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Clean water and sanitation

SDG 6: Ensure access to water and sanitation for all

Image by World Bank, Flickr.

www.research.uct.ac.za/research-report-2015-16

Newsbyte

Water is high on UCT's research agenda

Removing pollution from water and turning waste into value

Research based on work done by Professor Alison Lewis and her team in the Crystallisation and Precipitation Unit (CPU), is being used at Eskom's R8.3 million pilot eutectic freeze crystallisation plant. The research, funded by Eskom, removes all pollution from the water, solidifies it into pure salts and cleans the water so it can be reused in the power plant.

Using a technique called eutectic freeze crystallisation, Lewis and her team, Hilton Heydenrych, Benita Aspeling, Jemitias Chivavava and Genevieve Harding, have pioneered a way of turning contaminated mine water into clean potable water and individual salts.

This involves freezing out fresh water from the hyper-saline brine that makes up acid mine drainage, before separating out the individual salts by freezing them at individual (eutectic) temperatures. It produces hardly any toxic waste. The outcome is water clean enough to return to the environment, and salts (such as gypsum, used in building) that can be recycled. "Acid mine drainage is talked about as toxic waste, but it's 98% water. It's about turning waste into value," says Lewis. She claims that 99.9% of polluted water can be reused.

Lewis received a prestigious Water Research Commission (WRC) award in the category of New Products and Services for Economic Development. "It is very exciting to see our years of research being put to use. Last year, Eskom consumed 298 billion litres of water; the plant will allow it to improve its consumption of fresh water, and to start using polluted mine water. It's cost-effective and environmentally friendly."

Based on a story by Andrea Weiss.

Young researcher develops cost-effective solution for treating municipal wastewater

Wastewater management is integral to access to clean water and sanitation, and in preventing pollution. Increasing levels of sewer pollution require sustainable wastewater treatment solutions.

Dr David Ikumi is committed to tackling this challenge. "The struggle for a clean, ample supply of water for sustaining life continuously intensifies; there is a necessity for effective conservation, management and distribution of our water resources," he says.

Ikumi's research focuses on the mathematical modelling of wastewater treatment systems, in particular, bioprocess modelling, based on the recurrent behaviour of microorganisms that mediate wastewater treatment in various environments. This involves attempting to virtually replicate behavioural patterns in the development of mathematical models. "It's similar to assembling pieces of a puzzle," says Ikumi.

Biodegradability defines the extent to which organics that enter unit operations of the wastewater treatment plant can be broken down. In a unit process, the unbiodegradable particulate organics usually become enmeshed with the rest of the sludge mass. The remaining biodegradable particulate organics, when broken down anaerobically, provide energy in the form of methane and carbon dioxide production. The models can aid the design of ideal treatment systems and may optimise operations.

Under the leadership of Professor George Ekama, the Water Research Group has been developing mathematical models and wastewater treatment system configurations that are used internationally. "We are continuously asking ourselves exactly what the wastewater treatment systems of the future should look like", says Ikumi.

Based on a story by Chido Mbambe. Photo Michael Hammond.

Future Water

Early in of 2016, UCT announced the establishment of the Future Water research institute, which seeks to develop new approaches to the ways in which water is managed, thus meeting the challenges of water scarcity and ensuring equal access to this precious resource.

Future Water is a transdisciplinary research institute, under the directorship of Professor Sue Harrison from the Department of Chemical Engineering.

It integrates the work of researchers across 10 departments and five faculties. Research addresses water scarcity within an overarching systems framework that includes the effective integration of urban design, planning and management, in order to facilitate a change in urban areas from 'water-wasteful' to 'water-sensitive'. Supported by strong sociological, technical, environmental, legislative and governance expertise, it aims to understand different perspectives of water use in both urban and rural settings, and focuses on providing for people, industry and the environment.

In particular, the Institute addresses the government's development-oriented goals and the need for efficient resource use, social equity and poverty alleviation, focusing on 'new' water resources, water-sensitive management, maximising value from minimum resource, and building resilience and strengthening governance.

The goal is to recognise resource scarcity, but ensure that all people have access to water of sufficient quality.

Novel use of cell-phone technology to help rural communities with water management

In 2015, Information for Community Services (iCOMMS), an interdisciplinary research group, received an award from the Water Research Commission (WRC) of South Africa for its novel use of information communication technologies (ICT) to help rural communities and municipalities to improve water service delivery. Founder and team leader, Professor Ulrike Rivett, says: "We started off by developing mobile applications for water quality management, which were implemented in Asia and Africa. Today we are able to understand ICT and its potential in far more detail." Some of the projects undertaken by iCOMMS in the past year include:

World Bank Study

iCOMMS partnered with management consulting firm Cowater International in a World Bank project: a study in seven African countries to build knowledge and develop guidelines for the use of ICT tools and services. It investigated the emerging uses of ICT across sectors in order to improve the planning, implementation, monitoring, management and regulation of and accountability for water and sanitation systems.

DropDrop

iCOMMS developed an Android phone application, DropDrop, to help individuals track their water consumption. The app allows users to access information on their daily water usage, predicted end-month water bills, water conservation methods, municipal contacts and the water system. The application does not require internet access to function, making it useful in communities with limited or no internet access. The iCOMMS team collaborated with the City of Cape Town municipality to assess the impact of Drop Drop on water demand management and water conservation at household level.

Eastern Cape Research

In collaboration with the Nelson Mandela Metropolitan University, iCOMMS conducted a study for the WRC in the Cacadu District of the Eastern Cape, to empower communities by investigating if and how ICTs can give them a voice in local governance. It contributed towards understanding how to engage rural communities as key stakeholders in water supply management, and provided scientific evidence for the use and usefulness of ICTs in rural community engagement in the water, sanitation and hygiene (WaSH) sector. By developing an ICT tool that can be used anonymously to report problems, the research left communities feeling more empowered to raise concerns and report faults in water supply.

Based on a story by Carolyn McGibbon.

Thought leader

Will SDG 6 improve access to water and sanitation?

Access to water and sanitation was one of the targets under Millennium Development Goal (MDG) 7, on environmental sustainability. By the end of 2015 we had seen mixed results. The target of halving the proportion of people without access to improved sources of water was met five years ahead of schedule, but – according to the United Nations (UN) – 2.4 billion people globally still lack access to basic sanitation. Loretta Feris argues that SDG6 has the potential not only to increase the number of people who have access, but to make it more equitable.

During the period of the MDGs, a UN General Assembly resolution recognised human rights to water and sanitation; which was followed by an affirmation by the Human Rights Council (HRC) that the rights to water and sanitation derive from the right to life and the right to human dignity, as well as "from the right to an adequate standard of living and ... the right to the highest attainable standard of physical and mental health." This creates clear and substantive obligations on states to respect and promote the right to sanitation. Having made these strides, the question arises whether the SDG on water and sanitation, SDG 6, will advance the gains made so far.

We have seen some significant differences between the MDGs and SDG 6 that provide grounds for optimism. Under the MDGs, the water and sanitation target was framed rather simplistically: to "halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation". The target did not require an assessment of which sectors of a population would gain access. Furthermore, the MDGs focused mainly on poverty and health: environmental concerns were underemphasised.

It is clear that issues of universality, equality, vulnerability and the environment have been taken into account in the targets set under SDG 6, and the adoption of a human right influenced its framing. Specific targets include the need to achieve universal, equitable access to safe and affordable drinking water; and to provide access to adequate, equitable sanitation and hygiene, with special attention to those in vulnerable situations. The inclusion of the need to strengthen the participation of local communities will strengthen targets related to universal access. It also includes targets related to integrated water-resource management, water quality, the protection and restoration of water-related ecosystems, and increased water-use efficiency to address availability of water – in particular, water scarcity.

> "The SDGs shift the responsibility from developing countries to all states; it is a global responsibility that needs to be taken up by both state and non-state-actors."

More than a numbers game

What are the implications of this framing? It requires that states and non-state actors engage with both the human-rights and environmental dimensions of SDG 6. Meeting the target becomes more than a numbers game; and states must consider not only how many, but who will gain access to water and sanitation. It also requires that states ensure the protection of water, and of all aquatic ecosystems that are used in sanitation or act as receptors for sewage systems; incentivise the quest for alternatives to waterborne sanitation; and stimulate much-needed research on the suitability of more sustainable sanitation solutions.

Finally, the SDGs shift the responsibility from developing countries to all states; it is a global responsibility that needs to be taken up by both state and non-state actors. Funding for meeting SDG 6 will have to come not only from states, but also from development banks, national development agencies, donor funding and the private sector.

Loretta Feris is a professor of law and director of the Institute of Marine and Environment Law. Image by Pixabay.