost funded by revenue	122	44	0

Figure 11: Key data from 2010/11 to 2012/13 for Kangulumira

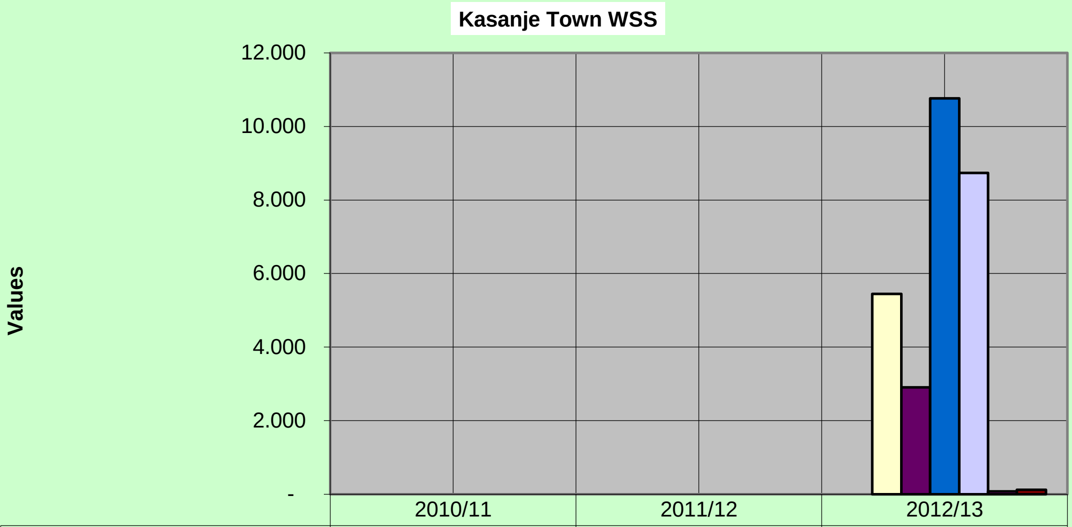
4.3.2.11. Kasanje (RGC)

Relatively new scheme constructed under supervision of WSDF Central and commissioned in July 2013.

Table 30: Scheme specific facts – Kasanje

Town/RGC	Technology and age of scheme and operational status	Envisaged Umbrella intervention	Issues giving rise Capital maintenance costs
Kasanje	Borehole with grid power pumping; Simple chrolination (although dozer none functional); Comissioned in 2013; Scheme under Scheme Operator (SO)	Leaks in joints and 47% NRW; WSSB needs capacity development; Pump repairs; Repair of chlorine doser Training for SO and pump attendants in O&M of scheme	Limited technical capacity of the SO; Suspected poor quality construction materials used for transmission and distribution mains; No capacity to fund capital maintenance; No prevententive maintenance schedule

4.3.2.11.1 Financial viability of the scheme



	2010/11	2011/12	2012/13
water Produced	-	-	-
Water supplied	-	-	5.445
Water sold / billed	-	-	2.904
Total Revenue	-	-	10.767
O&M Running cost	-	-	8.738
Running costs as percenatge of revenue	-	-	81
Cost funded by revenue	0	0	123

Figure 12: Key data from 2010/11 to 2012/13 for Kasanje

Being a new scheme, the figure above is based on a record of 3 quarterly reports submitted to UO. However, it can be observed that operational costs of the scheme are high at 81% relative to the revenue with the proportion of cost funded by revenue of 123%. This can be attributed to the contribution of cost of NRW to the overall O&M costs.

5. DISCUSSION OF THE RESULTS

5.1. CAPITAL EXPENDITURES OF THE SCHEMES

In the context of this study the capital expenditures (CapEx) relate to network extensions, asset renewals and major repairs. Previously performed with grant assistance, a review of 3 year performance reports from MWE shows that these critical aspects of system efficiency and sustainability have been ignored. Figure 13 illustrates the expenditure of schemes. It is noticeable that capital expenditure remains low relative to O&M costs.

5.2. SPECIFIC O&M AND CAPITAL MAINTENANCE COSTS

The derived results show that there is significant variability in the O&M costs which can be attributed to a number of factors including the efficiency of individual operators, oversight capacity of WSSBs, relative age of the scheme, design issues and water supply technology in use.

Figure 13 shows O&M and capital expenditure of the schemes. It can be seen that capital expenditure in all schemes is insignificant in comparison to O&M costs. Variability in the O&M costs can be attributed to a number of factors including the efficiency of individual operators, oversight capacity of WSSBs, relative age of the scheme, design issues and water supply technology in use. Annual energy cost and cost of water treatment are the highest cost contributors to grid powered schemes with fully fledged water treatment plants. In both of these cases (Kayunga, Mpigi) energy costs contributed about 30% of the cost of O&M, while water treatment accounted for 35% of the overall O&M costs in schemes with conventional water treatment.

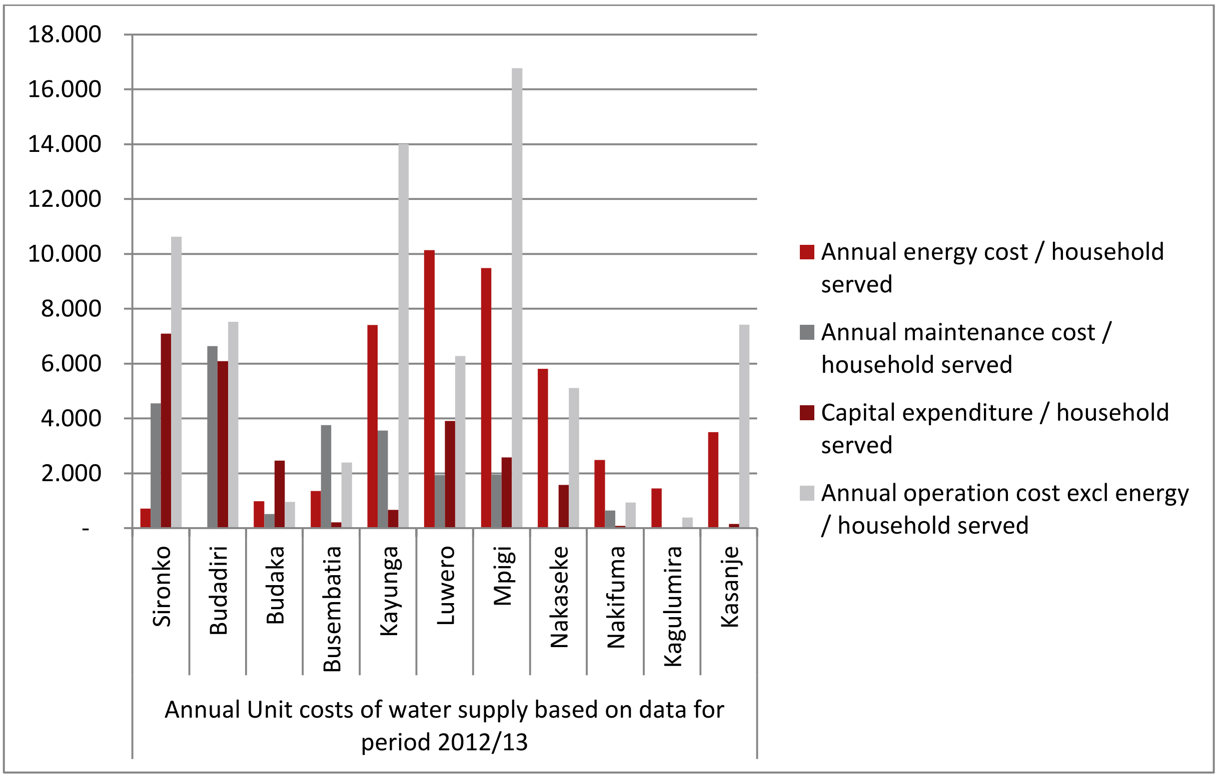


Figure 13: Annual O&M Costs

Table 31 indicates that the highest proportion of cost of water supply is contributed by operational costs with energy costs contributing about half of the overall operating cost. Schemes with convetional treatment costs also on average spent 53% of annual operational costs on water treatment. High operational costs for Mpigi, Kayunga and Sironko are largely influenced by the cost of water treatment. And although Luwero had relatively high operating cost, the cost is contributed largely by energy costs.

Table 31: Annual Unit costs of water supply based on data for period 2012/13

	Sironko	Budadiri	Budaka	Busembatia	Kayunga	Luwero	Mpigi	Nakaseke	Nakifuma	Kagulumira	Kasanje
Annual energy cost / HH served	717	-	983	1,356	7,412	10,138	9,483	5,810	2,485	1,454	3,500
Annual maintenance cost / HH	4,546	6,638	512	3,752	3,557	1,935	1,951	-	642	-	
Capital expenditure /HH served	7,089	6,095	2,459	214	670	3,906	2,585	1,578	80	-	150
Annual operation cost excl energy / HH	10,621	7,520	960	2,395	14,005	6,280	16,766	5,105	935	388	7,422
Total	**22,973**	**20,253**	**4,914**	**7,717**	**25,644**	**22,259**	**30,785**	**12,493**	**4,142**	**1,842**	**11,072**

5.3. QUALITY OF MATERIAL AND QUALITY OF WORKMANSHIP

Although difficult to determine, it was confirmed that quality of materials and workmanship have a significant impact on O&M and capital investment costs of a scheme. For example, Kasanje water supply scheme was commissioned in 2013 but has had serious O&M cost escalations arising from transmission and distribution mains leaks (which can be related only to either poor quality of materials or poor quality of workmanship and construction supervision).

With NRW% at 40% in the new scheme the WSSB has been forced to unilaterally increase tariff to Ush 4000/m³ to cover operational costs. The tariff has acted as a deterrent for new connections raising concerns about the financial sustainability of the scheme as economies of scale cannot be achieved.

These findings correspond to the findings as presented by (Leroch, Katukiza, & Isagara, 2012). Please refer also to (Whinnery, 2012) for further reference.

5.4. QUALITY OF O&M AND O&M SUPPORT

Support provided by UO and WSDF is highly appreciated by water authorities of RGCs but not entirely appreciated by water authorities of STs with POs. Not withstanding previous grant accountability shortfalls, STs were accustomed to recieving and expending conditional grants for O&M and capital investment directly from MWE. The UO model thus deprives such water authorities of O&M subsidy and CAPEX buffer funds and particularly for WAs that had routinely flouted guidelines for conditional grant utilisation.

Further, the existing O&M support structures are generally perceived by WAs to be inadequate owing to the needs of a large number of schemes and wide geographical area of UO coverage. Wide dispersion of schemes over large geographical area of coverage imposes significant logistical, financial and administrative constraints UOs. Currently 20% of the UO budget is spent on responding to out of budgeted technical emergences of member schemes, with 60% spent on staff costs and administrative overheads and only 20% on actions based on workplans. Incosistency in scheduling of capital maintenance grant releases from MWE to UO in part explains expenditure mismatch between emergencies, planned actions and staff and logistical costs. Often grant relases are not based on budget requests by UOs but rather on available funds from MWE. Realises are routinely inadequate to cover UO budgets for planned actions.

5.5. FINANCIAL VIABILITY OF SCHEMES

The financial viability of the investigated schemes is impacted mainly by the cost structure of the schemes. On average the schemes included in the study were able to cover O&M costs of 157%. Based on data for 2012/13 Budadiri recorded best indicators for viability although collection efficiency remained low in comparison to towns with higher collection efficiency.

NRW is an important factor as it has an adverse effect on the cost of water supply and financial viability of the scheme. Schemes with high NRW also had a lower proportion of O&M covered by tariff. Figure 14 demonstrates that Kayunga, Budaka and Kasanje recorded relatively higher NRW% and a significantly higher operational costs. Where such performance leads to a decline in level of service, it could influence the willingness of customers to pay for water usage as the case of Budaka demonstrates. Unreliable service impairs consumption, restrains revenue growth and results in low capital utilisation consequently and failure of the scheme to achieve economies of scale.

Figure 14 shows key percentage indicators for all 11 investigated schemes: collection efficiency, NRW, percentage of energy cost compared to total O&M cost, percentage of O&M covered by tariff.

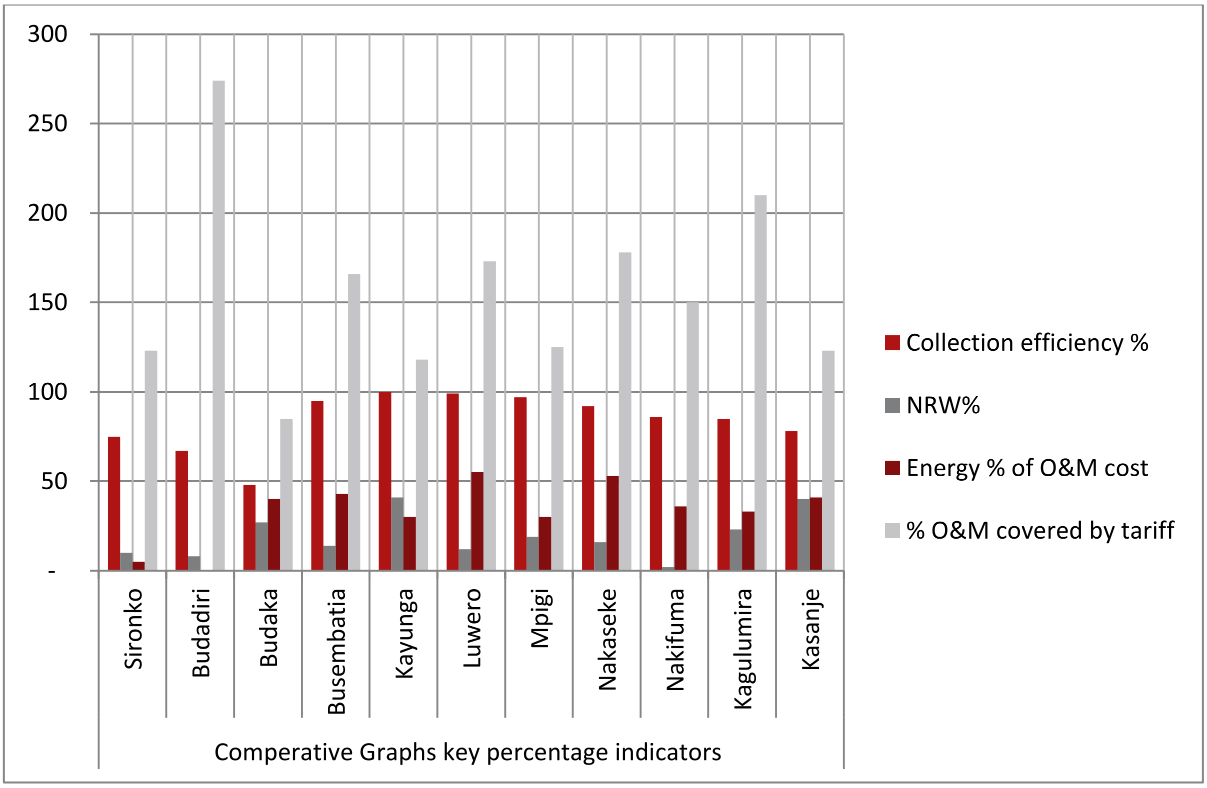


Figure 14: Key percentage indicators

5.5.1. Allocation of O&M costs

With the exception of one town, all schemes covered in the study were able to meet their O&M costs from the existing tariff at an average level of 157%. In WAs where a PO is contracted under a management contract, O&M costs are embedded in the operators' fees. It was found that costs covered under the management contracts are not always disaggregated except for energy costs, staff costs and costs of water treatment. In overall terms, the management fees of the operators (in which the O&M costs are included) accounted for 86.5% of the of expenditure from revenue collections, while board fees and capital investment accounted for 6.83% and 6.66%, respectively.

Table 32 shows revenue and expenditure for 2012/13 financial of schemes covered in the study.

Table 32: revenues and expenditures of schemes covered in the study for 2012/13

Scheme	Annual Revenue	Management Fees	Board Allowances	Investment Account
Sironko	50,460,320	40,368,256	2,523,016	7,569,048
Budadiri	25,643,000	17,950,100	1,282,150	6,410,750
Busembatya	46,881,000	44,536,950	2,344,050	0
Budaka	55,390,000	47,081,500	2,769,500	5,539,000
Kayunga	113,974,523	96,878,344	5,698,726	11,397,452
Luwero	171,373,373	162,804,704	8,568,668	0
Mpigi	136,887,200	123,198,480	6,844,360	6,844,360
Kasanje	3,678,000	1,103,400	2,206,800	367,800
Nakifuma	13,371,200	10,429,536	668,560	2,273,104
Kangulumira	12,840,000	5,136,000	6,420,000	1,284,000
Nakaseke	8,716,400	3,486,560	4,358,200	871,640
Totals	**639,215,016**	**552,973,830**	**43,684,030**	**42,557,154**
Percentage		**86.51**	**6.83**	**6.66**

The management fees shown in Table 32 depend on the type of management contracts subsisting in individual schemes. While schemes with POs are on average charging management fees at 80% of revenue, towns under OBA are charging management fees in the range of 90 – 95%. The third category of management contracts are those implemented by RGCs managed under individual scheme operator model where operator's fees range from 30% to 40% of revenue.

Under the RGC arrangement, WAs/WSSBs are involved in routine monitoring of the scheme's operations and often constitute monthly meetings to review operators' reports and appropriate funds to O&M requirements. The peculiar feature of the RGC model is that WAs/WSSBs convene monthly meetings resulting in annual claims for transport and sitting allowances in the region of 20-25% of annual revenue of a scheme thus additing to the overall cost water supply.

Figure 15 illustrates the variability of operational costs for the schemes covered in the study. It also shows that cost structure for individual schemes is influenced by a number of factors but primarily, the water supply technology and energy source. Kayunga and Mpigi water supply schemes are powered by grid power and are designed with fully fledged conventional water treatment plants. Water treatment requirements add another cost component which simple borehole based water supply systems do not incur. The lowest operational costs by contrast were found in schemes relying on gravity flow systems. However, water treatment costs still constitute a significant proportion to the O&M costs.

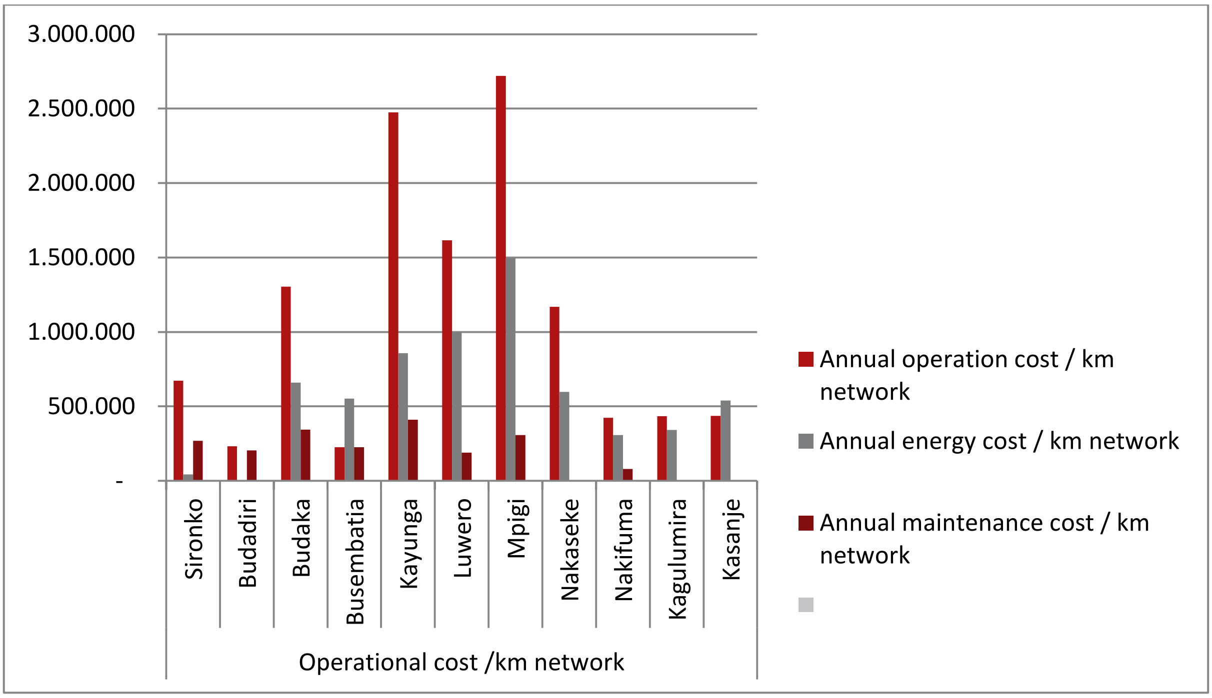


Figure 15: variability of operational costs

Real cost of water supply is also influenced by O&M capability of a WA more specifically in regard to asset management and use. In this study, it was evident that WSSBs do not engage POs in detailed planning of operation and maintenance work plans. None of the WAs covered in the study for instance had an annual planned preventive maintenance schedule for major network assets much as operators reported that maintenance was routinely being done. Considering the general ineptness of WSSBs and inadequacy of quarterly reports, it was difficult for the study to establish a relationship between cost arising out of good or poor O&M and how that impacts capital maintenance costs of individual schemes.

5.5.2. Private Operators

Private Operators are engaged by WAs/WSSB through management contracts and are currently running 60 schemes across the country. Under the current contracts arrangements, POs are supervised by WSSBs and are concerned with daily operation and maintenance of schemes at a fee financed exclusively through tariff. While there is evidence that some schemes are effectively overseen by WSSBs, this is not always the case as some of boards have only limited understanding of their oversight mandate. As a result, the oversight role of the WSSBs has in some towns largely remained ineffective leaving POs to run business without effective oversight.

Through their association, POs have made effort in collaboration with sector partners to improve the member companies' performance through capacity building programmes. Programme interventions include training in reduction of NRW, water integrity and sanitation marketing. The association is also supporting initiatives in Water Asset management in Northern Uganda.

In spite of this, cost structure of POs is perceived by WAs and other sector stakeholders as imposing a significant cost on the overall cost of water supply. Increasingly a number of WAs are opting to use individual Scheme Operators. SOs are generally thought to cost less with average management fees in the region of 35-40% of revenue.

Although this seems cheaper, it is not clear if there are ample safeguards under the SO model in RGCs to ensure that revenue collections are not misappropriated. In this study, there were indications that individual technocrats in Sub Counties where RGCs are anchored were interfering with operations of WSSBs. In another case, the board meets once a month and each member collects a sitting allowance of Ush 50,000 for each sitting. In either situation, the motivation is to get access to money generated by the schemes.

6. SUMMARY AND CONCLUSIONS

Referring to Chapter 2.3 it is worth mentioning once more that also in the South-Western Towns - Review of the Results and Sustainability of Water and Sanitation Interventions Since 1996 (conducted by Seidelmann 2013) similar results were found:

Seidelmann (2013) found out that 79% of the SWTWS schemes had a revenue exceeding 120% of the regular O&M costs. However, the situation varied significantly as shown in Figure 1. In 50% of the towns (19 of the 38 SWTWS towns for which financial data were available) revenue exceeded 200% of the direct O&M costs. Direct O&M costs as defined in this subject study include staff, energy, administrative costs and the Umbrella contribution but not depreciation or major repairs.

Referring to Guiding Question 3 as given in the ToR "How does quality of material and quality of workmanship influence these specific costs (IC, O&M C and CapMC)?" it is worth referring once more to Chapter 2 – Literature Review, in particular to the study conducted by (Whinnery, 2012) who demonstrated the costs incurred in the case of poor workmanship, construction or maintenance practices, using a Kenyan water supply project as a case study. (Whinnery, 2012) could show that decreased or absent Operational & Maintenance funds and poor inferior construction practices lead to greatly depleted project value. While the possibility to investigate the quality of material and workmanship of the investigated schemes was very limited, the observations made in the course of this study point in the same direction.

As already mentioned in Chapter 4.1, all 11 schemes visited were operational and each of them seemed to be operating well with either a private water operator or a scheme operator with reasonable revenue collection from water users. However, it is worth being emphasized that performance parameters with implication to O&M and requirement for capital maintenance costs (and support) varied widely from scheme to scheme even within similar water supply technology and operational characteristics.

The study found that all schemes were not able to enforce oversight mandate over the management and operation of schemes in accordance with terms of their performance contracts with MWE. The term of office of WSSB is 5 years and old boards that were oriented to the requirements have all expired – giving way to appointment of new boards whose members do not understand their mandate.

During the field visit only 3 schemes (Sironko, Kayunga, and Nakaseke) reported that they were regularly conducting board meetings. Even then, the boards did not exhibit knowledge of their oversight mandate, leaving room for the operators to more or less 'self regulate' their activities. This situation is exacerbated by the fact that most often board members are not adequately oriented and do not measure to the task. In some cases, members of the board were found to be semi illiterate.

In 6 out of the 10 schemes covered in the study (excluding Luwero which is under NWSC) escrow accounts for investment and capital maintenance were depleted leaving schemes at a risk of break downs for want of essential spare parts. A non functioning WSSB leads to poor performance of management contracts and gives room to unscrupulous operators to neglect their obligations and lay emphasis more on operation and revenue collection to the detriment of scheme maintenance.

As discussed in Chapter 5.5.1, the cost structure of POs is perceived by WAs and other sector stakeholders as imposing a significant cost on the overall cost of water supply. Increasingly a number of WAs are opting to use individual Scheme Operators. SOs are generally thought to cost less with average management fees in the region of 35-40% of revenue. Although this seems cheaper, it is not clear if there are ample safeguards under the SO model in RGCs to ensure that revenue collections are not misappropriated. In this study, there were indications that technocrats in Sub Counties where RGCs are anchored were interfering with operations of WSSBs. In another case, the board meets once a month and each member collects a sitting allowance of Ush 50,000 for each sitting. In either situation, the motivation is to get access to money generated by the schemes.

7. OUTLOOK

Reflecting on the ToR, the results of this study are yet to be interpreted towards the "expected output" of this study. The issues are yet to be substantiated:

- Transparent Delineation of all Relevant O&M and Capital Maintenance Costs in Relation to the Investment Costs
- Description of a Realistic and Effective Arrangement for Division of Tasks/ Cost Between O&M at Scheme Level and the O&M Support Implemented by the Umbrella Organisations
- Preparation of a Rationale for Development of a Sound Finance Management Strategy for ST and RGC Water Supply.
- Preparation of a Rationale for Development of a Sound Finance Management Strategy Covering Direct O&M Funded by Tariffs and O&M Support

Respective propositions will be drafted and submitted to the Client/Stakeholders in a timely manner before the scheduled stakeholder workshop in order to provide a basis for discussion.

7.1. FURTHER STEPS

The foreseen schedule for the next steps until the completion of the study is displayed in Table 33.

Table 33: Schedule for project implementation

28 April 2014	Reception of Client’s comments
30 April 2014	Half-day workshop with key stakeholders for presentation of results and discussion of comments on Wednesday
6 May2014	Submission of Final Report

ANNEX 1 – DETAILED RESULTS

A.1 SIRONKO (ST)

A1.1 Water production of Scheme

Table 34: Annual water production of Sironko

	Value for FY2010/11	Value for FY2011/12	Value for FY2012/13	Value for FY2013/14
Water supplied	46,803	44,305	44,108	20,827
Water sold	41,266	39,403	39,715	18,773
Water produced	50,332	44,305	44,108	20,827
Water supplied / Water produced	92.99%	100.00%	100.00%	100.00%
Water sold / Water supplied	88.17%	88.94%	90.04%	90.14%

Table 35: Monthly water production of Sironko in the 2010/2011 financial year

	2010 July	2010 August	2010 Sept.	2010 Oct.	2010 Nov.	2010 Dec.	2011 Jan.	2011 Feb	2011 March	2011 April	2011 May	2011 June	Value for FY
Water supplied	3,297	4,230	4,270	3,812	2,732	3,841	4,696	4,865	4,255	3,581	3,780	3,444	46,803
Water sold	3,162	3,106	3,264	3,431	2,354	3,524	4,348	4,427	3,787	3,259	3,401	3,203	41,266
Water produced	3,532	5,795	4,484	4,003	2,869	4,033	4,696	5,108	4,468	3,760	3,969	3,616	50,332
Water supplied / Water produced	93.35%	73.00%	95.24%	95.24%	95.22%	95.24%	100.00%	95.24%	95.23%	95.24%	95.24%	95.24%	92.99%
Water sold / Water supplied	95.91%	73.43%	76.44%	90.01%	86.16%	91.75%	92.59%	91.00%	89.00%	91.01%	89.97%	93.00%	88.17%

Table 36: Monthly water production of Sironko in the 2011/2012 financial year

	2011 July	2011 August	2011 Sept.	2011 Oct.	2011 Nov.	2011 Dec.	2012 Jan.	2012 Feb	2012 March	2012 April	2012 May	2012 June	Value for FY
Water supplied	2,982	3,932	3,221	2,214	3,221	3,530	4,236	4,930	4,342	3,853	4,002	3,842	44,305
Water sold	2,558	3,341	2,867	1,943	2,770	3,241	3,866	4,328	3,977	3,451	3,666	3,395	39,403
Water produced	2,982	3,932	3,221	2,214	3,221	3,530	4,236	4,930	4,342	3,853	4,002	3,842	44,305
Water supplied / Water produced	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Water sold / Water supplied	85.78%	84.97%	89.01%	87.76%	86.00%	91.81%	91.27%	87.79%	91.59%	89.57%	91.60%	88.37%	88.94%

Table 37: Monthly water production of Sironko in the 2012/2013 financial year

	2012 July	2012 August	2012 Sept.	2012 Oct.	2012 Nov.	2012 Dec.	2013 Jan.	2013 Feb	2013 March	2013 April	2013 May	2013 June	Value for FY
Water supplied	4,002	3,206	3,432	2,864	3,498	3,864	3,512	4,621	4,157	3,431	3,720	3,801	44,108
Water sold	3,630	2,902	3,109	2,722	3,290	3,470	3,209	4,275	3,837	2,636	3,327	3,308	39,715
Water produced	4,002	3,206	3,432	2,864	3,498	3,864	3,512	4,621	4,157	3,431	3,720	3,801	44,108
Water supplied / Water produced	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Water sold / Water supplied	90.70%	90.52%	90.59%	95.04%	94.05%	89.80%	91.37%	92.51%	92.30%	76.83%	89.44%	87.03%	90.04%

Table 38: Monthly water production of Sironko in the 2013/2014 financial year

	2013 July	2013 August	2013 Sept.	2013 Oct.	2013 Nov.	2013 Dec.	2014 Jan.	2014 Feb	2014 March	2014 April	2014 May	2014 June	Value for FY
Water supplied	3,329	3,446	3,574	3,342	3,486	3,650	0	0	0	0	0	0	20,827
Water sold	3,005	3,074	3,056	3,066	3,223	3,349	0	0	0	0	0	0	18,773
Water produced	3,329	3,446	3,574	3,342	3,486	3,650	0	0	0	0	0	0	20,827
Water supplied / Water produced	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%
Water sold / Water supplied	90.27%	89.20%	85.51%	91.74%	92.46%	91.75%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	90.14%

A.1.2 Total Costs of Scheme

Table 39: Annual operation costs in Sironko

Annual operating costs ('000 shs)	FY2010/11	FY2011/12	FY2012/13	FY2013/14
Electrical energy costs during the year (G11)	1,318.53	1,297.01	1,749.65	845.00
Spending for Chlorine during the year	2,898.00	2,788.00	3,384.00	1,712.00
Spending for Alum consumed during the year	3,429.00	3,795.80	6,402.00	3,772.00
Spending for Lime during the year				
Spending for Fuel Consumption: Transport	538.00		317.00	236.00
Spending for Fuel Consumption: Machinery	157.00	426.00		
Staff cost during the year (intern. manpower G8)	10,911.70	15,427.00	15,803.00	7,456.00
Spending for Cost of Routine Service	1,406.00	1,215.00	1,023.00	601.00
Spending for Cost of Repairs during the year	1,491.00	1,301.00	1,663.00	921.00
Spending for Water Qual. Test during the year (G25)			49.50	
Other operating and fixed costs during the year (G16)	2,268.00	7,212.00	8,357.00	5,544.00
Total	24,417.23	33,461.81	38,748.15	21,087.00

Table 40: Monthly operation costs in Sironko

		2013	2013	2013	2013	2013	2013	2014	2014	2014	2014	2014	2014	Value for FY
		July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb	March	April	May	June	
Electrical energy costs during month (G11)	000USh	174	219	165	88	97	102	0	0	0	0	0	0	845
Spending for Chlorine during month	000USh	280	296	304	280	272	280	0	0	0	0	0	0	1,712
Spending for Alum consumed during month	000USh	656	696	620	640	600	560	0	0	0	0	0	0	3,772
Spending for Lime during month	000USh	0	0	0	0	0	0	0	0	0	0	0	0	0
Spending for Fuel Consumption: Transport	000USh	36	40	40	40	40	40	0	0	0	0	0	0	236
Spending for Fuel Consumption: Machinery	000USh	0	0	0	0	0	0	0	0	0	0	0	0	0
Staff cost during month (intern. manpower G8)	000USh	1,388	1,320	1,403	993	1,191	1,161	0	0	0	0	0	0	7,456
Spending for Cost of Routine Service	000USh	105	100	102	120	88	86	0	0	0	0	0	0	601
Spending for Cost of Repairs during month	000USh	176	166	220	72	147	140	0	0	0	0	0	0	921
Spending for Water Qual. Test during month (G25)	000USh	0	0	0	0	0	0	0	0	0	0	0	0	0
Other operating and fixed costs during month (G16)	000USh	0	1,066	1,042	1,173	1,123	1,140	0	0	0	0	0	0	5,544
Total operating cost	000USh	2,815	3,903	3,896	3,406	3,558	3,509	0	0	0	0	0	0	21,087

A.1.3 Specific Costs of Scheme

Table 41: Specific costs of water scheme of Sironko

General Indicators		
Indicator N°	**Indicator**	**Value**
1	Total staff	7
2	Total no of connections	818
3	Active connections	733
4	% O&M covered by tariff	123
5	Collection efficiency %	75
6	NRW	10
7	Energy % of O&M cost	5
8	Water tariff [USH/m³]	1,212
9	Management fees%	80
Specific Indicators		
Indicator N°	**Indicator**	**Value**
10	Capital expenditure / km network	420,900
11	Capital expenditure / household served	7,089
12	Total cost of operation / m³ sold	975
13	Annual operation cost / km network	672,887
14	Annual operation cost / household served	11,338
15	Annual operation cost / m³ water sold	696
16	Annual maintenance cost / km network	269,890
17	Annual maintenance cost / household served	4,546
18	Annual maintenance cost / m³ water sold	279
19	Annual capital maintenance cost / km network	-
20	Annual capital maintenance cost / household served	-
21	Annual capital maintenance cost / m³ water sold	-
22	Annual energy cost / km network	42,270
23	Annual energy cost / household served	717
24	Annual energy cost / m³ water sold	44
25	N° connections / km network	21

A.2 BUDADIRI (ST)

A.2.1 Water production of Scheme

Table 42: Annual water production of Budadiri

	Value for FY2010/11	Value for FY2011/12	Value for FY2012/13	Value for FY2013/14
Water supplied	52,624	52,343	48,979	23,754
Water sold	44,803	45,338	45,256	22,569
Water produced	89,083	63,486	55,357	25,693
Water supplied / Water produced	59.07%	82.45%	88.48%	92.45%
Water sold / Water supplied	85.14%	86.62%	92.40%	95.01%

Table 43: Monthly water production of Budadiri in the 2010/2011 financial year

	2010	2010	2010	2010	2010	2010	2011	2011	2011	2011	2011	2011	Value for FY
	July	August	Sept.	Oct.	Nov.	Dec.	January	Feb	March	April	May	June	
Water supplied	3,028	4,133	0	3,737	3,402	3,718	4,919	9,287	6,672	5,079	4,621	4,028	52,624
Water sold	2,959	3,326	0	3,130	2,379	3,581	4,619	8,077	6,398	3,993	3,154	3,187	44,803
Water produced	11,573	9,707	0	9,049	9,013	7,815	7,133	9,947	7,013	7,211	5,101	5,521	89,083
Water supplied / Water produced	26.16%	42.58%	0.00%	41.30%	37.75%	47.58%	68.96%	93.36%	95.14%	70.43%	90.59%	72.96%	59.07%
Water sold / Water supplied	97.72%	80.47%	0.00%	83.76%	69.93%	96.32%	93.90%	86.97%	95.89%	78.62%	68.25%	79.12%	85.14%

Table 44: Monthly water production of Budadiri in the 2011/2012 financial year

	2011	2011	2011	2011	2011	2011	2012	2012	2012	2012	2012	2012	Value for FY
	July	August	Sept.	Oct.	Nov.	Dec.	January	Feb	March	April	May	June	
Water supplied	3,525	3,501	3,422	4,248	4,248	5,012	5,021	5,621	4,892	3,872	4,471	4,510	52,343
Water sold	3,359	3,249	3,210	3,654	3,363	4,238	4,228	4,347	4,037	3,783	4,117	3,753	45,338
Water produced	4,519	4,021	3,681	5,689	5,689	6,581	5,671	6,048	5,981	4,021	5,651	5,934	63,486
Water supplied / Water produced	78.00%	87.07%	92.96%	74.67%	74.67%	76.16%	88.54%	92.94%	81.79%	96.29%	79.12%	76.00%	82.45%
Water sold / Water supplied	95.29%	92.80%	93.80%	86.02%	79.17%	84.56%	84.21%	77.33%	82.52%	97.70%	92.08%	83.22%	86.62%

Table 45: Monthly water production of Budadiri in the 2012/2013 financial year

	2012	2012	2012	2012	2012	2012	2013	2013	2013	2013	2013	2013	Value for FY
	July	August	Sept.	Oct.	Nov.	Dec.	January	Feb	March	April	May	June	
Water supplied	0	4,812	4,672	3,406	3,721	5,679	3,823	5,643	3,761	4,924	3,124	5,414	48,979
Water sold	0	4,152	4,434	2,956	3,467	5,238	3,663	5,532	3,331	4,637	2,734	5,112	45,256
Water produced	0	5,614	5,013	5,013	5,013	6,412	4,391	5,932	4,012	5,154	3,124	5,679	55,357
Water supplied / Water produced	0.00%	85.71%	93.20%	67.94%	74.23%	88.57%	87.06%	95.13%	93.74%	95.54%	100.00%	95.33%	88.48%
Water sold / Water supplied	0.00%	86.28%	94.91%	86.79%	93.17%	92.23%	95.81%	98.03%	88.57%	94.17%	87.52%	94.42%	92.40%

Table 46: Monthly water production of Budadiri in the 2013/2014 financial year

	2013	2013	2013	2013	2013	2013	2014	2014	2014	2014	2014	2014	Value for FY
	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb	March	April	May	June	
Water supplied	5,012	4,994	2,214	3,012	3,941	4,581	0	0	0	0	0	0	23,754
Water sold	4,850	4,850	1,865	2,934	3,633	4,437	0	0	0	0	0	0	22,569
Water produced	5,421	5,204	2,574	3,242	4,231	5,021	0	0	0	0	0	0	25,693
Water supplied / Water produced	92.46%	95.96%	86.01%	92.91%	93.15%	91.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	92.45%
Water sold / Water supplied	96.77%	97.12%	84.24%	97.41%	92.18%	96.86%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	95.01%

A.2.2 Total Costs of Scheme

Table 47: Annual operation costs in Budadiri

Annual operating costs ('000 shs)	FY2010/11	FY2011/12	FY2012/13	FY2013/14
Electrical energy costs during the year (G11)				
Spending for Chlorine during the year				
Spending for Alum consumed during the year				
Spending for Lime during the year				
Spending for Fuel Consumption: Transport	90			
Spending for Fuel Consumption: Machinery				
Staff cost during the year (intern. manpower G8)	11,618	14,090	8,769	5,485
Spending for Cost of Routine Service	967	917	1,051	695
Spending for Cost of Repairs during the year	1,033	509	528	346
Spending for Water Qual. Test during the year (G25)				
Other operating and fixed costs during the year (G16)	1,120	3,936	6,161	4,344
Total	14,827.9	19,452.0	16,509.0	10,870.0

Table 48: Monthly operation costs in Budadiri

		2013	2013	2013	2013	2013	2013	2014	2014	2014	2014	2014	2014	Value for FY
		July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb	March	April	May	June	
Electrical energy costs during month (G11)	000USh	0	0	0	0	0	0	0	0	0	0	0	0	0
Spending for Chlorine during month	000USh	0	0	0	0	0	0	0	0	0	0	0	0	0
Spending for Alum consumed during month	000USh	0	0	0	0	0	0	0	0	0	0	0	0	0
Spending for Lime during month	000USh	0	0	0	0	0	0	0	0	0	0	0	0	0
Spending for Fuel Consumption: Transport	000USh	0	0	0	0	0	0	0	0	0	0	0	0	0
Spending for Fuel Consumption: Machinery	000USh	0	0	0	0	0	0	0	0	0	0	0	0	0
Staff cost during month (intern. manpower G8)	000USh	670	728	894	853	477	615	613	1,339	671	813	537	559	8,769
Spending for Cost of Routine Service	000USh	60	60	88	89	60	77	76	185	93	103	83	77	1,051
Spending for Cost of Repairs during month	000USh	30	30	44	44	30	39	38	92	46	55	41	39	528
Spending for Water Qual. Test during month (G25)	000USh	0	0	0	0	0	0	0	0	0	0	0	0	0
Other operating and fixed costs during month (G16)	000USh	413	641	389	383	432	372	577	600	573	541	593	647	6,161
Total operating cost	000USh	1,173	1,459	1,415	1,369	999	1,103	1,304	2,216	1,383	1,512	1,254	1,322	16,509

A.2.3 Specific Costs of Scheme

Table 49: Specific costs of water scheme of Budadiri

General Indicators		
Indicator N°	**Indicator**	**Value**
1	Total staff	7
2	Total no of connections	768
3	Active connections	567
4	% O&M covered by tariff	274
5	Collection efficiency %	67
6	NRW	8
7	Energy % of O&M cost	-
8	Water tariff [USH/m³]	816
9	Management fees%	70
Specific Indicators		
Indicator N°	**Indicator**	**Value**
10	Capital expenditure / km network	187,520
11	Capital expenditure / household served	6,095
12	Total cost of operation / m³ sold	850
13	Annual operation cost / km network	231,372
14	Annual operation cost / household served	7,520
15	Annual operation cost / m³ water sold	193
16	Annual maintenance cost / km network	204,221
17	Annual maintenance cost / household served	6,638
18	Annual maintenance cost / m³ water sold	171
19	Annual capital maintenance cost / km network	-
20	Annual capital maintenance cost / household served	-
21	Annual capital maintenance cost / m³ water sold	-
22	Annual energy cost / km network	-
23	Annual energy cost / household served	-
24	Annual energy cost / m³ water sold	-
25	N° connections / km network	-

A.3 BUDAKA (ST)

A.3.1 Water production of Scheme

Table 50: Annual water production of Budaka

	Value for FY2010/11	Value for FY2011/12	Value for FY2012/13	Value for FY2013/14
Water supplied		5,771	7,618	4,028
Water sold		4,669	5,578	2,710
Water produced		6,371	9,697	4,968
Water supplied / Water produced		90.58%	78.56%	81.08%
Water sold / Water supplied		80.90%	73.22%	67.28%

Table 51: Monthly water production of Budaka in the 2011/2012 financial year

	2011 July	2011 August	2011 Sept.	2011 Oct.	2011 Nov.	2011 Dec.	2012 January	2012 Feb	2012 March	2012 April	2012 May	2012 June	Value for FY
Water supplied	641	692	350	254	758	350	32	254	768	620	471	581	5,771
Water sold	372	465	341	251	667	245	31	230	689	496	432	450	4,669
Water produced	704	698	358	287	874	365	32	295	898	728	530	602	6,371
Water supplied / Water produced	91.05%	99.14%	97.77%	88.50%	86.73%	95.89%	100.00%	86.10%	85.52%	85.16%	88.87%	96.51%	90.58%
Water sold / Water supplied	58.03%	67.20%	97.43%	98.82%	87.99%	70.00%	96.88%	90.55%	89.71%	80.00%	91.72%	77.45%	80.90%

Table 52: Monthly water production of Budaka in the 2012/2013 financial year

	2012 July	2012 August	2012 Sept.	2012 Oct.	2012 Nov.	2012 Dec.	2013 January	2013 Feb	2013 March	2013 April	2013 May	2013 June	Value for FY
Water supplied	342	322	634	903	987	891	100	564	580	745	750	800	7,618
Water sold	288	273	540	668	723	658	100	498	410	509	559	352	5,578
Water produced	350	348	684	1,203	1,440	1,235	100	600	602	832	782	1,521	9,697
Water supplied / Water produced	97.71%	92.53%	92.69%	75.06%	68.54%	72.15%	100.00%	94.00%	96.35%	89.54%	95.91%	52.60%	78.56%
Water sold / Water supplied	84.21%	84.78%	85.17%	73.98%	73.25%	73.85%	100.00%	88.30%	70.69%	68.32%	74.53%	44.00%	73.22%

Table 53: Monthly water production of Budaka in the 2013/2014 financial year

	2013 July	2013 August	2013 Sept.	2013 Oct.	2013 Nov.	2013 Dec.	2014 January	2014 Feb	2014 March	2014 April	2014 May	2014 June	Value for FY
Water supplied	1,200	1,563	1,265	0	0	0	0	0	0	0	0	0	4,028
Water sold	706	1,054	950	0	0	0	0	0	0	0	0	0	2,710
Water produced	1,724	1,639	1,605	0	0	0	0	0	0	0	0	0	4,968
Water supplied / Water produced	69.61%	95.36%	78.82%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	81.08%
Water sold / Water supplied	58.83%	67.43%	75.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	67.28%

A.3.2 Total Costs of Scheme

Table 54: Annual operation costs in Budaka

Annual operating costs ('000 shs)	FY2010/11	FY2011/12	FY2012/13	FY2013/14
Electrical energy costs during the year (G11)	N/A	4,253	4,470	1,994
Spending for Chlorine during the year	N/A	260	165	50
Spending for Alum consumed during the year	N/A			
Spending for Lime during the year	N/A			
Spending for Fuel Consumption: Transport	N/A	2,169	298	120
Spending for Fuel Consumption: Machinery	N/A	1,223	937	120
Staff cost during the year (intern. manpower G8)	N/A	4,297	4,820	1,500
Spending for Cost of Routine Service	N/A	734	1,010	150
Spending for Cost of Repairs during the year	N/A	507	447	60
Spending for Water Qual. Test during the year (G25)	N/A	12	21	3
Other operating and fixed costs during the year (G16)	N/A	685	1,343	135
Total	N/A	14,140	13,511	4,132

Table 55: Monthly operation costs in Budaka

		2013	2013	2013	2013	2013	2013	2014	2014	2014	2014	2014	2014	Value for FY
		July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb	March	April	May	June	
Electrical energy costs during month (G11)	000USh	619	698	677	0	0	0	0	0	0	0	0	0	1,994
Spending for Chlorine during month	000USh	0	0	50	0	0	0	0	0	0	0	0	0	50
Spending for Alum consumed during month	000USh	0	0	0	0	0	0	0	0	0	0	0	0	0
Spending for Lime during month	000USh	0	0	0	0	0	0	0	0	0	0	0	0	0
Spending for Fuel Consumption: Transport	000USh	40	40	40	0	0	0	0	0	0	0	0	0	120
Spending for Fuel Consumption: Machinery	000USh	40	40	40	0	0	0	0	0	0	0	0	0	120
Staff cost during month (intern. manpower G8)	000USh	500	500	500	0	0	0	0	0	0	0	0	0	1,500
Spending for Cost of Routine Service	000USh	50	50	50	0	0	0	0	0	0	0	0	0	150
Spending for Cost of Repairs during month	000USh	20	20	20	0	0	0	0	0	0	0	0	0	60
Spending for Water Qual. Test during month (G25)	000USh	1	1	1	0	0	0	0	0	0	0	0	0	3
Other operating and fixed costs during month (G16)	000USh	45	45	45	0	0	0	0	0	0	0	0	0	135
Total operating cost	000USh	1,315	1,394	1,423	0	0	0	0	0	0	0	0	0	4,132

A.3.3 Specific Costs of Scheme

Table 56: Specific costs of water scheme of Budaka

General Indicators		
Indicator N°	**Indicator**	**Value**
1	Total staff	4
2	Total no of connections	319
3	Active connections	262
4	% O&M covered by tariff	85
5	Collection efficiency %	48
6	NRW	27
7	Energy % of O&M cost	40
8	Water tariff [USH/m³]	1,830
9	Management fees%	85
Specific Indicators		
Indicator N°	**Indicator**	**Value**
10	Capital expenditure / km network	1,649,756
11	Capital expenditure / household served	2,459
12	Total cost of operation / m³ sold	2,422
13	Annual operation cost / km network	1,303,658
14	Annual operation cost / household served	1,943
15	Annual operation cost / m³ water sold	1,916
16	Annual maintenance cost / km network	344,024
17	Annual maintenance cost / household served	512
18	Annual maintenance cost / m³ water sold	505
19	Annual capital maintenance cost / km network	3,095,732
20	Annual capital maintenance cost / household served	4,615
21	Annual capital maintenance cost / m³ water sold	4,550
22	Annual energy cost / km network	659,390
23	Annual energy cost / household served	983
24	Annual energy cost / m³ water sold	969
25	N° connections / km network	39

A.4 LUWERO TC (ST)

A.4.1 Specific Costs of Scheme

Table 57: Specific costs of water scheme of Luwero

General Indicators		
Indicator N°	**Indicator**	**Value**
1	Total staff	8
2	Total no of connections	1,677
3	Active connections	1,487
4	% O&M covered by tariff	173
5	Collection efficiency %	99
6	NRW	12
7	Energy % of O&M cost	55
8	Water tariff [USH/m³]	230
9	Management fees%	95
Specific Indicators		
Indicator N°	**Indicator**	**Value**
10	Capital expenditure / km network	384,460
11	Capital expenditure / household served	3,906
12	Total cost of operation / m³ sold	1,034
13	Annual operation cost / km network	1,615,996
14	Annual operation cost / household served	16,418
15	Annual operation cost / m³ water sold	925
16	Annual maintenance cost / km network	190,475
17	Annual maintenance cost / household served	1,935
18	Annual maintenance cost / m³ water sold	109
19	Annual capital maintenance cost / km network	
20	Annual capital maintenance cost / household served	
21	Annual capital maintenance cost / m³ water sold	
22	Annual energy cost / km network	997,897
23	Annual energy cost / household served	10,138
24	Annual energy cost / m³ water sold	571
25	N° connections / km network	31

A.5 KAYUNGA (ST)

A.5.1 Water production of Scheme

Table 58: Annual water production of Kayunga

	Value for FY2010/11	Value for FY2011/12	Value for FY2012/13	Value for FY2013/14
Water supplied	95,870	95,870	111,315	
Water sold	60,529	60,529	66,230	
Water produced	132,050	132,050	149,112	
Water supplied / Water produced	72.60%	72.60%	74.65%	
Water sold / Water supplied	63.14%	63.14%	59.50%	

Table 59: Monthly water production of Kayunga in the 2010/2011 financial year

	2010	2010	2010	2010	2010	2010	2011	2011	2011	2011	2011	2011	Value for FY
	July	August	Sept.	Oct.	Nov.	Dec.	January	Feb	March	April	May	June	
Water supplied	8,282	8,350	6,882	7,670	6,757	6,958	7,553	7,540	8,221	8,454	9,051	10,152	95,870
Water sold	4,969	5,105	4,438	4,762	4,249	4,941	5,685	5,525	5,732	4,724	4,429	5,970	60,529
Water produced	9,949	11,992	10,588	10,957	9,257	10,156	10,070	10,565	10,817	11,581	12,399	13,719	132,050
Water supplied / Water produced	83.24%	69.63%	65.00%	70.00%	72.99%	68.51%	75.00%	71.37%	76.00%	73.00%	73.00%	74.00%	72.60%
Water sold / Water supplied	60.00%	61.14%	64.49%	62.09%	62.88%	71.01%	75.27%	73.28%	69.72%	55.88%	48.93%	58.81%	63.14%

Table 60: Monthly water production of Kayunga in the 2011/2012 financial year

	2011	2011	2011	2011	2011	2011	2012	2012	2012	2012	2012	2012	Value for FY
	July	August	Sept.	Oct.	Nov.	Dec.	January	Feb	March	April	May	June	
Water supplied	8,282	8,350	6,882	7,670	6,757	6,958	7,553	7,540	8,221	8,454	9,051	10,152	95,870
Water sold	4,969	5,105	4,438	4,762	4,249	4,941	5,685	5,525	5,732	4,724	4,429	5,970	60,529
Water produced	9,949	11,992	10,588	10,957	9,257	10,156	10,070	10,565	10,817	11,581	12,399	13,719	132,050
Water supplied / Water produced	83.24%	69.63%	65.00%	70.00%	72.99%	68.51%	75.00%	71.37%	76.00%	73.00%	73.00%	74.00%	72.60%
Water sold / Water supplied	60.00%	61.14%	64.49%	62.09%	62.88%	71.01%	75.27%	73.28%	69.72%	55.88%	48.93%	58.81%	63.14%

Table 61: Monthly water production of Kayunga in the 2012/2013 financial year

	2012	2012	2012	2012	2012	2012	2013	2013	2013	2013	2013	2013	Value for FY
	July	August	Sept.	Oct.	Nov.	Dec.	January	Feb	March	April	May	June	
Water supplied	10,003	8,961	9,558	8,688	8,050	9,183	10,554	8,880	9,090	9,393	8,375	10,580	111,315
Water sold	5,821	5,371	5,686	5,108	4,882	5,113	6,112	5,748	5,432	5,577	5,025	6,355	66,230
Water produced	14,151	12,801	11,947	12,412	10,402	12,580	13,706	11,100	12,120	12,042	10,737	15,114	149,112
Water supplied / Water produced	70.69%	70.00%	80.00%	70.00%	77.39%	73.00%	77.00%	80.00%	75.00%	78.00%	78.00%	70.00%	74.65%
Water sold / Water supplied	58.19%	59.94%	59.49%	58.79%	60.65%	55.68%	57.91%	64.73%	59.76%	59.37%	60.00%	60.07%	59.50%

A.5.2 Total Costs of Scheme

Table 62: Annual operation costs in Kayunga

Annual operating costs ('000 shs)	FY2010/11	FY2011/12	FY2012/13	FY2013/14
Electrical energy costs during the year (G11)	23,826	23,826	30,078	N/A
Spending for Chlorine during the year	658	658	1,106	N/A
Spending for Alum consumed during the year	17,859	17,859	22,204	N/A
Spending for Lime during the year	1,202	1,202		N/A
Spending for Fuel Consumption: Transport	3,520	3,520	4,515	N/A
Spending for Fuel Consumption: Machinery	4,783	4,783	68	N/A
Staff cost during the year (intern. manpower G8)	22,120	22,120	29,135	N/A
Spending for Cost of Routine Service	142	142	78	N/A
Spending for Cost of Repairs during the year	4,983	4,983	1,848	N/A
Spending for Water Qual. Test during the year (G25)	3,430	3,430	2,604	N/A
Other operating and fixed costs during the year (G16)	12,947	12,947	9,938	N/A
Total	95,470	95,470	101,574	N/A

Table 63: Monthly operation costs in Kayunga

		2013	2013	2013	2013	2013	2013	2014	2014	2014	2014	2014	2014	Value for FY
		July	August	Sept.	Oct.	Nov.	Dec.	Jan	Feb	March	April	May	June	
Electrical energy costs during month (G11)	000USh	1,617	1,819	1,635	1,697	1,387	1,874	1,749	2,361	1,919	2,571	2,481	2,716	23,826
Spending for Chlorine during month	000USh	77	61	52	71	35	38	49	38	48	60	63	66	658
Spending for Alum consumed during month	000USh	2,093	1,638	1,820	1,820	1,001	1,183	1,456	1,547	1,729	23	1,820	1,729	17,859
Spending for Lime during month	000USh	0	0	0	0	0	0	0	0	0	0	225	977	1,202
Spending for Fuel Consumption: Transport	000USh	441	238	166	524	320	440	251	207	627	246	18	42	3,520
Spending for Fuel Consumption: Machinery	000USh	21	50	73	49	76	0	0	0	0	57	2,326	2,131	4,783
Staff cost during month (intern. manpower G8)	000USh	2,131	2,131	2,131	2,131	2,131	2,131	2,326	2,326	2,326	2,326	0	30	22,120
Spending for Cost of Routine Service	000USh	0	0	15	0	0	23	28	13	14	21	13	15	142
Spending for Cost of Repairs during month	000USh	1,779	56	0	109	9	1,068	0	1,631	23	21	65	222	4,983
Spending for Water Qual. Test during month (G25)	000USh	222	222	216	222	216	228	228	210	228	222	228	988	3,430
Other operating and fixed costs during month (G16)	000USh	1,281	1,112	1,220	925	1,088	1,530	1,089	1,122	1329	995	1,256	0	12,947
Total operating cost	000USh	9,662	7,327	7,328	7,548	6,263	8,515	7,176	9,455	8,243	6,542	8,495	8,916	95,470

A.5.3 Specific Costs of Scheme

Table 64: Specific costs of water scheme of Kayunga

General Indicators		
Indicator N°	**Indicator**	**Value**
1	Total staff	9
2	Total no of connections	1,302
3	Active connections	1,508
4	% O&M covered by tariff	118
5	Collection efficiency %	100
6	NRW	41
7	Energy % of O&M cost	30
8	Water tariff [USH/m³]	1,500
9	Management fees%	85
Specific Indicators		
Indicator N°	**Indicator**	**Value**
10	Capital expenditure / km network	77,386
11	Capital expenditure / household served	670
12	Total cost of operation / m³ sold	1,533
13	Annual operation cost / km network	2,474,602
14	Annual operation cost / household served	21,417
15	Annual operation cost / m³ water sold	1,315
16	Annual maintenance cost / km network	411,023
17	Annual maintenance cost / household served	3,557
18	Annual maintenance cost / m³ water sold	218
19	Annual capital maintenance cost / km network	-
20	Annual capital maintenance cost / household served	-
21	Annual capital maintenance cost / m³ water sold	-
22	Annual energy cost / km network	856,420
23	Annual energy cost / household served	7,412
24	Annual energy cost / m³ water sold	455
25	N° connections / km network	37

A.6 BUSEMBATYA (ST)

A.6.1 Specific Costs of Scheme

Table 65: Specific costs of water scheme of Busembatya

General Indicators		
Indicator N°	**Indicator**	**Value**
1	Total staff	4
2	Total no of connections	758
3	Active connections	689
4	% O&M covered by tariff	166
5	Collection efficiency %	95
6	NRW	14
7	Energy % of O&M cost	43
8	Water tariff [USH/m³]	1,050
9	Management fees%	95
Specific Indicators		
Indicator N°	**Indicator**	**Value**
10	Capital expenditure / km network	12,883
11	Capital expenditure / household served	214
12	Total cost of operation / m³ sold	1,219
13	Annual operation cost / km network	225,270
14	Annual operation cost / household served	3,751
15	Annual operation cost / m³ water sold	216
16	Annual maintenance cost / km network	225,270
17	Annual maintenance cost / household served	3,752
18	Annual maintenance cost / m³ water sold	216
19	Annual capital maintenance cost / km network	-
20	Annual capital maintenance cost / household served	-
21	Annual capital maintenance cost / m³ water sold	-
22	Annual energy cost / km network	552,365
23	Annual energy cost / household served	9,200
24	Annual energy cost / m³ water sold	530
25	N° connections / km network	30

A.7 NAKASEKE

A.7.1 Specific Costs of Scheme

Table 66: Specific costs of water scheme of Nakaseke

General Indicators		
Indicator N°	**Indicator**	**Value**
1	Total staff	4
2	Total no of connections	250
3	Active connections	230
4	% O&M covered by tariff	178
5	Collection efficiency %	92
6	NRW	16
7	Energy % of O&M cost	53
8	Water tariff [USH/m³]	2,250
9	Management fees%	40
Specific Indicators		
Indicator N°	**Indicator**	**Value**
10	Capital expenditure / km network	296,000
11	Capital expenditure / household served	1,578
12	Total cost of operation / m³ sold	1,139
13	Annual operation cost / km network	1,169,500
14	Annual operation cost / household served	10,915
15	Annual operation cost / m³ water sold	959
16	Annual maintenance cost / km network	-
17	Annual maintenance cost / household served	-
18	Annual maintenance cost / m³ water sold	-
19	Annual capital maintenance cost / km network	-
20	Annual capital maintenance cost / household served	-
21	Annual capital maintenance cost / m³ water sold	-
22	Annual energy cost / km network	596,986
23	Annual energy cost / household served	5,810
24	Annual energy cost / m³ water sold	607
25	N° connections / km network	18

A.8 MPIGI (ST)

A.8.1 Specific Costs of Scheme

Table 67: Specific costs of water scheme of Mpigi

General Indicators		
Indicator N°	**Indicator**	**Value**
1	Total staff	9
2	Total no of connections	1,580
3	Active connections	1,350
4	% O&M covered by tariff	125
5	Collection efficiency %	97
6	NRW	19
7	Energy % of O&M cost	30
8	Water tariff [USH/m³]	2,300
9	Management fees%	90
Specific Indicators		
Indicator N°	**Indicator**	**Value**
10	Capital expenditure / km network	407,692
11	Capital expenditure / household served	2,585
12	Total cost of operation / m³ sold	1,820
13	Annual operation cost / km network	2,720,153
14	Annual operation cost / household served	170,249
15	Annual operation cost / m³ water sold	879
16	Annual maintenance cost / km network	307,692
17	Annual maintenance cost / household served	1,951
18	Annual maintenance cost / m³ water sold	99
19	Annual capital maintenance cost / km network	-
20	Annual capital maintenance cost / household served	-
21	Annual capital maintenance cost / m³ water sold	-
22	Annual energy cost / km network	1,495,384
23	Annual energy cost / household served	9,483
24	Annual energy cost / m³ water sold	483
25	N° connections / km network	39

A.9 NAKIFUMA (RGC)

A.9.1 Specific Costs of Scheme

Table 68: Specific costs of water scheme of Nakifuma

General Indicators		
Indicator N°	**Indicator**	**Value**
1	Total staff	5
2	Total no of connections	302
3	Active connections	283
4	% O&M covered by tariff	150
5	Collection efficiency %	86
6	NRW	2
7	Energy % of O&M cost	36
8	Water tariff [USH/m^3]	1,800
9	Management fees%	78
Specific Indicators		
Indicator N°	**Indicator**	**Value**
10	Capital expenditure / km network	10,000
11	Capital expenditure / household served	80
12	Total cost of operation / m^3 sold	1,005
13	Annual operation cost / km network	423,380
14	Annual operation cost / household served	3,420
15	Annual operation cost / m^3 water sold	1,024
16	Annual maintenance cost / km network	79,523
17	Annual maintenance cost / household served	642
18	Annual maintenance cost / m^3 water sold	517
19	Annual capital maintenance cost / km network	
20	Annual capital maintenance cost / household served	
21	Annual capital maintenance cost / m^3 water sold	
22	Annual energy cost / km network	307,414
23	Annual energy cost / household served	2,485
24	Annual energy cost / m^3 water sold	744
25	N° connections / km network	14

A.10 KAGULUMIRA (RGC)

A.10.1 Specific Costs of Scheme

Table 69: Specific costs of water scheme of Kagulumira

General Indicators		
Indicator N°	**Indicator**	**Value**
1	Total staff	3
2	Total no of connections	464
3	Active connections	319
4	% O&M covered by tariff	210
5	Collection efficiency %	85
6	NRW	23
7	Energy % of O&M cost	33
8	Water tariff [USH/m³]	1,850
9	Management fees%	30
Specific Indicators		
Indicator N°	**Indicator**	**Value**
10	Capital expenditure / km network	-
11	Capital expenditure / household served	-
12	Total cost of operation / m³ sold	510
13	Annual operation cost / km network	434,285
14	Annual operation cost / household served	1,842
15	Annual operation cost / m³ water sold	687
16	Annual maintenance cost / km network	-
17	Annual maintenance cost / household served	-
18	Annual maintenance cost / m³ water sold	-
19	Annual capital maintenance cost / km network	-
20	Annual capital maintenance cost / household served	-
21	Annual capital maintenance cost / m³ water sold	-
22	Annual energy cost / km network	342,857
23	Annual energy cost / household served	1,454
24	Annual energy cost / m³ water sold	200
25	N° connections / km network	31

A.11 KASANJE (RGC)

A.11.1 Specific Costs of Scheme

Table 70: Specific costs of water scheme of Kasanje

General Indicators		
Indicator N°	**Indicator**	**Value**
1	Total staff	4
2	Total no of connections	215
3	Active connections	203
4	% O&M covered by tariff	123
5	Collection efficiency %	78
6	NRW	40
7	Energy % of O&M cost	41
8	Water tariff [USH/m³]	4,000
9	Management fees%	30
Specific Indicators		
Indicator N°	**Indicator**	**Value**
10	Capital expenditure / km network	6,000
11	Capital expenditure / household served	150
12	Total cost of operation / m³ sold	1,605
13	Annual operation cost / km network	436,900
14	Annual operation cost / household served	10,922
15	Annual operation cost / m³ water sold	3,008
16	Annual maintenance cost / km network	-
17	Annual maintenance cost / household served	-
18	Annual maintenance cost / m³ water sold	-
19	Annual capital maintenance cost / km network	-
20	Annual capital maintenance cost / household served	-
21	Annual capital maintenance cost / m³ water sold	-
22	Annual energy cost / km network	540,000
23	Annual energy cost / household served	13,500
24	Annual energy cost / m³ water sold	1,239
25	N° connections / km network	11