Rural Water Supply Network

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The SOMAP Experience, Zambia

A study of the how sustainable a national rural water supply programme turned out, in Chongwe District, Zambia

Executive Summary

SOMAP is the acronym for Sustainable Operation and Maintenance Project for rural water supply in Zambia and it is the strategy that the Government of the Republic of Zambia has adopted to sustain rural water supply. The SOMAP model was first successfully piloted in six rural towns for five years before rolling out nationwide in 2012.

This brief study report is adopted from the dissertation submitted in partial fulfilment of the requirements for the Degree of Master of Science in Project Management from the University of Lusaka. The research was a self-financed academic project to explore the effectiveness of the strategy adopted by the Government of the Republic of Zambia to sustain rural water sources of boreholes fitted with handpumps, using a case of Chongwe District. Convenient sampling technique was used to sample 47 water points at villages, schools and rural health centres for the study in the rural part of Chongwe district.

The key findings of the study of the SOMAP model principles were:

i. 72% of communities do not regularly contribute towards operation and maintenance of handpumps.

ii. The SOMAP spare parts outlet shop does not have spare parts available all the time.

iii. There are no sub-district structures under the District Council to monitor rural water supply in the communities.

iv. 38% of communities are experiencing problems with inappropriate handpumps installed due to hydrogeological conditions.

- The water in some boreholes is rusty from corroded galvanised iron pipes used on the handpumps making the water not potable.
- Handpumps in hilly terrain are difficult to draw water from, especially for women and children.

v. 85% of the communities do not practice preventative maintenance even for basic chores, such as greasing of the chains on the handpumps.

The study has proposed areas for further research and action that will enhance sustainability of rural water supply in Zambia such as:

i. tackling corrosion by scaling up alternative materials to galvanised iron for handpump riser pipes;

ii. exploring the supply chain for alternative to galvanised iron pipes; and

iii. standardisation and enforcement of groundwater lifting devices in rural water supply.

Such further research can enhance sustainability of rural water supply, which is in line with Zambia's Seventh National Development Plan (2017 – 2021) theme "accelerating development efforts towards Vision 2030 without leaving anyone behind".

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Introduction

RURAL WATER SUPPLY IN ZAMBIA

The World Health Organization and United Nations Children's Fund (WHO/UNICEF) Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) produces internationally comparable estimates of progress on drinking water, sanitation and hygiene (WASH). According to the latest JMP report for 2019, Zambia's population is estimated at 17.094 million people of which 43% live in urban areas.

Zambia's progress on improved water supply in the rural areas from 2000 to 2017: the basic rural water supply improved from 31% to 42%. The improved facilities includes both piped and non-piped drinking water supplies.

The proportion of population using non-piped water supplies in Zambia's rural areas from 2000 to 2017 improved from 28% to 46%, although access to piped supplies declined from 6% to 4%. (JMP, 2019 P. 104 - 105) The non-piped water supplies are borehole / tubewells, protected wells and springs, rainwater, packaged and delivered water.

According to the Zambia Demographic and Health Survey, improved water sources in rural Zambia is at 47%. Boreholes fitted with handpumps account for 33% of improved water sources in rural areas (CSO 2015. p. 1). This shows that boreholes with handpumps are the highest improved water sources of safe drinking water in the rural areas.

The principal justification for water supply projects has been to improve health, and the link between water and health has long been understood (UNICEF 1999, p. 5). When the funders undertake a Rural Water Supply (RWS) project, the objective is to provide safe and clean water supply to the rural communities.

HANDPUMP STANDARDS AND FUNCTIONALITY IN ZAMBIA

The Government of Zambia does not have an official handpump standardisation policy. In 2002, there was a list of propose water lifting devices for standardisation of handpumps but was never officially approved. The Operation and Maintenance Implementation Manual and User Guide focuses on the India Mark II (as the most popular handpump) and Afridev (as slowly gaining popularity and encouraged as alternative pump in RWSS) (RWSS, 2010, MacArthur, 2015)

A 2007 national survey of 25,624 handpumps recorded 27% non-functional. A more recent survey of 300 handpumps across all 10 districts found a non-functionality rate of 29% at baseline in 2012 and 22% at end line in 2016. Water point mapping in eight districts identified 2,123 handpumps, of which 16% were non-functional (Foster et al 2019).

All binary handpump functionality statistics should be treated with caution because the yes/no categorization masks important nuances on whether quantity and quality of the water is acceptable (or safe) for users, and the duration and seasonality of downtimes. It maybe for this reason that the rate of non-functional handpumps has estimated to be more than 50% (Chitembo, 2015; Kambole, 2016).

GROUNDWATER AVAILABILITY AND QUALITY

The most important consequence of the hydrogeology is that in many areas groundwater is aggressive (pH <7) which leads to corrosion (rusting) of iron, even when galvanised iron (GI) pipe is used. Handpump corrosion and high iron issues in Zambia have been long known about and discussed (RWSN, 2019)

The SOMAP model

SOMAP is an acronym for **Sustainable Operation and Maintenance Project for rural water supply**, a project that piloted in six rural districts for five years to sustain the running of handpumps. The non-functional rate for handpumps had reduced from 50% to less than 12.4% in the project areas. The results showed reduced down time, spare parts were available in the district all the time, the community members contributed towards the cost of maintenance. The adopted standard hand pumps produced good quality water. From the success of the project, SOMAP was adopted as the model of operation to sustain RWS in Zambia (GRZ/MLGH 2007). In this study, the author wanted to find out how effective the SOMAP model to sustain RWS long after the project finished.

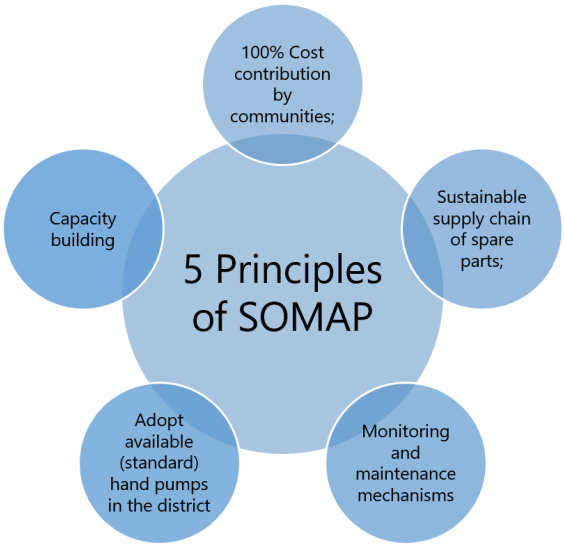


Figure 1: The 5 Principles of the SOMAP model

THE GUIDING PRINCIPLES OF SOMAP

SOMAP is organised around five complementary principles or elements (Figure 1). The model was designed to address systemic weaknesses identified in Zambian rural water supply. However, many of the challenges have been identified in other countries across Sub-Saharan Africa. The structure and principles of SOMAP can be summarised as follows:

Communities' cost contributions towards maintenance of handpumps

The community needs to contribute 100% of the operation and maintenance of handpumps. In addition, to demonstrate their sense of commitment, the community is requested to contribute K1,500 (USD90) toward capital cost for borehole with handpump. For major rehabilitation works, the Local Authority is obliged to assist where rehabilitation would cost more than K500 (USD30)

Sustainable supply chain of handpump parts

Sustainable supply chains of spare parts should be available at outlets at all times. The spare parts should be affordable, so that the communities can afford them. An appropriate sustainable supply chain should be set up, in the district near to the rural communities. To ensure ease of repair by the Area Pump Minders (APMs) a toolkit should be made available in the communities. The toolkit can be stored at a government institution such as a rural health centre. A toolkit management mechanism should also be established to ensure tools are available any time in working condition when the need arises to use them.

Monitoring and management mechanism

There should be a monitoring and management mechanism. The monitoring and management should devolve from the district level down, the ward or catchment level down to community level. At catchment, level the Environmental Health Technician (EHTs) should oversee the APMs and tool kits at Rural Health Centres (RHCs). The APMs should oversee RWS at community level and report to the EHT at catchment level. The EHT to oversee the management of the toolkit at RHC so that tools are ready for use. The RWS at community level to be managed by a gender balanced Village Water Committee.

Adopted Standard Handpump Type

The local authority should adopt available handpumps in the district that have proved over time. The handpump should be suitable for the hydrogeological conditions, with regard to aggressive and corrosive groundwater, such as the use of polyvinyl chloride (PVC) pipes of Afridev handpumps. The use of standardised public domain handpumps are encouraged. The standardised handpumps include India Mark II, Afridev and Ghana Modified India Mark II. The handpumps should be affordable, in relation to capital and recurrent costs. The standardisation should come from the process of research, testing and development.

Stakeholder Capacity Development

There should be a supportive regulatory framework provided in the policy. Capacity building include physical, material resources along with knowledge, understanding and skills from national down to the

community. At community level, there shall be awareness campaigns and public participation created. Management, financial and technical skills development shall be imparted for effective operation and maintenance.

The conceptual framework of the SOMAP model shows that the five independent variables are linked to ensure that the handpump is sustainable. When all the five operation and maintenance principles are equally practiced, then the sustainability of the rural water at the water point in the community should be assured.

Any weak link leads breakdown and the handpump not being sustainable. The SOMAP Model sustainability conceptual framework is illustrated in Figure 2 below.

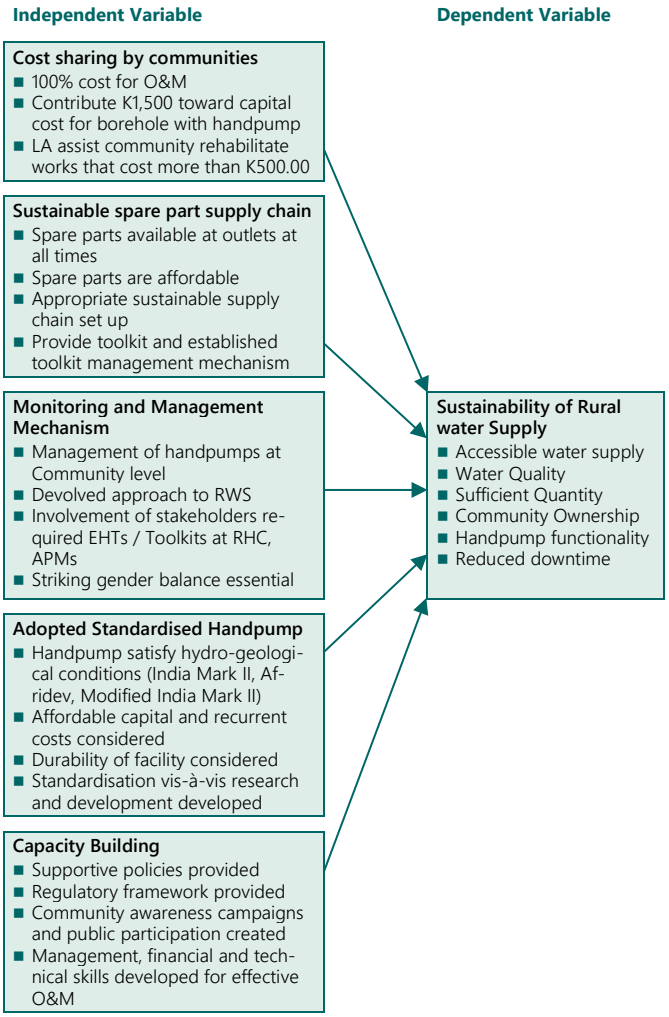


Figure 2: SOMAP conceptual framework (author)

HOW SOMAP IS ORGANISED AND IMPLEMENTED

The organisational structure of the SOMAP Model arranged in a three-tier operation and maintenance system to ensure that handpumps are operational over time. The three-tier system is the operation and maintenance of rural water at three levels: district, sub-district/ward/catchment and community level, set within the organizational structure shown in Figure 3.

District level

The head of the District Council administration is either the Town Clerk or Council Secretary who oversees the operation and maintenance through the WASH Coordinator. The National Rural Water Supply and Sanitation Programme (NRWSS) established handpump spares shop to stock up spare parts at the district.

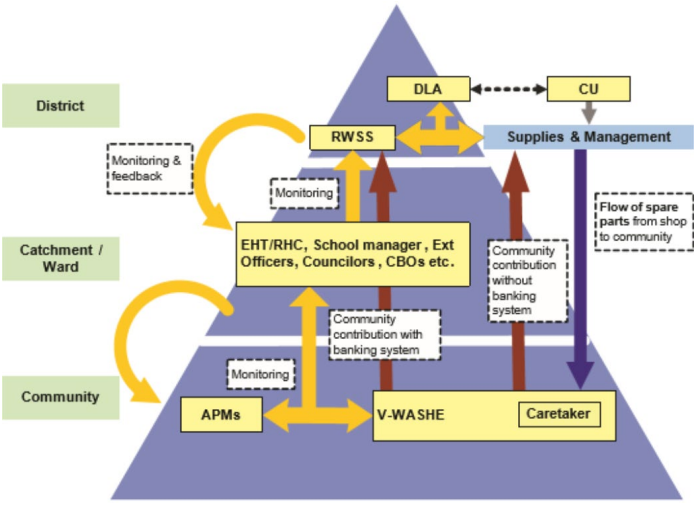
Sub-District / Ward / Catchment Level

Chongwe District has one constituency with nine wards or catchment areas as stipulated for the 2016 General Elections (ECZ 2016). An example for sub-district structures in the Ministry of Health (MoH) below the District Hospital are the Rural Health Centre (RHCs) covering the Catchment area, then Health Posts then the community. Below the Health Posts spread out equitably in the catchment area to service the rural communities (MoH 2012).

For the SOMAP model sub-district structure is the Environmental Health Technicians (EHT) from the Ministry of Health at the Rural Health Centres (RHCs) who oversees the operation and maintenance of the handpumps in the sub-district with the help of the Area Pump Minders (APMs).

Community level

At the community level, there are Area Pump Minders (APM) that maintain and repair handpumps in the communities. The Water Committees also called Village Water Sanitation Health and Education (V-WASHE) organised at each water points (MLGH 2007). Each handpump services a community or a village. Every water point has an elected water committee to oversee the operation and maintenance. In the water committee apart from the usual officers, there is a caretaker who overs sees the daily operation of the handpump. If there is a fault, the caretaker reports to the area pump minder at sub-district level. In the committee is also the treasurer that collects user fees and pays for the spare parts and the APM for the repair works (RWSS 2010).



Source: RWSS O&M Implementation Manual and User Guide, (2010), MLGH, Lusaka.

Figure 3: Organisation structure of SOMAP system at district level

Regulation

The Zambian Water and Sanitation Act No. 28 of 1997 established the National Water Supply and Sanitation Council (NWASCO) (WSS Act 1997, p. 244). This Act states that only Local Authorities (LA) or utility companies formed by the local authority are to provide water supply and sanitation services within their areas of jurisdiction. NWASCO give licenses to utility companies and develop sector guidelines for the provision of water supply and sanitation.

NWASCO advises government on water supply and sanitation matters; sets tariffs for the provision of water and sanitation services; and enforces standards for water supply and sanitation services. However, there is no water utility company to provide rural water supply and sanitation services. The vision, the policies and laws, the national plans, programmes and strategies are essentialy in place. However, there is a gap, as currently rural water supply and sanitation are not regulated by NWASCO (NWASCO, 2018.24) . This means there is a gap in regulation and enforcement for rural water supply.

Water resources in Zambia are regulated through the Water Resources Management Act 2011. According to the Act, there is no permit required for the use of water, from any water resource for domestic and non-commercial purposes and the development or use of groundwater for domestic and non-commercial purposes (WRM 2011, Clause 70 (a and b) p. 320). In the context of water for the rural communities, rural water can be considered as water for domestic and non-commercial use.

THE SOMAP TIMELINE

Government of the Republic of Zambia came up with the SOMAP initiative as a project from 2005 to 2010 (SOMAP2, 2010), with support from the Japanese International Cooperation Agency (JICA). After successful piloting, SOMAP model was adopted as a programme sustaining rural water supply. Chongwe Municipal Council adopted the SOMAP model of sustaining RWS by establishing a handpumps spare parts shop under the National Rural Water and Sanitation Programme (NRWSSP), in September 2014.

SOMAP emerged from studies in 2004 into earlier drilling and rehabilitation campaigns done in the 1980s and 1990s, which concluded:

- More than 80% of the boreholes that were constructed under the Japanese grant aid project were functional.
- Community managed boreholes are more sustainable where they receive external support;
- Lack of supply chains for spare parts of handpumps was the common problem in the operation and maintenance of boreholes with handpumps.
- There was insufficient institutional arrangement to monitor and attend preventive maintenance of water facilities and this affected period of down time of the facilities.
- It was necessary to officially standardise the handpump in Zambia and improve the spare parts supply system.

SOMAP1 (2005-7) the pilot was done in 2 districts and then extended to a further 4 districts in SOMAP2 (2007-10). The non-functional rate results from these districts under SOMAP2 was reported as 12.4% in the SOMAP2 Project – Joint Evaluation Report (2010).

> *The joint evaluation report indicates that the operation rates of handpumps were above 80% in five Districts, Mumbwa (91.7%), Chibombo (90.3%), Kapiri Mposhi (81.1%), Mkushi (92.3%), and Serenje (82.5%), at the end of SOMAP2. The report also addressed the high operation rates resulted from construction of new water points in these Districts with no experiences of breakdown, not from full functioning of O&M mechanisms.* (Excerpt from SOMAP2 – Joint Evaluation Report, June 2010: Page 27).

> *The baseline and endline surveys of SOMAP3 found that the operation rates of 300 water points with handpumps randomly selected in 10 districts in nine provinces were 71.3% in 2012 and 77.7% in 2016, respectively.* (Excerpt from SOMAP3 Project Completion Report, JICA, February 2017 Page 4-118)

Since SOMAP 1 and SOMAP 2 had produced significant impacts in improving the rural water supply handpump functionality rate in the project target districts, the Zambian Government proceeded to roll out the SOMAP O&M model across the whole country.

SOMAP3 as a project was part of the national rollout of the Sustainable Operation and Maintenance Programme, which ran from 2011 to 2016. SOMAP was adopted in Chongwe District in September 2014 with support from the Danish Technical Assistance (DANIDA).

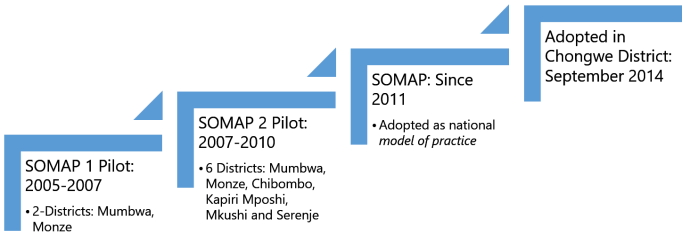


Figure 4: Timeline of SOMAP Development

The Study

STUDY AIMS:

The study, the author set out to do the following:

- To establish the effectiveness of SOMAP Model to sustain rural water supply in Zambia using Chongwe district as the study area.
- To provide information on what was happening on the ground in the communities to the national ministries.
- To pinpoint some weaknesses, for local authorities and NGOs, in the implementation of programmes to sustain RWS in the rural communities and to highlight areas that need to be strengthened to ensure that the facilities installed are sustained in improving health in the rural areas.
- To assist other scholars in the rural water supply sector, with the Zambian perspective of the sustainability of rural water supply.

THE STUDY AREA: CHONGWE DISTRICT

The study area that was selected was Chongwe District, a district bordering the eastern side of Lusaka District. The reason for this selection of the study area was its proximity to Lusaka. The study was a self-financed academic research, as such the cost was bearable to the researcher who resides in Lusaka. The western part of Chongwe district is in all intent and purpose part of Lusaka City Council - an urban area.

The sections of Chongwe where the study was conducted were at least 10km from the central business area of Chongwe town. The areas visited were typical villages where the community members drew water from handpumps and not piped water supply. This kind of arrangement resembles most rural districts in Zambia.

According to the 2010 Census of Population, the population of Chongwe was estimated at 141,301 people of which 129, 141 were rural and 12,160 were urban (CSO 2012). The target population for the study is the rural population of Chongwe District, which constitutes 91.4% of the district population.

The location of Chongwe district is shown on the map of Zambia in Figure 5.

Chongwe district was not a pilot district, therefore it is of interest to study because scaling-up of pilots nationally is a major challenge in most countries because non-pilot areas do not benefit from intense external support or scrutiny.

Figure 5: Location of study district

METHODOLOGY: SCOPE AND LIMITATIONS

Data collection

The researcher used three types of data collection forms – interviews; structured record reviews (to pick information from official records) and structured observations at water points in the rural communities.

- The number of the group respondents in the study was 282 segregated as 114 men and 168 women.
- The number of water points visited was 47 sites. The sites visited included rural health centres, basic schools and villages.

The 47 surveyed water points were identified using a hand held geographical position system (GPS) unit and the locations were plotted on the map of Chongwe shown in Figure 6 seen here on the map as red dots.

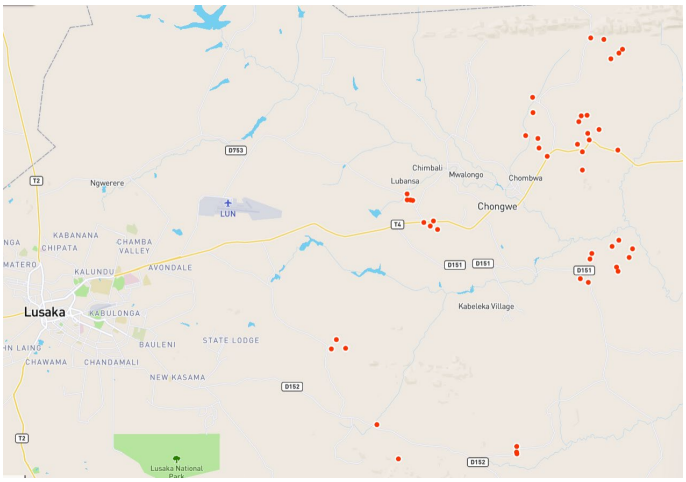


Figure 6: Map of Chongwe – Showing surveyed water points

The handpumps that were surveyed had been in use for some time: 2% had been operational for less than 2 years, 32% were between 2 and 5 years old, 30% were between 5 and 8 years old and 36% were more than 8 years old (Figure 7).

These findings showed that more than 66% of the handpumps were installed before the Chongwe Municipal Council adopted the SOMAP Models of sustaining handpumps as such the communities had been sensitised in SOMAP approach in the maintenance of handpumps.

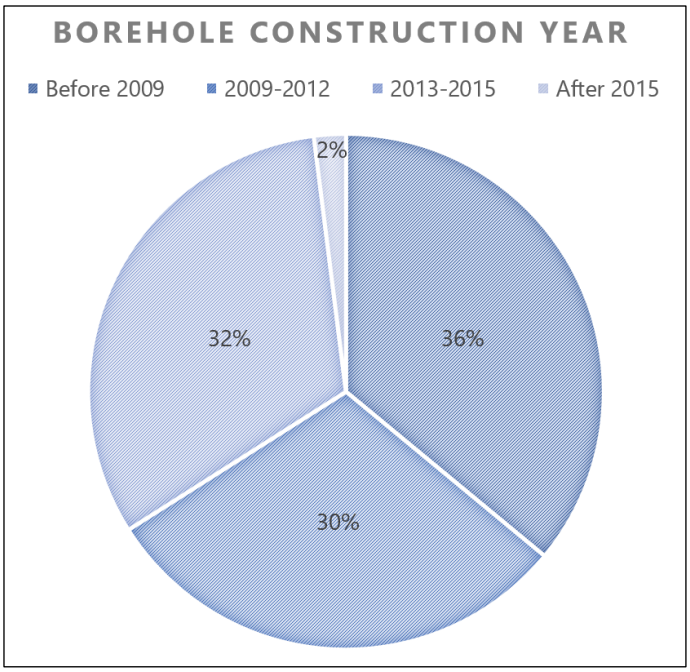


Figure 7: Age of 47 boreholes surveyed

Sample selection

The Sample frame of the study was the updated list of boreholes kept at Chongwe Municipal Council. The selection of the samples was convenience sampling (also known as haphazard sampling or accidental sampling). Convenience sampling is a type of nonprobability or non-random sampling where members of the target population that meet certain practical criteria, such as easy accessibility, geographical proximity and availability at a given time (Dörnyei, 2007). This provided the ability to generalise to a population.

Assumptions and limitations

- The study area was a rural area and the respondents were local community members mostly farmers involved in subsistence farming. The period (1 – 14 December 2017) for the data collection coincided with the planting period and as such most of the respondent were busy with farming activities.
- The study could not extend to Rural Health Centres to interview the Environmental Health Technicians (EHTs) at the sub-district level. The authority that oversees the work of the EHTs in the district is the District Health Management Team (DHMT) and not Chongwe Municipal Council. The EHTs are answerable to the DHMT under the Ministry of Health and not the Ministry of Local Government, even when permission was granted from the Council Secretary from Chongwe Municipal Council to carry out the research on SOMAP model. The EHTs were not willing to be interviewed, as there was no authority granted from the DHMT.
- This was an academic research undertaken by a single researcher (the author).
- The close proximity of Chongwe District to Lusaka District with regard to the relative wealth of the population and transport links for supply chains, had implications that the findings would not be representative of the (more remote) rural districts. This limitation was mitigated by selecting the water points that were both far from Lusaka and far from the centre of Chongwe town, which gave a typical rural area setting.
- The use of the Municipal Council borehole list assumes that such records are current and comprehensive.
- It was not possible to do detailed diagnosis of problems at each water point where problems may have been caused by poorly sited or badly drilled boreholes.
- Households often rely on multiple water sources, including improved community sources, private self-supply sources and communal unimproved sources (such as surface water) and their use often depends on a range of factors, including seasonality and rainfall. Within the scope of an MSc study, it was not possible to comprehensively factor all of these in.
- Insufficient financial data was available to undertake a Life Cycle Cost analysis of the SOMAP model performance in the study area, only Operation and Maintenance Costs (Opex) were examined.

Figure 8: Researcher administering questionnaire at Water Point at Nkomeshya Village.

Findings: General observations of handpumps

FUNCTIONALITY & DOWN TIME

Almost all the handpumps surveyed were working; the finding was 94% that were operational and 6% were not operational. This is not the rate of non-functional handpumps in the district as this was not objective of this research. Instead, the purpose of the survey was to see how the community are sustaining the handpumps (i.e. keeping the pumps operational all the time) using the SOMAP model.

Of those that were operational: 56% had water flowing at the first stroke of resumed pumping and can therefore be considered fully functional. This means that the rising pipe was watertight and not leaking. At the other extreme, 28% of the handpumps took more than 11 strokes of handpump before water flowed out. This indicated that water was leaking out of the rising pipe through the foot valve or leaking pipes. These handpumps were potentially non-functional and a burden to the users.

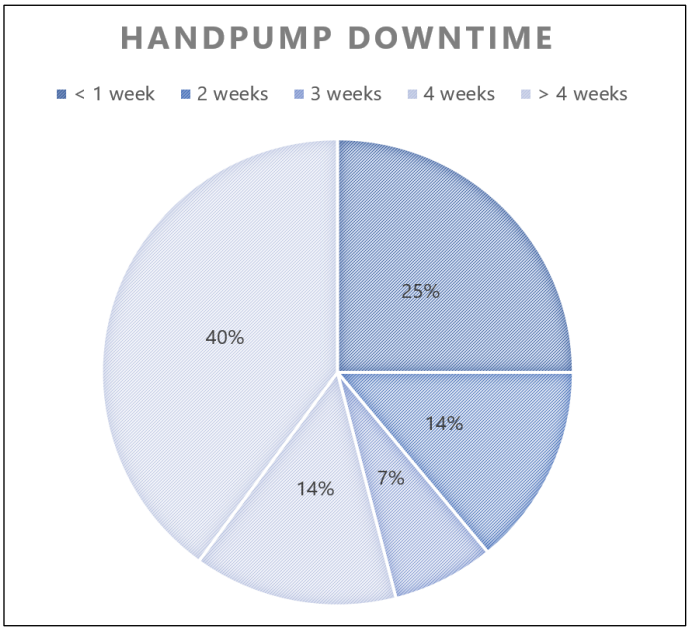


Figure 9: Handpump Downtime (47 sampled)

For the handpumps that broke down, 25% of the handpumps had less than one week of down time. 35% had a downtime of between two weeks and four weeks and 40% take more than four weeks down time as shown in Figure 9.

EVIDENCE OF SERVICING

The researcher used the presence of greasing of the chain on the handpump as indicator of it being serviced, but 85% of those inspected had never been greased. This shows there is no servicing of the handpumps in these communities.

Figure 10: Applying grease to chain on handpump at Nkomeshya Village, Chongwe (Javan Nkhosi. Dec 2017)

WATER AVAILABILITY & USE

The survey reviewed the availability of water from the handpumps with regard to reliability of the water supply throughout the year. The research finding on this was that 89% of the boreholes were reliable as the water was available throughout the year, in both the dry and rainy season and 11% was unreliable due to low water table in the dry season.

The available water supply also met the water demand in the serviced communities around the borehole throughout the year. The water from the handpump is primarily used for household daily chores of drinking, cooking, washing and bathing in the households.

ALTERNATIVE SOURCES

On the alternative sources of water supply apart from the handpumps described in the target communities. More than 77% of the boreholes described had other substitute water sources. 23% of the handpumps did not have other water sources within the vicinity.

The challenge with the single water sources in case of handpump failure is that the community is in dire water stress; on the other hand, the lack of alternative water source is a catalyst that gives the impetus on the community to sustain the only available water point in the community.

WATER QUALITY (PERCEPTION)

The research also surveyed the community's perception of the quality of water from the handpumps. The findings showed that 66% of the water from the handpumps was good and they were happy with it.

For 34% of the handpumps surveyed, the community members indicated that the water quality was not good. The water quality was not good due to the rusty smell from the water. In the mornings, the first user to draw water would find that the water was brownish in colour. One has to pump continuously for a while before the water clears enough to be usable. In some cases, the water had a shiny layer on top when the water is left over night.

The other problem from the rusty water is that it discolours the inside of the water container with a reddish-brown colour. When cooking *nsima*, Zambia staple food made from white *mealie meal*, the rusty water turns white *nsima* to light brown after it is cooked and served at the table, it makes it less palatable, but has to be eaten anyway. White coloured clothes are discoloured after using water from the handpump with high iron content in the water. White nurses' uniforms at rural health centres in rural areas are also discoloured!

The main water quality problem that the rural community identified in the water was rust or the high iron content in the water.

The communities complained of poor quality water, the findings showed that 32% pointed out that the problem was rust in the water, while another 8.5% said it was rust in addition to other problems.

For water quality checks, Environmental Health Technicians (EHTs) based at Rural Health Centres are mandated to collect samples from water points for testing, but it was found that their visits were erratic or rare. 72% of the water points indicated that they had not been visited by an EHT. Where visits did occur, 58% were visited once a year and 42% are visited twice a year.

Figure 11: Rust stained pedestal and concrete apron at Shanyanga Village, Chongwe (Javan Nkhosi. December 2017)

Evaluation of SOMAP principles

For each of five SOMAP principles, the following was found in the study area:

COST SHARING BY COMMUNITIES

Capital cost contributions

For boreholes equipped with handpumps, the community members are required to pay K1,500 (USD90) as community capital cost contribution towards the capital cost of the handpump. During the survey, even without being asked, the community members mentioned spontaneously the amount of K1,500 as the money required as community cost contribution towards the drilling of borehole to be equipped with handpump. However, the survey found that only 20 (43.5%) of the 46 water points had contributed towards the community capital cost.

Operation and maintenance cost contributions

From the survey, it was found that

- 72% of the rural communities did not make regular contributions towards operation and maintenance of the handpumps;
- 80% of the communities had raised less than K500 (USD30) towards operation and maintenance when the cost of spare parts is higher than that.
- When handpumps breakdown, only 25% of the communities were able to have them repaired within one week and 40% after four weeks.

This shows that the communities could not contribute one hundred percent cost for operation and maintenance of handpumps.

Most of the handpumps were rehabilitated (where repair cost is greater than K500) has been through the RWSS projects undertaken by the government through the Local Authority. Apart from RWSS, the other organisations that were involved in the rehabilitation of handpumps in Chongwe District were World Vision, DAPP / HITACHI and Child Fund. 19% of handpumps surveyed had been rehabilitated since 2013.

Sustainable spare parts supply chain

Chongwe Municipal Council had set up a container spares shop for selling handpump spare parts. The spares shop was open on demand when one comes to the council offices to buy parts. The container shop is shown in Figure 12.

- The most common repair works on the handpumps involved the pipes and rubber seals in the pump cylinders. The part on the handpump to be replaced least often are the bearings and chains. For the previous three years (2014 – 2017), there was no price adjustment, and no stocktaking was done, to check what stock needed to be replenished. The spare parts that had sold out had not been restocked.
- The quantities of the spare parts that were bought in 2014, at the beginning of the spares shop, could not be replaced at the same price. It was to be run as a not for profit shop but run as a revolving fund to service the rural community and to have handpump spare parts at the district centre. Staff used in the shop are the from a department within Chongwe Municipal Council.
- The prices did not reflect the current costs of the re-ordering parts. Therefore, after holding the same price for 3 years, the money raised may not be enough to re-order same quantity.

The supply chain established at Chongwe was not sustainable; therefore, rural water supply could not be sustained.

Figure 12: Chongwe Municipal Council SOMAP spare parts container shop (Javan Nkhosi, Sept. 2017.)

MONITORING AND MANAGEMENT MECHANISM

Ward level monitoring and management mechanism

- Chongwe Municipal Council (RWSS unit) did not have staff that are answerable to the Council at community level but relied on the Environmental Health Technicians (EHTs) who are from the Ministry of Health at Rural Health Centres (RHC) in the catchment areas.
- 72% of the communities indicated that the EHTs do not visit their water points in the communities to collect water samples for water quality analysis.
- 74% of the communities indicated that the water committees were not active, this means there was no management system to oversee that handpumps at community level.

There is no ward level monitoring and management mechanism to oversee the rural water supply at the community level. There is a voluntary stakeholder committee (that supports Local Authorities) in implementation of RWSS activities called a District Water Sanitation and Health Education (DWASHE). Majority of Local Authorities have inadequate staff with insufficient experience in RWSS. Therefore, the D-WASHE committee supplements the efforts of the Local Authorities. (RWS, 2010 p. 32). The D-WASHE is not a legal entity therefore, it depends on the goodwill of government district staff.

Area Pump Minders (APMs)

The area pump minders are the community-based handpump mechanics for routine maintenance of rural water supply. The government trained APMs to repair handpumps in the villages. The trained APMs were not provided with their own toolkits for repairing the handpumps. Instead, the toolkits were kept at government institutions such as schools and Rural Health Centres centrally located in Wards. The APMs were to collect the toolkits whenever they wanted to repair the handpumps in the communities.

- APMs were identified for 89% of the community handpumps surveyed.
- 33% of the APMs owned their own toolkits and remainder collected toolkits from schools or rural health centres; 59% of APMs collected from the health centres, 27% from the RWSS unit at Chongwe, and 14% from the Schools.
- 46% of the communities viewed the APMs as private business individuals, because they charged for the services, 36% viewed the APMs as community workers and 18% viewed the APMs as volunteers.
- More than 57% did not know to whom the APMs were answerable; 10.6% of the respondents said the organisation that trained them for example World Vision or 10.6% said the Headperson in the village and 8.5%.said RWSS Coordinator at Chongwe.
- The APMs are well spread in the communities to repair the handpumps. They need to be empowered with toolkits to be entrepreneurs, to maintain the handpumps effectively in the communities. The community does not know to whom the APMs are answerable.

Adopted standardised handpumps

- There were three adopted standard handpumps in Chongwe district – India Mark II, Ghana Modified India Mark II and Afridev.
- India Mark II (estimated at 85%) was the most common followed by Ghana Modified India Mark II (estimated at 15%) of the surveyed sample and very few Afridev pumps.
- 38% of the handpumps surveyed were unsuitable to supply water to the communities.
- Challenges identified were either difficult in pumping due to the low water table in the boreholes or they had rust in the water when the community members draw water from the handpumps. This 38% of the handpumps surveyed were not sustainable due to hydrogeological conditions.

With regard to the adopted standardised handpumps, 38% of the were not suitable as they produced rusty water or were too stiff to operate due to very low water levels – especially in hilly terrain. The handpumps were not suitable due to the hydrogeological conditions and cannot be sustained.

Figure 13: Ghana Modified India Mark II handpump (with stainless steel pipes), Chongwe (Javan Nkhosi, December 2017)

CAPACITY BUILDING

- 72% of the communities indicated that they had been sensitised on how to look after the handpumps and that 57% were sensitised through a public meeting. Despite this, their practices on sustaining the handpumps showed the opposite.
- 85% of the handpumps were found to have not been greased since the handpump was first installed. The pump head cover had never been opened for greasing. The initial factory grease had dried up and the chain was worn-out.
- 69% of the handpumps completely broke down before they could be repaired. This indicated a lack of preventive maintenance by the caretakers.
- Only 25% had a downtime less than one week and 40% of the handpumps had a downtime of more than 4 weeks.

The capacities of the rural communities were not sufficiently strong to sustain rural water supply. There was no preventive maintenance and long downtime before the handpumps were repaired.

AREAS FOR FURTHER RESEARCH AND ACTION

Tackling corrosion: how to scale-up alternatives to Galvanised Iron (GI)

- Ghana Modified India Mark II is a robust pump; it was tried in Zambia for the first time in 2012. There is need for in-depth research on the effectiveness of the Ghana Modified India Mark II handpump under the Zambian conditions. Such a study should also review the appropriate supply chain of spare parts.
- The other challenge experienced with the India Mark II handpumps is the issue of rust in the drinking water, where the water is corrosive. A solution is the use of un-plasticised Polyvinyl Chloride (uPVC) pipes. Although this is the solution that is recommended, (Casey et al 2016, p 72 - 74), the study identified two problems with this solution in the Zambian scenario.

- Limited local supply chains, lack of local knowledge and competence in different installation and maintenance techniques, and availability of appropriate tools to work with these materials.
- Little demand for alternatives, so galvanized iron rods and riser pipes dominate the market. Stainless steel and plastic materials are theoretically available, appearing in product catalogues but not stocked. Suppliers are reluctant to carry large stocks because they do not sell as fast as Galvanised Iron (GI) pipes. Recent experience in Uganda shows that government directives can successfully change this.

Further research and action, under Zambian conditions, is needed on this problem of rusty/high iron water:

- Research and action to improve the supply chain for uPVC pipes for use in aggressive corrosive water; to increase local knowledge and competence in different installation and maintenance techniques, and increase availability of appropriate toolkits.
- Action to increase the demand for uPVC in place of galvanised iron rods and pipes that dominate the handpump market. (Rust in groundwater in rural water is a major problem; it covers the rural communities in eight provinces out of the ten provinces in Zambia).
- SOMAP3 proposed the standardisation of handpump specification in consideration of water quality. This needs to be done.
- Evaluate the enforcement of regulations of the standardisation of the proposed specification in consideration of water quality, so that Zambia can move away from the use of galvanised iron pipes in aggressive water aquifers.
- Learn from the recent experience in Uganda and support peer-to-peer exchange to encourage uptake similar measures for regulating against Galvanised Iron (GI) and encouraging better alternatives (Stainless Steel, uPVC).

Ways to strengthen the SOMAP system :

With the growing awareness and experience globally in systems strengthening in WASH, there is potential value in using some of the new analytical tools that are being developed to refine and prioritise the recommendations from this study to enable stakeholders in the system, including civil society and the private sector, to mobilise resource and coordinate efforts to improve rural water supply services across Zambia.

Conclusion and Key Recommendations

This study looked at the medium-term performance of the SOMAP model in a District that adopted it in 2014 as part of a national scaling-up effort:

- The rural communities in Chongwe could not contribute 100% of the costs for operation and maintenance of handpumps, so an alternative financing mechanism should be adopted. Other studies have shown that community management model for rural water alone cannot succeed without Community Water 'plus' (Hutchings, P et al, 2015, Harris B. et al, 2015).
- The supply chain established at Chongwe was not sustainable. The spares shop was set up with "seed stock" but after this was depleted Chongwe municipal council could not restock using the income from sales. The funds raised could not replenish to the original stock as the supply chain was not a profit-making venture.
- Rural water supply in Chongwe was not sustainable as Chongwe municipal council had no monitoring and management mechanism to oversee and supervise the rural water supply facilities at rural community level. There is need to have a rural water supply 'extension' staff at community level.
- The India Mark II that is adopted as standard handpump for rural water supply is not suitable due to hydrogeological conditions in Chongwe - low water table and the presence of aggressive water that corrode the galvanised iron riser pipes. India Mark II handpump with galvanised iron riser pipes should never been used in low pH water. The problem of rust in aggressive water is well documented and known in Zambia for close to 20 years (Harvey and Skinner, 2002:43).
- The capacities of the rural communities to sustain rural water supply using the community management model were not sufficient. Regular support in capacity building from the district council and non-governmental organisations is required.

Overall, despite good intentions and clear principles, the evidence of this study points to major challenges to the SOMAP approach. The failings may be due to the structure of the community management model itself, under-investment in rural water supply services stand out as some of the weaknesses in the system and generally the lack of resources and incentives in place to ensure that a professional, high quality service can be provided in rural water supply.

Glossary

APM	Area Pump Mechanic
DANIDA	Danish International Development Agency
DAPP	Development Aid from People to People
DHMT	District Health Management Team
EHTs	Environmental Health Technicians
MLGH	Ministry of Local Government and Housing
MoH	Ministry of Health
NGO	Non-Governmental Organisation
NRWSSP	National Rural Water Supply and Sanitation Programme
NWASCO	National Water Supply and Sanitation Council
RHC	Rural Health Centres
RWS/ RWSS	Rural Water Supply (& Sanitation)
SOMAP	Sustainable Operation and Maintenance Project for Rural Water Supply
uPVC	unPlasticised Polyvinyl Chloride
V-WASHE	Village Water Sanitation Health and Education

Selected References & Further Information

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Full references for the study are provided in the final thesis report, which is available to download from http://research.unilus.ac.zm/xmlui/browse?type=author&value=NKHOSI%2C+Javan

About this Study

This work is based on "The Effectiveness of the SOMAP Model to Sustain Rural Water Supply in Zambia - A Case of Chongwe District", a thesis submitted in Partial Fulfilment of the Requirements for the Degree of Master of Science in Project Management of the University of Lusaka. Supervised by Eng. Nsefu, MK. kalumbunsefu@gmail.com Permission given to adapt and re-publish given by the University of Lusaka.

Full details of the literature review and analysis, methodology, analysis, data, conclusions and references are available in the completed thesis report, available from the author or the university on request. This publication necessarily presents these in a summarized form and readers wanting more detail are advised read the fuller thesis report. The Thesis was completed in May 2018 and some references have been updated where there is more recent data.

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