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ZERO HUNGER SDG 2 TARGET PUSHED FURTHER OUT OF REACH BY COVID-19

BY DI CAELERS

The world is going "in the completely wrong direction" in its bid to achieve the Zero Hunger Sustainable Development Goal (SDG) 2 by 2030, and is also woefully off-track for SDG 6, ensuring water and sanitation for all by that date, if the current trajectory continues.

That was the stark warning sounded by leading hydrologist Professor Stefan Uhlenbrook, managing director of the International Water Management Institute, in his keynote address on the second day of the Water Institute of Southern Africa's (WISA) 2020 online annual conference. Entitled "Manage the Water We Eat", his address raised significant concerns around sustainable management of water across the globe, and the need for a transformation agenda.

Food insecurity and malnutrition, intrinsically linked to water availability and resources, is on the increase, accelerated by the onset of the COVID-19 pandemic, Uhlenbrook stressed. While incidence had decreased over recent years, almost 40% of people living in sub-Saharan African are still categorised as living in extreme poverty.

"Due to COVID-19 and the consequent economic crisis, we are now seeing drastic increases, with tens of millions of people being pushed into extreme poverty. Globally, about a quarter of all people suffer as a result of moderate or severe food insecurity, but in sub-Saharan Africa that figure is 50% - and it's likely to increase further," he told the meeting.

This major challenge for society lay in the fact that progress towards the Zero Hunger SDG target was not only slow, but "going in the completely wrong direction", he added, pointing to the nexus between climate change, water security, food insecurity and malnutrition.

"Water resources and solutions are required in the whole value chain of the food system if we are to achieve the outcome of a stable food system for all. This is particularly critical considering forecasts that the number of dry days in sub-Saharan Africa, which impacts rainfall and consequently harvests, will increase significantly over the next years."

COVID-19, said Uhlenbrook, had demonstrated deep inequalities within society, but not only in respect of medical treatment and care. The global recession and shrinking of the economy in 2020 would continue to have a negative impact into the future, with the predicted failure to realise the SDG water goals by 2030 compounding the situation.

Commenting during the panel discussion highlighting ways to sustain South Africa's water resources that followed Uhlenbrook's address, Dr Kevin Winter, of the University of Cape Town's Future Institute, added his voice to the warning. "The stark reminder that we are not going to make the SDG of food security by 2030 should galvanise us all into action. This is a really urgent matter, particularly considering the growing number of people rapidly migrating into South Africa's urban areas."

Future food security systems, he said, needed to embrace society's poor and most vulnerable as part of the solution, especially young people.

"It's critical that we address this rift in vision in respect of encouraging people to enter the very exciting arena of food production, making it clear that this is not only an issue of a career, but also the opportunity to make a very important contribution to growing food for the nation," Winter commented.

SOUTH AFRICA'S WATER SECTOR RIPE WITH INVESTMENT OPPORTUNITIES

Equitable access to water and sanitation for all South Africans comes with a multi-billion rand price tag. But for willing to investors, and businesses in the urban water space, the opportunities are substantial.

Water efficiency, GreenCape water analyst Ashton Mpofu told today's session of the Water Institute of Southern Africa's (WISA) 2020 annual conference, is one of three significant investment opportunities in the sector highlighted for inclusion in the country's Renewable Energy Master Plan (SAREM).

The first industry working group meeting towards the development of SAREM was hosted remotely in August. One of 14 industry-specific master plans in progress since July last year, it falls under the reimagined Industrial Strategy of the Department of Trade, Industry and Competition. Key stakeholders involved in the need and opportunity for a renewable energy masterplan include various government departments and entities, civil society, labour, industry experts and academics who have offered their time, research and insights to help lay the foundations.

"We need to reduce water losses due to ageing infrastructure. But large amounts of water are also stolen, lost through leakages or faulty metering," he stressed. In the 2018/19 financial year, these losses amounted to R6.6 billion.

Describing this opportunity as "low-hanging fruit", Mpofu urged municipalities to focus their efforts – and investment – on addressing the situation, which he said would contribute positively to ensuring sufficient water supplies for the nation.

"Among the current barriers to success is that 41% is the current national average loss of non-revenue water, and the master plan wants to the see the country reduce that figure by 15% by 2030.

"To reduce that figure to 26% by that time, we need investment For this opportunity, we need investment of just under R1billion, But that will translate to potential savings of R6 billion a year," he pointed out.

This would require efforts to overcome shortcomings in terms of technical capacity, but also a focus on locally-proven technologies that enjoy broad public acceptance.

Meanwhile, with eight to nine million South Africans living without access to safe sanitation, the status quo presented a second significant opportunity with a market potential of some R41.4 billion, Mpofu continued.

This was in reference to non-sewered sanitation systems, more commonly known as "alternative sanitation", which is the daily reality for 2.8million households, according to the 2018 General Household Survey. He explained that this situation is driven by issues including informal settlements on private land, lack of bulk infrastructure, problematic maintenance of that infrastructure, and the increasing migration of people to urban areas.

"But if 2.8 million households don't have access to safe sanitation, that translates to a market potential of R41.4 billion. Cape Town has the largest investment potential because it has the largest number of bucket toilets," he added.

Mpofu also pointed to the lack of wastewater sludge beneficiation, or using the sludge for a beneficial purpose, as the third significant investment opportunity. Currently, most

BY DI CAELERS

wastewater sludge ends up in landfills in South Africa, when it could be diverted to be turned into fertilisers and similar useful products.

"We need to promote acceptance of such value-added products in the market. Tshwane has an agreement to provide sludge to be used to produce fertilisers, but it's something we can do as a country," he said, adding that the aim was to achieve 50% diversion for South Africa by 2022. This would save South Africa average annual disposal costs of R300 million.

These major opportunities, Mpofu stressed, not only offered significant investment opportunities, but could play a key role going forward as South Africa innovated in order to provide safe water and sanitation for every one of its citizens.

WASTEWATER: A SOURCE, NOT A PROBLEM

BY SUE SEGAR

Most people see wastewater as a problem, but others, such as Herman Smit, the managing director of Quality Filtration Systems (QFS) in Cape Town, believe waste water is a source of water that can be reused.

According to Smit, the reuse of water in smaller decentralised plants is an answer to drought relief.

In a session titled Wastewater Reuse Decentralisation: The Answer to SA's Water Shortages, Smit said traditionally, municipalities have preferred "mega-projects" to treat wastewater at one spot. However, this function should be decentralised for a number of reasons, Smit argued. "Instead of pumping the wastewater to a mega plant and then having to pump it back to the mega users, why not localise it? We are busy with some localised projects where we are seeing quick turnarounds and lower costs.

"We see wastewater as a source, not as a problem. A lot of wastewater plants don't get upgraded as these mega projects are so huge but every town has a central place where wastewater collects. It is much easier to treat it locally and to reuse it as irrigation water," he said.

Smit said his company is treating wastewater back to drinking water in three plants in South Africa.

"Some people think this is unheard of to reuse it back to drinking water but this is what is happening. We have the technology to do this and it has a smaller footprint than the bigger mega projects. …

Smit said a great deal of water loss is through leaks in the pipes, with some South African municipalities losing up to 40 percent of water through pipe leaks.

"About two years ago, there was a big drive from the Water Department to train people for leak detection. Why install 40 km worth of pipe work and maintain it if we can localize and decentralise small volumes for communities to use? Mega projects are an archaic way of looking at water treatment," Smit said.

Smit said South African authorities should make use of the example set by the United States and some other countries which have spent a lot more money on research and development of technology used for water reuse.

"We must not be foolish reinventing the wheel. Let's rather observe what happens in first world countries and learn from them," Smit said.

Smit cited a quote by the French explorer and conservationist Jacques Cousteau: "Water and air, the two essential fluids on which life depends, have become global garbage cans."

"The quote refers to how we handle our waste. There is not a good picture of how we are doing this in the world."

Smit said what is needed to address South Africa's water crisis is "a few disruptive thinkers to look at how we change tack and provide solution-driven answers to this big problem.

"The government always talks about the food, energy and water nexus but I think water is being left behind," he said.

"I want to put people's attention to where will water be sourced in the future. The common man will say it will be sourced from rivers and dams but these are not the only sources we should concentrate on. The sources we are able to use are dams, rivers, boreholes, the sea and wastewater. All those sources of water have to be utilised.

"Conventional water sources – the dams and rivers – have to be augmented by new sources."

THE UNHARVESTED POTENTIAL OF STORMWATER

BY LYNNE SMIT

In a drought prone region like Southern Africa, it is important to focus on all potential water sources, including those that have been neglected.

Stormwater run-off for example has the potential to expand supply at a small and large-scale to previously unserviced citizens without placing further strain on already overexploited surface water resources in many parts of South Africa.

Dr John Okedi Senior lecturer at the University of Cape Town and a core member of the Future Water Institute explained in his presentation how the drought experienced in Cape Town from 2015 to 2018 was a catalyst for research into stormwater harvesting as a means of boosting the limited water resources in the city.

"At the time there was no mention of stormwater harvesting, and we think this was really a missed opportunity," he said.

"Even with the increase in desalination, there was always a mismatch between how much could be supplied and the demand. We think stormwater harvesting is an opportunity to bridge that gap."

Okedi's study focused on the identification of suitable stormwater storage facilities, the level of reliability of the water from the storage and the cost effectiveness of the storage options compared with what the city of Cape Town was proposing at the time.

The study showed that there were clear opportunities for the storage of stormwater, especially in detention ponds, many of which are mostly dry throughout the year.

These natural and constructed wetlands have the additional benefit of providing both flood control and water quality improvements. The large shallow lakes in the Cape Town catchment area also provide an excellent opportunity for the storage of stormwater run-off.

There is a caveat however. Okedi reminded delegates that the detention ponds were originally constructed to manage flooding and that any storage plans would need to include a control strategy that would hold water in upstream storage until there was capacity in downstream locations.

The results clearly showed a big opportunity for storing non-potable water for agriculture, residential garden and toilet flushing, and the irrigation of public open spaces.

An additional benefit is that water stored in this way will percolate into the aquifer, especially when bio retention cells are installed, thereby replenishing the water levels, he said.

FOR GREEN INFRASTRUCTURE TO WORK, YOU NEED TO PLANT THE RIGHT SPECIES

BY MORGAN MORRIS

On the surface, using plants to remove toxic metals and pesticides from the soil sounds like a silver bullet – an environmentally sound approach to combatting pollution.

But choose the wrong plant and you might trigger a cascade of unforeseen consequences.

So cautioned Mr Dylan Jacklin, a PhD candidate in the Department of Civil Engineering at Stellenbosch University, in his opening day presentation titled 'Selecting Indigenous South African Plant Species for the Phytoremediation of Polluted Urban Runoff'.

Urban stormwater runoff from rooftops, roads and other surfaces, explained Jacklin, is considered the leading cause of poor water quality in natural and semi-natural systems, picking up and releasing large amounts of contaminants.

"A potential solution to urban water-caused pollution is green infrastructure (GI), which offers a novel and sustainable approach to polluted water and soil systems," he says.

This involves the use, alongside tested civil engineering methods, of plants as 'phytoremediators' to destroy, inactivate or immobilise contaminants. But that's easier said than done. The wrong plants not only produce inefficient GI systems, but also risking the spread of aggressive invasive species.

"Species selection must consider species that are naturally acclimatised to recipient ecosystems and do not threaten the natural biodiversity," says Jacklin.

With this in mind, he and others have developed, as a case study, a Phyto-guide that identified 78 indigenous plant species in the Western Cape with proven phytoremediation properties.

FOR WATER PROVISION, THERE'S MUCH TO BE LEARNT FROM COMMUNITIES

BY MORGAN MORRIS

It's one thing, no mater how admirable, to provide water to communities; but there's a lot more to be gained when they are full participants in that process.

So argued Ms Virginia Molose, research manager at the Water Research Commission (WRC), in her presentation – 'Alternative Water Supply: Community-led water services for multiples uses' – on the first day of the 2020 Online Conference of the Water Institute of Southern Africa (WISA).

To back up her argument, Molose cited a project that the WRC had started in six villages across two district municipalities in Limpopo, an initiative supported by the African Development Bank. The aim of the project was to put in place water infrastructure – from reservoirs and water storage facilities to standpipes – that could be used for multiple purposes in these communities.

Communities not only used the water in their households, but also for their crop and livestock farming.

The benefits of alternative and reliable multiple-use water services (MUS) are manifold for such communities, explained Molose. Among these is that it contributes to improved health and food security, and even provides employment in its construction phase. "Most importantly also, it serves the unserved – communities who have not been reached by municipal services," she said.

But the 'how' of providing MUS is as important as delivering on it, as the approach assumes elements of self-supply and participation.

So starting in 2017, the WRC had implemented the projects across six stages. This incorporated the introduction of MUS to the communities, which involved creating an MUS forum; a diagnosis of what was required; drawing up a solution, which included developing capacity within communities; developing up a plan that included a financial framework; the implementation and construction of the technology; and finally using the alternative water supply.

"The last phase is actually a reflection of what communities say, as users, of the improved systems, whether they for themselves see improvements in water supply - whether the water that is supplied is sufficient, and whether it meets their multiple use needs."

From the initial baseline study kick-started the project, it was clear that community participation was essential, said Molose. "In there it was very clear that communities have their own ideas - plenty of ideas - how they infrastructure could be implemented in their own communities. They were quite innovative."

And the project is paying off in communities. Not only do they now have a ready supply of clean drinking water, but the reliability of the water supply has improved their livelihoods as well, early findings suggest.

"Working in this way, not only are you leaving infrastructure behind," says Molose, "but actually you are leaving also well-capacitated communities who'd be able to look after their project, but also would be able to generate some form of income using the skills that you have impacted."

BIG DATA AND SCIENCE GO HAND IN HAND IN WATER-QUALITY SURVEY

BY MORGAN MORRIS

Citizen science again proved its value when, in a study conducted by a team from the University of the Witwatersrand, community members' perceptions on the quality of water from an aquifer dovetailed with international datasets.

In his presentation – 'Towards Big Data Analytics and Citizen Science for Extracting Value from Water Datasets: The Ramotswa Aquifer case study' – Prof Hlanganani Tutu of Wits' Department of Chemistry reported on a study incorporating citizen science, water datasets, and their own analysis on the quality of water from an aquifer. Aquifers are defined as underground layers of water-bearing permeable rock.

In this case, citizen science took the form of interviews with community members who consume groundwater from the 'transboundary dolomitic' aquifer – named after the rock formations underpinning the aquifer – known as the Ramotswa Aquifer.

The aquifer spreads across the North West Province in South Africa and in the South East district in Botswana. This valuable water source is, however, under threat from increased bacterial contamination and discharge from industrial and agricultural activities, as well as from landfill sites.

In the citizen science interviews, the Wits team sought to get community members' perceptions of the taste and colour of the water. They then matched their findings from those interviews with (1) the International Groundwater Resources Assessment Centre (IGRAC) dataset on the aquifer, as well as (2) their own confirmatory studies, which involved sampling, analysis and modelling of the water.

The team also incorporated their own 'citizen science', ie their own perceptions of the water quality. For purposes of the study, both sets of interviews were converted into numerical values and put into a big data framework using text mining, ie the use of keywords in the interviews.

There was one added layer to the study. As the IGRAC dataset missed critical values on the Ramotswa Aquifer, they had to rely on IGRAC data on the Ngaka Modiri Molema District Municipality, also in the North West Province, using what's known as 'transfer learning'.

In transfer learning, known data from a similar environment are applied to the environment for which data is missing. (There has to be some level of verifiable confidence that the data is transferrable.)

The study showed that, yes, citizen science can successfully be built into big data analytics, reported Tutu. Both techniques found that the water from the aquifer was 'hard' but useable for households.

"Our own confirmatory survey, including water sampling, analysis, hydrochemical modelling and our own 'citizen' science assessment of the water, did correspond with or corroborate the community citizen science, and also did corroborate the analytical data in the datasets," he said.