



CAPE TOWN NEEDS PERMANENT SOLUTIONS FOR WATER CRISIS



As Capetonians were lauded for halving their daily water consumption, mostly in a precedent-setting 12 months between February 2017 and 2018, the city has been cautioned that the realities of climate change call for permanent solutions to avoid running out of water.

The warning was sounded by scenario planner and futurologist Clem Sunter, who delivered the keynote address during the opening plenary of WISA 2018, the Water Institute of South Africa's biennial conference which continues until Wednesday at the Cape Town International Convention Centre.

Sunter said he was extremely impressed at the efforts of ordinary Capetonians who united to see the city more than halve its daily water

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consumption over the past three years, from 1.2 billion litres daily in February 2015, to 511 million litres a day by March 2018. More impressive was the fact that of the total decrease, 400 million litres per day were saved in the single year to February 2018.

"I don't know how many major cities of the world could have done something like that in such a short space of time," he said.

However, Sunter told the session, climate change meant while Cape Town was currently enjoying downpours that had refilled the dams to 38%, less frequent rainfall would be a future reality for the region.

“Day Zero must be avoided at all costs. It would be a disaster for people,” he said, adding that water needed to be treated as “liquid gold”.

“We will have nature’s gift as a short-term solution where it does rain, but we can’t rely on nature’s gift. We need to ramp up water saving efforts even further and, in the long term, look at what that liquid gold means to us, and how we can avoid becoming a ‘lost city’ here in South Africa,” Sunter said.

The solution, he suggested, lay in the ability to “fit in” and adapt to environmental changes. This was not something that could be “put off” for later either.

“This is really serious stuff,” Sunter warned.

Western Cape Premier Helen Zille, who together with national Minister of Water and Sanitation Gugile Nkwinti comprised the rest of the panel during the opening session, reiterated Sunter’s call to plan for a long-term water saving strategy, saying Cape Town had to learn to become a resilient city if it was to stand the test of climate change.

“The dams are now 38% full, compared to this time last year when they were 28% full. It’s very tempting to drop the stop-start showers and not to stand in a bucket to collect the run-off, but we have to keep doing these things because while we’re having good rains this year, we can’t rely on the same for next winter,” she said.

Zille also addressed the criticism levelled at city and provincial authorities about lack of adequate forward planning and apparently slow movement



Premier Helen Zille. – Picture by Wempic Photography

on the introduction of alternative solutions such as desalination. She said the Western Cape had struggled with multiple views and expert opinions, grappling with cost analyses and questions of sustainability.

She pointed to Australia, from where she said they took their lead. That country had warned authorities here not to rush into desalination solutions, which ended up lying idle when the rains returned to the areas in that country where they were established at significant cost.

“We had to consider carefully whether we could justify that spend in the bigger picture of getting the balance right, especially in South Africa where there is huge demand in a rapidly urbanising society,” Zille said.

She also raised the issue of split responsibilities for water in South Africa, where the national government has responsibility for the bulk water supply, while local governments must clean and deliver the final product to end users.

This threw up difficulties in terms of duties and delivery, a hurdle acknowledged by Nkwinti, who told the conference he had written to the premiers of all nine provinces to ask them to work with him to address the crisis, considering South Africa was the 30th driest city globally.

“We cannot continue to work in silos, he said, adding that his future strategy included the establishment of a national water resource authority, a national water resources and services regulator, and a resource value chain far more streamlined than the current model with its 428 different entities.

“We need to institutionalise water saving throughout the country, and we need all the premiers on board to achieve this, working together to effect concrete change,” Nkwinti said.



Minister Gugile Nkwinti. – Picture by Wempic Photography

SOUTH AFRICA AND NETHERLANDS SIGN WATER SUSTAINABILITY MOU

The Netherlands and South Africa cemented their joint commitment to sustainable water management efforts, continuing a co-operation commitment that has generated water sector investments worth nearly €11million over the past four years.

The new four-year MOU was signed during a press conference on the first full day of the Water Institute of South Africa's WISA 2018 conference, by South Africa's Water and Sanitation minister Gugile Nkwinti and Henk Ovink, Netherlands special envoy for Water Affairs.

Nkwinti said he was delighted at the decision to extend the co-operative agreement, which was making a fundamental difference across the nine provinces in the effort to institutionalise a culture of water saving.

"I am very excited to see this continuing for another four years," he said.

The Netherlands is a market leader in integrated water management skills and innovative water technologies, with its total current commitment to South African water projects standing currently at about €30million. In total, the projects generate about €90million in investments in South Africa's water sector, excluding

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investments from the Dutch private sector.

Among the host of projects, which Ovink said were spread throughout South Africa, is the ORIO programme, a big infrastructure development programme involving the provision of sanitation to informal settlements and providing off-grid solutions to remote villages, among other things.

The Kingfisher programme supports the South African Catchment Management Authorities, while the MOU

has also facilitated the establishment of a Centre of Expertise, hosted by the South African Local Government Association (Salga), in Pretoria. The centre identifies needs in the water and sanitation sector, then links these to Dutch innovative solutions.

Ovink said much had been accomplished in the first four years, including a nearly complete Water and Sanitation Strategic Plan for South Africa.

"Looking ahead, it is all about implementation, and we are looking forward to seeing all the planning finally put into action," he said.



Minister Gugile Nkwinti and Henk Ovink sign the MOU. – Picture by Wempic Photography

THERE'S BRASS TO BE MADE OUT OF "BROWN GOLD"

Municipalities and entrepreneurs must start to view human faeces and urine as "brown gold", rather than seeing its disposal as a problem, says Jayant Bhagwan of South Africa's Water Research Council (WRC).

With up to 13 litres of water – or as much of 25 percent to 35 percent of all domestic use – being used for flushing toilets, it was time for cities to move on to non-water toilet systems, he says.

"And that's to move around 150g to 200g of human waste ... and then we use another 150 to 200l to convey it down the system." But turning human waste into products could

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create thousands of new jobs, says Bhagwan.

Bhagwan's message is simple: human waste is a valuable commodity that can be monetised for profit, rather than soaking up valuable water resources.

Many of the sewers in use in cities around the world pre-date "bathrooms as we know them" and water sanitation accounts for 60 percent of the cost of disposing of human waste. "Yet people are conditioned into viewing flush toilets and centralised sewage treatment works as the preferred options ... the Gold Standard ... while the

poor are excluded."

And as the world runs out of its traditional sources of energy, potable water and plant nutrients, the water resources are declining, energy costs are rising and climate change is an issue. Yet the basic design of toilets have hardly changed over the past 200 years he says, adding that current types of toilets, including flush and chemical toilets, pit latrines and septic tanks were "full of problems".

An example of an innovative solution and design is the Arumloo, which has the same lines as Cape Town's arum lily. It uses just two litres for a full flush and the designer is trying to reduce this to just half a litre a flush. Other innovative systems that are showing promise include experimenting with drying, dehydrating, biological, carbonisation, combustion, solar and thermal treatment for the disposal and repurposing of human waste, says Bhagwan. Some prototypes of different new age toilets are already being tested in South Africa.

And a South Africa-designed system that transforms faeces into carbon is being used in Uganda to help create "EntrePOOnership", joked Bhagwan. In Isipingo near Durban larvae of black soldier flies are being used to process faeces into commercial products similar to palm oil,



while a fragrance company is considering using a charcoal byproduct produced by the larvae in its products.

Human waste is a “major global opportunity and resource” and service providers and business need to adopt a new paradigm ... they need to think of being in business and creating revenue.

Ross Roberts, of Insidima Design and Development, a Cape Town-based engineering consultancy, showcased two innovative grey water products

his company has developed. One, an automated grey water toilet flushing system, is currently being piloted in Johannesburg and Cape Town. It has helped make an average saving of 2, 200 litres a month in the 20 homes in which it has been installed.

The second is a communal grey water disposal system in an informal settlement in Franschhoek where stagnant waste water was causing illness, bad smells and unpleasant living conditions.

The diverted grey water is now poured down drains dotted around the settlement, which is then used to water trees and plants. This has led to a greening of the area, less illness and better living conditions for residents.

“The best thing is that the residents have taken ownership of the system and they are also generating an income to help maintain it from the tourists who visit the area to see the project and its results,” says Roberts.

IT IS TIME TO MOVE AWAY FROM ‘PATCH AND PRAY’

The maintenance of infrastructure in South Africa has been “on the slide” for the last dozen years – and it is not getting any better.

This was the solemn warning sounded by Dr Kevin Wall, who was the lead researcher in the 2006, 2011 and 2017 South African Institution of Civil Engineering (SAICE’s) Infrastructure Report Card for South Africa.

Speaking during the session entitled Waste Not Want Not on the opening day of the Water Institute of Southern Africa 2018 Conference, Dr Wall highlighted the importance of proper infrastructural maintenance – in water and other areas of service delivery.

“We cannot afford to build only to permit decay. We want to move from a situation of ‘patch and pray’ to one of ‘find and fix’. Maintenance is crucial,” Dr Wall said.

In his presentation, Dr Wall looked at the condition of South African water infrastructure and at the results from the third national infrastructure report card.

“SAICE and the CSIR have found that since 1994 significant strides have been made to correct infrastructural imbalances. Drinking water, sanitation, education, energy and health

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infrastructure have received focused attention and government is continuing to invest at a rapid pace in infrastructure for disadvantaged communities. However the combination of limited resources, public sector restructuring, inefficiency, shortages of key skills and, dare it be said, less than optimum governance, has led to extreme pressure on the condition of the public infrastructure asset base.”

On water, he summarised the trends as follows:

- Bulk water resources dropped from a grade of D plus in 2006 to D minus in 2011 and no change from that in 2017;
- Water supply in major urban areas: stable at C plus 2006 through 2011 through 2017;
- Water supply for all other areas: stable at D minus: 2006 through 2011 through 2017;
- Sanitation for major urban areas: stable at C minus 2006 through 2011 through 2017;
- Sanitation for all other areas: stable at E through 2006 through 2011 through 2017.”

Dr Wall said that, compared to the gradings given over the years for the condition of

infrastructure for all other sectors, which have exhibited far more change both upwards and downwards, the gradings given for water and sanitation fixed infrastructure condition have been remarkably stable.

“It is of concern that the water and sanitation fixed infrastructure of the country appears to be stuck in a condition that is at best “satisfactory for now: infrastructure condition is acceptable, although stressed at peak periods” ... to “at worst, unfit for purpose (where the) infrastructure has failed or is on the verge of failure, exposing the public to health and safety hazards.”

“But it is mostly “at risk of failure, (where the) infrastructure is not coping with demand and is poorly maintained. It is likely that the public will be subjected to severe inconvenience and even danger without prompt action,” he warned.

Dr Wall said one of the main motivations for preparing the report cards was to lobby the government to focus on the importance of maintaining infrastructure.

He stressed that the stock of public sector infrastructure is “significant”.

“The current replacement cost of their infrastructure, excluding that owned by state-owned enterprises, is immense. The replacement cost of water and sanitation infrastructure alone would be of the order of R1400 billion – or half of national GDP,” he said.

“If the government spends its maintenance budget on fixing infrastructure only after it has already broken down, then it’s effectively throwing away a large proportion of that budget, funds that could rather have been used elsewhere. If infrastructure is not looked after, the people who suffer the most are the poor,” he stressed.



COMMUNITY ACTION BRINGS NEW LIFE TO CAPE RIVERS

Two once heavily polluted rivers on opposite ends of Cape Town have been brought back to life thanks to community volunteers who took ownership of the problem and worked together to fix it.

The rivers are the Liesbeek River, which begins life on the Eastern slopes of Table Mountain and flows from the Kirstenbosch Gardens to the suburb of Observatory, and the Mosselbank River at Fisantekraal.

The role played by so-called communities of practice were key in what had been achieved, Andrew Bennett, a researcher at the University of Cape Town Future Water Department, said.

“Communities of practice are groups of people who share a common concern or passion for something they do, and learn how to do it better as they interact with each other regularly,” according to 2015 research conducted by Etienne and Beverly Wenger-Trayner.

This enables collaborative process, shared meaning and values that, in turn, inspire action, according to German researcher, Professor Claudia Pahl-Wostl.

In the case of the Liesbeek River, a group of concerned residents came together in 1991 to form the Friends of the Liesbeek, with the goal of cleaning up the then heavily polluted river.

The group has had some major successes, including bringing the highly invasive purple loosestrife, which was discovered in 2009, under control. Today the Friends, supported by funding from local business along the river’s route, employs eight full-time workers to “look after and maintain the river,” says Bennett, explaining that it was a good example of a successful community of practice at work.

“Looking after their river is the core action that has held this community together since 1991. They partnered with local business that saw what was happening ... and wanted to get involved.”

Over the years The Friends have built an active and engaged community that is involved in a

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variety of activities that include holding events and “community paddles” that takes people on canoe trips down the Liesbeek to raise awareness.

On the other side of Cape Town is the poorer community of Greenville, in Fisantekraal, which formed the Mosselbank River Conservation Team to help clean up the heavily polluted Mosselbank River. The community has signed a co-operation agreement with the Provincial Government, but this was only as good as the intent and goodwill of the parties involved to make it work, said Bennett. The Greenville community undertakes a variety of activities involving the river, including successful, ongoing campaigns to clean up the pollution and garbage choking their river.

Both projects proved the worth of communities of practice in connecting people, by building trust and developing relationships, says Bennett. They also help stimulate authentic learning, generate new knowledge and promote collaborative processes within a community, he adds.

Both are proof that when communities of practice work well, they can have a dramatic effect on the environment, as it has with the revival of the Liesbeek and Mosselbank rivers.



SMART METERS CHANGE WATER USAGE BEHAVIOUR

A Stellenbosch University schools water-saving initiative has saved an impressive 95million litres in the year to June, after remarkable results at four schools involved in a pilot project prompted Shoprite to sponsor a rollout to a further 100 schools.

Schools were highlighted during Cape Town's major drought as significant water consumers, said presenter Cheroline Ripunda, a Mechanical Engineering student at Stellenbosch University, prompting her department to investigate potential savings and behaviour change with the installation of smart water meters.

According to the City of Cape Town, they supply water to 754 schools, which use an average 3.5million litres daily.

The meters, which measure and report water use by the minute, transmitting user-friendly consumption information to an internet app which alerts users to any unusual spikes in consumption, were designed and built by Bridgiot, a start-up company affiliated to the university.

Ripunda said, during a session at the Water Institute of Southern Africa's Breaking Boundaries, Connecting Ideas conference in Cape Town, that the first school to get the meter, Stellenbosch Primary School, notched up a 44% decrease in water usage. Another of the initial four schools to get the meters, Hector Peterson Secondary School in Wallacedene, saw an average daily saving of 40kl of water – the equivalent of the 87-litre daily allowance for 460 people. In financial terms, they effected a saving of an equivalent R52 000 a month.

Ripunda said the Shoprite sponsorship allowed them to extend the programme to 100 more schools, which ended in the 95Ml saving from June last year to the present day.

The issue of successfully effecting permanent behaviour change amongst water users in South Africa was an overarching theme amongst speakers throughout the session, with the SA Water Research Commission's Jayant Bhagwan

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warning that consumption patterns in South Africa remained far higher when compared to other countries. While South Africans used an average 235litres per person per day, the world average stood at a far lower 177litres. In some areas of the country, this figure was even significantly higher, up to 586 to 1100 litres per person per day.

"That's why behaviour change is very, very necessary, but it is a long-term process that requires long-term investment. It's about changing people's beliefs and some of their traditions, and that requires a new and innovative approach," Bhagwan said.

It was possible however, he added, pointing to one study in the United Kingdom in which behavioural change interventions reduced water usage by 10% (17% reduction during peak times), and saved the equivalent of nearly \$80 000.

In line with the Stellenbosch result, which raised staff and learner awareness of their water usage, Bhagwan said it was essential to create salience around personal water usage, via creative ways that influence behaviour.

He also identified prices/tax, structural changes such as water restrictions, and information and education campaigns as three crucial contributors to effective behaviour change.

When people responded to the UK survey, they cited reasons such as lack of time and disinterest for their failure to invest in changing their water usage habits.

"We need to identify ways to nudge them in the right direction, and make sure these are backed up by relevant behavioural messages they'll actually respond to.

"One good example is social comparisons, like when we show them how they're stacking up against their neighbours or others in their community. This seems to be an effective nudge," Bhagwan explained



USING FIBRE OPTICS TO DETECT LEAKS

In Pretoria alone, a shocking 75 million cubic metres of water is lost to leaks every year. In South Africa, more than a third of the country's water, an average of 37 percent, is lost through leaks.

So, what if it was possible to detect leaks well in advance, and long before such massive water losses are incurred?

A team of researchers under the direction of Professor Schalk (SW) Jacobsz at the University of Pretoria is currently investigating the use of fibre optic instrumentation for the detection of leaks in pipelines.

The research project, which was started in April 2017, is funded by the South African Water Research Commission.

Professor Jacobsz said the first phase of the project is nearly complete. It investigated leak detection using Fibre Bragg Gratings – short segments of optical fibre that reflect particular wavelengths of light and transmit all others. These were used to measure strains and temperature on pipelines and in the ground adjacent to pipelines. The next phase of the research will focus on distributed strain and temperature sensing.

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“The problem with leaking pipes is that often you have lost a lot of water before the leaking water surfaces. We know we can find leaks by burying a fibre optic cable into a pipe trench with any new pipe or we can retro fit it by burying the cable above an existing pipe, all with a view to detecting leaks in pipes. We are still researching aspects of that,” Professor Jacobsz said.

“What we want to do is feed the cables into a leakage detection centre where we would have somebody monitoring those pipes. If there is a deviation, it is then possible to send someone out to fix the leak. This early detection means we do not lose massive volumes of water.”

Professor Jacobsz said his team are currently researching the technology and indications are that it is showing great promise to work as a highly effective leakage detection system.

“I hope that, through this research, we will be able to implement workable leakage systems, and save the country an enormous amount of water and money and thereby ensure that more water is available to disadvantaged communities,” he said.