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**SUSTAINABLE WATER AND SANITATION SERVICES
FOR ALL IN A FAST CHANGING WORLD**

**Functional water sources that don't work: a case for
household self-supply through the Mzuzu SMART Centre**

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BRIEFING PAPER 1898

There remains a challenge of technically functional water sources in developing countries under the Millennium Development Goals not being used for a variety of reasons, including cost, traditional beliefs, convenience or politics. This paper presents a focus on self-supply at a newly developed water and sanitation focused centre, the Mzuzu SMART Centre. The SMART Centre concept aims at increasing the availability and functionality of water sources through increasing household ownership of low-cost systems and build-up of entrepreneurs. The primary self-supply, low-cost, technology at the Mzuzu SMART Centre is the Rope pump, a simple technology using locally available materials. It has shown great success. Encouragement of a focus on self-supply through a dedicated training centre may also be the best accompaniment towards improved household water sources in other areas of Southern Africa.

Introduction

Malawi is in a similar situation to many countries in Southern Africa. Throughout Malawi, governmental, non-governmental, religious and civic organizations are working to implement the Millennium Development Goals (MDG) with slow and steady progress (World Health Organization 2013; National Statistical Office and ICF Macro 2011). The need for clean water is detailed in MDG Target 7.C, which states: "Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation" (United Nations 2011). Drinking water coverage estimates in Malawi for rural areas have seen improved coverage since 1990. However, as of 2011, WHO/UNICEF report 16% of the rural population still consume water from unimproved or surface water sources. Yet, this is a drop from 58% in 1990 (World Health Organization 2013). The Malawian Government, through the National Water Policy, states the government vision is "Water and Sanitation for all, always" (Malawi Government 2005). Nonetheless, efforts are still urgently needed to increase access to safe water supplies, as well as to improve the sustainability of those services.

Water supply infrastructure and service delivery in Malawi is provided through five water boards: Lilongwe and Blantyre water boards serving their respective major urban areas, with other areas of the country served by Northern, Central and Southern Regional boards. However, rural water sources are also provided by non-governmental organizations. In northern Malawi, organizations including Rotary, Marion Medical Mission, World Vision and the Church of Central Africa Presbyterian are aiming to address the need for clean water.

The Government of Malawi Ministry of Agriculture Irrigation and Water Development reports that technical functionality of water schemes is still a challenge (Malawi Government Ministry of Agriculture, Irrigation and Water Development 2013). There is higher functionality of gravity piped water schemes in the Central and Southern region as compared to the North, likely a result of less remote schemes (Table 1). Yet, it is unmeasured how many of the functional water schemes are fully accessible to the households they targeted to reach.

Table 1. Functionality of gravity piped water schemes in Malawi 2011 (data from Malawi Government Ministry Of Agriculture, Irrigation And Water Development 2013)			
Area	Number of taps	Total operational taps	% Functional
Northern Region	2305	599	36%
Central Region	1465	664	45%
Southern Region	10215	4661	45%

Low levels of functional piped systems undermine efforts to expand coverage. Yet there remains a challenge of technically functional water sources in developing countries under the Millennium Development Goals not being used for a variety of reasons including cost, traditional beliefs, convenience or politics (Photograph 1). Encouragement of a focus on household self-supply may be the best accompaniment towards meeting the intended MDG objectives. This paper will present a case study on technically functional water sources that don't work, and how this is specifically being addressed in the country of Malawi through a focus on self-supply at a newly developed water and sanitation focused training centre, the Mzuzu SMART Centre.



Photograph 1. Example of a functional hand pump, which is not being used as evidenced by the child still collecting water from the unprotected stream just meters away, southern Tanzania, 2013

Source: McGill

When functional doesn't work

Kimani-Murage and Ngindu (2007) report that in a Kenyan slum, respondents' explanation for not using available piped tap water were its unreliability, long distance from households, and high unit cost. The inequality of services for the poorest community members builds on the observations of Briscoe (1992) that

tap water from Kenyan slum kiosks costs five times more than water from formal urban areas. In the northern Malawi city of Mzuzu, which is serviced by piped water, Wanda et al. (2012) also found inequitable spatial distribution of water points leading to many people relying on unsafe water sources, including unprotected shallow wells, streams and rivers. Areas classified as unplanned settlements had the lowest accessibility to water supply. Holm (2012) also found some piped water users in a peri-urban area of Mzuzu allocating up to 25% of available monthly income solely for the purchase of piped water for a household. Pertinently, Holm also found unimproved water sources still being used for drinking water while piped water free of *Escherichia coli* was in some cases less than 100 meters away from a household (Photograph 2). This indicates the low perceived value for safe water meeting the MDG by a household not willing to pay a high cost, and the case for a functional water source not working for the households the source is targeted to reach.



Photograph 2. An unimproved water source used for drinking water (left photo) even though a piped water system providing safe water is less than 100 m away (right photo), Mzuzu, Malawi, 2012

Source: Holm

Self-supply and SMART centre concept

Sally Sutton (2009) defines self-supply as “Self-supply encourages the incremental improvement of household and community supply through user investment in water treatment, supply construction and upgrading, including small rainwater harvesting and groundwater systems. It is a concept which complements conventional rural water supply funded by government, enabling self-help improvement of supplies where no protected supply is available, or where consumers feel they can support higher levels of service than are presently provided by the public sector.”

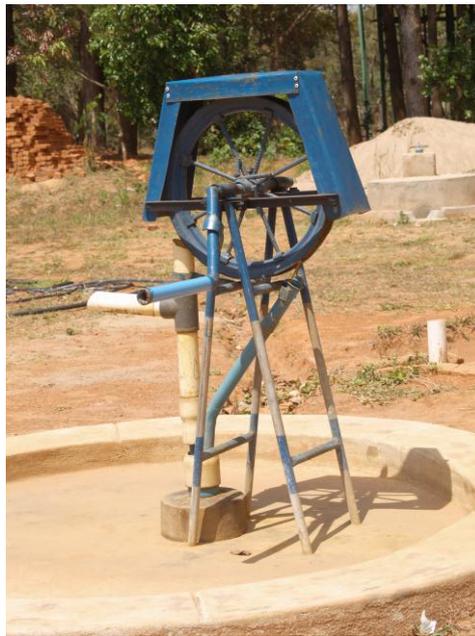
In self-supply the household is the purchaser and owner of the improved water source. The self-supply need and experiences in Malawi are similar to those in Uganda. A forum found self-supply model benefits in Uganda due to:

- Slow progress towards national rural water supply targets,
- People were already investing in their own water supplies, and
- Self-supply was able to reduce pressure on other community supplies (hand pumps and piped) (Uganda Government, Ministry of Water and Environment 2012).

How to increase self-supply in Africa? There are two dedicated SMART Centres in Africa with a focus on training local entrepreneurs leading to greater household self-supply. The intent of SMART Centres is to train entrepreneurs in a range of low-cost water and sanitation technologies which can then be marketed to local households. The first SMART Centre was the Southern Highlands Participatory Organisation (SHIPO) in Njombe, Tanzania (www.shipo-tz.org/). In 2012, Mzuzu University opened the second SMART Centre as an extension of the Centre of Excellence in Water and Sanitation (<http://www.mzuzusmartcentre.com/>). The Mzuzu SMART Centre promotes improved water sources including the Rope pump, Canzee, and rain water harvesting, each of which may, or may not, be appropriate for different situations or household preferences.

The Centre operates as a training hub, offering both technical and business training to local entrepreneurs motivated to join the private sector, with both structured short courses (of several days in length) and long term mentoring through spot checks of finalized products. The Centre currently operates with start-up donor funding, with the aim to be self-supporting through charging local course fees after 2015/2016. The Centre is staffed by a team of three, and programs are frequently supported with international technical trainers on short-term assignment of several days to weeks for specialized subjects. The Centre is also often able to use training wells in rural areas in need of water, in that both the water source and training are packaged.

The newest technological solution is not necessarily the most appropriate technology for all developing countries. The Rope pump, a simple technology using locally available materials, is the primary household self-supply option promoted at the Mzuzu SMART Centre (Photograph 3). The Rope pump has been highly successful in Nicaragua since the 1990's (Alberts et al. 1993). In Mzuzu, the locally produced Rope pump costs approximately USD\$100, in contrast to an imported Afridev pump at a cost of USD\$550.



Photograph 3. Self-supply Rope pump, Mzuzu, Malawi, December 2014

Source: Holm

The SMART Centre concept is beneficial to both business and water supply interests. One local entrepreneur under mentorship at the SMART Centre offering the service of low-cost water technologies, E. Mzumara, indicates "selling rope and washer pump with hand drilling provides him and his wife money to take care of this family. He doesn't have a farm to grow crops for his family, now he is able to buy food for his family through the money he realizes in selling the rope and washer pump and hand drilling. He is also able to buy clothes for his children through the same money." Another local entrepreneur, I. Nkoma, states "he can reach a lot of people for an affordable price which guarantees him of having constant business and his is able to take care of his family through the money he realizes."

Experience in the first year at the Mzuzu SMART Centre has shown households will purchase water sources, and the Rope pump has seen great promise for future improved water source supply in Malawi. But, there is a gap in private sector services to supply low-cost water sources which the Centre aims at addressing. One of the households that has purchased a Rope pump has indicated the system has improved her living standard with the following statement: "The water is helping my family in all household chores, such as drinking, cooking, washing, mopping, irrigating home gardens, etc." Additionally she went ahead to say, "the Rope pump is helping us so much more especially with the current intermittent [public] piped water supply. The pump is one year old now and I have not registered any serious problem with it. I am even informing other people on the advantages of having a rope at home even if they have piped water. A number of families have installed this pump and they are living comfortably in as far as water issues are concerned."

There is a perception among some self-supply opponents that given the basic design look of the rope pump, it is considered a backward technology and users would tend to prefer conventional piston pumps. A 2012 study in Tanzania of rural communities found this not to be the case (Table 2) (Coloru 2012). In addition, the household interest in Malawi anecdotally also supports the research findings from Tanzania.

Satisfaction	Rope Pumps	Piston Pumps
Not satisfied	24%	57%
Quite	2%	14%
Very Satisfied	74%	29%

The Coloru et al. (2012) study noted observations that Rope pump user dissatisfaction was attributed to the increased physical effort required to operate the pump, while piston pump users dissatisfaction was due to low reliability, a lack of technical assistance, and a high user to water source ratio attributed to high initial investment and maintenance costs.

The SMART Centre focus on training to increase the availability of local low-cost technologies means that more households will have access to an improved water source. It also means more water sources because more people can afford these technologies which can further bring down the number of users per water point. If only looking at pump hardware costs, in Malawi, five Rope pumps, with locally available technology and materials, can be purchased for the cost of one imported Afridev pump.

However, promotion of household self-supply poses a challenge for monitoring and evaluation of water points in terms of tracking attainment of the MDG, and maintaining quality finalized products. There is a great opportunity for real-time monitoring of self-supply water sources through mobile data logging of the Rope pumps. Real-time monitoring of the Rope pumps in the future might include quantities of water used daily, water quality sensors especially for microbial contaminants (*E. coli* and total coliform), and groundwater level measurements.

Conclusion

Sustainability of water supplies in developing countries is a key challenge, both in terms of water resources and service delivery. The SMART Centre concept aims at increasing the availability and functionality of low-cost water sources through increasing household ownership of low-cost systems and build-up of entrepreneurs to provide the service which increases the number of water points available and decreases the number of users per water point. Household self-supply options can help prevent technically functional water sources not being used due to cost, traditional beliefs, convenience or politics. Encouragement of a focus on training in technologies aimed at self-supply through a dedicated training centre may also be the best step towards improved household water sources in other areas of Southern Africa.

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