

# AWAKE

*African Water Adaptation through Knowledge Empowerment*

## POLICY BRIEF

### Good practice examples of contextually relevant water technology from and for Africa

Small-scale, locally-developed, climate-resilient technology and infrastructure has the potential to play a role in addressing the looming threat and impacts of climate change. Recognising this, the African Water Adaptation through Knowledge Empowerment (AWAKE) project aims to enhance and share knowledge on the opportunities and constraints that city stakeholders in southern Africa might face in developing and marketing technology of this nature. This Policy Brief links key research outcomes from the AWAKE project with practical examples of climate-resilient water management and treatment technology and methods, through a case study approach.

A key message from the AWAKE research, with regards to water technology in southern Africa, was that the design and development of technology to harvest, treat, and supply water should first and foremost consider the context within which its intended recipients are situated. This is to ensure that such technology is fit-for-purpose and appropriate for its target audience, especially in the face of a changing climate where bulk water and energy supply are anything but secure. Entrepreneurs and innovators in the water technology space should look to partner with government, the non-governmental sector, as well as communities, to ensure that their technology is adopted, sustainable and economically viable.

**To this end, our research found that opportunities exist in southern African countries for:**

- Off-grid or renewable energy powered technology options.
- Development of partnerships that allow for community involvement in technology development to ensure uptake and acceptance.
- Economic or financial incentives for small-scale entrepreneurs to develop home-grown technology, which has the potential to increase technology uptake, dissemination and local economic development.
- Non-electrified or manual technologies to supply and treat water.
- Wastewater reuse.

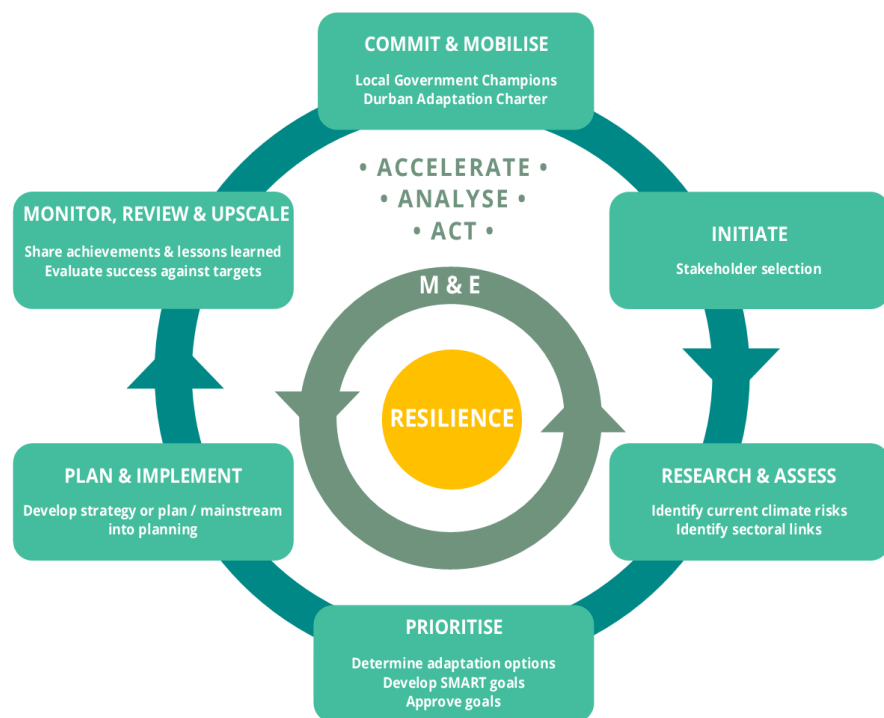
More info and AWAKE project deliverables:  
<http://africa.iclei.org/activities/agendas-projects/resilient-city/awake.html>

The AWAKE project is funded by the African Development bank and implemented by ICLEI-Local Governments for Sustainability's Africa Secretariat.



ICLEI has developed the interactive [Resilient Africa Online Decision Support Tool](#) (RAT) to support climate-responsible decision making that builds resilience at the local level. The RAT allows local authority decision makers to actively engage in cross-cutting planning processes that coordinate efforts and actions to adapt to the adverse impacts of climate change, in a context-specific way. Through the Sustainable Urban Resilient Water for Africa ([SURE Water 4 Africa](#)) project, six local authorities used the RAT to develop Local Action Plans to address the complex and interrelated issues of climate change adaptation and water management. Blantyre, Francistown, Bulawayo, Walvis Bay, Nelson Mandela Bay Municipality and Lusaka used the RAT participatory and consultative process to identify water and climate related risks, as well as adaptation actions that can be integrated into existing municipal planning frameworks and structures. The RAT outlines the framework for action, timeframes, responsibilities, and financial considerations associated with each step. The feasibility of many of the identified actions was assessed by means of a cost-benefit analysis (CBA), which weighed up the costs of implementing and not implementing each adaptation option. The

RAT tool is a practical example of the use of a context-specific technological methodology to drive water and climate action in a bottom-up manner.



**Disclaimer:** This Resilient Africa Tool was developed with funds from the European Commission as part of the 'Sustainable Urban Resilient Water for Africa: Developing Local Climate Solutions' project (DCI-NSAPVD/2012/303-795). The project, document and views expressed herein can in no way be taken to reflect the official opinion of the European Commission.



## DelAgua - Distribution of advanced water filters in Rwanda

Targeting the poorest 30% of Rwandan households, the DelAgua health programme aims to provide approximately 3 million people with 600,000 advanced water filters and 600,000 high efficiency cookstoves.



A major benefit of the DelAgua programme is its overarching objective of water purification and reducing reliance on biomass (wood) for cooking. This is achieved through the provision of high-efficiency cookstoves that require significantly less fuel and advanced water filters ([Vestergaard Frandsen Lifestraw Family™ 2.0](#)) that require no energy to operate. The intervention consisted of the cost-free distribution of the water filters and high efficiency cookstoves.

The water filter is a point-of-use microbial water treatment system designed for household use in resource-limited settings, which can provide treatment of water for a family of five persons for three to five years. The filter does not require electricity, batteries or any replacement parts and is made of durable plastic. The filter works by using advanced hollow fibre technology where water is forced through narrow fibres under pressure. Clean water then exits through tiny pores in the walls of the hollow fibres and deposits into the safe storage container. It removes virtually all bacteria, protozoan parasites and viruses.

The cost-free provision of water filters and cookstoves enabled DelAgua to claim carbon credits for partial cost recovery of the distribution and other costs (e.g. logistics, monitoring and evaluation) and made the approach feasible and economically sustainable. In addition, DelAgua worked with several universities including the University of Rwanda to conduct research studies on the programme. These independent studies were designed to examine the technology adoption, behavioral change and public health impacts of the programme.

Read more: [DelAgua website](#)

## Water and energy savings in Nagpur

Innovations in climate-resilient water technology are not limited to the development of new techniques or technologies, but can also include modifications to existing systems and processes. This was demonstrated by the Nagpur Municipal Corporation, and is included here as an example from a developing country to complement the African examples outlined thus far.

A comprehensive water sector audit done by the Nagpur Municipal Corporation (NMC) in 2005 resulted in recommendations for improvement in two areas: water distribution and water supply energy efficiency.

In 2005, while the NMC had the capacity to treat 470 million liters per day (MLD) of raw water to the city, billing records reflected sales amounting to only 241 MLD. These figures indicated that large losses were taking place in the distribution network.

The NMC extended the water audit by including a study on the energy usage of the water supply and distribution system in Nagpur. At that time, the seven pumping stations and the distribution network contributed 78 million kilowatt hours (kWh) to the city's energy consumption every year. At the same time, the sector accounted for over 60% of the carbon emissions generated through municipal services. Considering these figures, the City became aware of the importance of increasing the energy efficiency of the system. Based on the findings of the audit, some recommendations were made and put forward for implementation by the City. By the end of 2009, all the recommendations had been completely implemented. Two considerable results of this initiative include:

- Cumulative monetary savings of approximately 1 million EUR per year through network maintenance to avoid water loss.
- Annual energy savings of over 9.7 million kilo watt-hours (kWh).

To ensure that the progress made through this initiative would be continued, the NMC incorporated the findings of the audit into a water sector energy efficiency master plan.

A longer ICLEI case study is available [here](#).



## DAPP - Rope & Washer Pump

Mikolongwe Vocational School

Development Aid from People to People (DAPP) established the Mikolongwe Vocational School in 1997 on the outskirts of Blantyre, Malawi.

The Mikolongwe Vocational School aims to equip young Malawians with technical skills and knowledge for poverty alleviation by promoting self-reliant, small-scale businesses. A current initiative at the school is the manufacture, distribution and installation of a 'rope and washer' manual pump. The pump consists of nylon rope with rubber washers attached to a crank-assisted wheel and pulley system. The pump is installed over a well shaft, with the pipe descending to the level of the water. Manual rotation of the wheel sends the nylon rope and its washers down the well shaft, which forces water up the pipe to the discharge point at the surface. The system is able to pump water at an approximate rate of 40 litres per minute, and is suitable for household and small-scale agricultural use. Benefits of the system include its ease of maintenance, relatively low cost of production (in the region of US\$70), easily available components, and the fact that it requires no electricity to run. The rope and washer pump system is especially suited to water supply challenges in isolated or rural communities where resources are limited and technical support for mass produced, electric-powered pumps is expensive and logistically challenging. In an urban context, the system has potential to promote water security by providing water to communities who are not served by large-scale bulk water provision.

Source: [DAPP Malawi](#)

The system consists of a submersible pump which is fitted to an existing borehole. The pump is powered by solar panels that deliver inexpensive, reliable and environmentally friendly energy. Users are able to tap water from an automatic water dispenser using a smart card with water credit. The [LIFELINK concept](#) includes a service contract where a local service team oversees service and maintenance activities. The payment system is one of the key factors of sustainability as it ensures that the means for service and maintenance are paid into an independent bank account. Via a mobile banking interface, community members can use a mobile phone to transfer credit to the water key, which they use to draw water at the dispensing station. The price of water is regulated by the local water committee and is in line with public tariffs for municipal water supply. Often, this price is much lower than the prices that the communities used to pay for water of poorer quality. The LIFELINK technology can provide access to safe water from both groundwater and surface water. The system emphasises working with communities to ensure sound project management and promotion of sustainable development in the community through access to clean water.

Source: [Grundfos](#)



## Grundfos LIFELINK – Sustainable drinking water solutions for the developing world

The Grundfos LIFELINK approach is a solution for regulated, sustainable water supply in both community based water projects and for public or private water service providers.



## WATERSPOUTT

### Solar rainwater reactor

The WATERSPOUTT project's main objective is to provide safe drinking water to communities in South Africa and Uganda who would otherwise rely on untreated or unsafe water sources.



A key project output of WATERSPOUTT is the development of technology that purifies unsafe water at household level post collection. Relying on a process known as solar disinfection, three technologies have been developed that have the potential to improve water quality to levels that are safe for drinking.

Stored water is at risk of contamination from a range of pathogens which can make water unsafe for drinking or cooking. The WATERSPOUTT solar rainwater reactor application aims to combat this by using solar compound parabolic collectors or other low-cost reflectors that increase solar light collection and radiation exposure of stored water. This process has the effect of inactivating waterborne pathogens, or disinfecting the stored water. Reactors that make use of this process have been developed by the WATERSPOUTT project that are capable of providing up to 125 litres/day of drinking water.

Of interest from a community uptake and buy-in perspective is the perceived high value of this technology, which leads to associated social prestige if a household owns such a unit.

Plastic jerrycans are widely used in sub-Saharan Africa as water containers and for water transport, but are easily contaminated. WATERSPOUTT has specifically designed a prototype 20 litre jerrycan which is aimed at maximising solar exposure and therefore disinfection. Given the prestige associated with 'modern technology' and the ceramic filter prototype, the WATERSPOUTT design team has emphasised the importance of liaising and working closely with community leaders and potential users, rather than merely modifying existing jerrycan designs from opaque material to transparent. This is aimed at ensuring that the technology meets the needs of target communities and that it is 'socially' accepted.



Source:

WATERSPOUTT - H2020 project N° 688928: [www.waterspoutt.eu](http://www.waterspoutt.eu)

# Development of sustainable drinking water quality solutions for rural communities in the developing world

- *Moringa oleifera*



In the absence of safer options, many developing countries rely on untreated or unprotected sources of groundwater, such as shallow wells that are potentially contaminated. Research by Leeds Beckett University and the Polytechnic University of Malawi has recently focused on the potential of natural plant extracts to purify water. As a baseline exercise, this study showed that approximately 95% of all the wells that were tested failed to meet safe drinking water standards for untreated water in the wet season, while about 80% of the wells failed to attain these standards in the dry season. The most effective method to remove bacteriological and physical contaminants (the most common sources of contamination of shallow wells in Malawi) is through the process of coagulation. Coagulation is normally achieved by adding aluminium sulphate or ferric sulphate to contaminated water, but these chemicals are relatively expensive and often not logistically available to rural communities. The aforementioned study has shown that a natural plant extract in the form of *Moringa oleifera*, which grows wild throughout rural villages in developing countries, can be used to improve water quality by between 80 and 94%. The coagulation performance of *M.oleifera* is roughly equal to that of its synthetic chemical counterpart, aluminium sulphate. While the addition of natural plant extracts such as *M.oleifera* can considerably improve the quality of shallow well water, the application and detailed methodology of this process has yet to be developed to the point of commercial sustainability.

Source: Pritchard, M., Edmondson, A., Craven, T. and Mkandawire, T.(2015) *Development of sustainable drinking water quality solutions for rural communities in the developing world*. In: Gorse, C and Dastbaz, M (eds) International SEEDS Conference, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

