

## RESEARCH AND INNOVATION

### Study busts the barriers to implementation of water innovation

*Innovation may be our best hope for meeting the need for better, cheaper and greener water and sanitation. So what's slowing it down and who should be chivvied along?  
Matthew Hattingh reports.*



When drought strikes again, guests at Cape Town's Radisson Blu won't go wanting. A borehole beneath the posh Waterfront hotel supplies an in-house desalination plant which uses a special membrane to produce about 7 000-litres of drinking water an hour.

Also in the Mother City, University of Cape Town (UCT) engineering students have come up with a 'biobrick'. It is made in part from human urine employing a method said to be similar to how nature forms seashells. Meanwhile in Howick, designers have developed the Arumloo, a toilet inspired in form and function, we are told, by the beautiful, indigenous arum lily. It combines an effective vortex with a patented trap to provide a clean flush from a miserly 2-litres or less of mains- or grey-water.

These are just a few of the many good ideas already in service or under development in South Africa. They represent beacons of hope in what might otherwise be a gloomy landscape – the country's water, sanitation and hygiene sector. Consider this: Unless things change in the sector, and sharpish, most of you reading this (in 2023) will be *stokoud* or worse by the time all our countrymen enjoy decent toilets, basic hygiene and a ready supply of clean water. At the current pedestrian pace of progress, South Africans can only hope to achieve universal access to these services "some time after 2050", according to United Nations agency UNICEF.

Our existing waste and water systems are increasingly decrepit. Potable water leaks away in vast quantities. Sewage gushes untreated into rivers or seeps into the groundwater. According

to the Department of Water and Sanitation, more than half the country's 1 150 wastewater treatment works aren't up to snuff. And 44% of water treatment works are in a poor or critical condition. Meanwhile, the money and know-how needed to fix things is in short supply.

A 2018 department report reckoned at least R90-billion would have to be spent every year for the next decade to break the back of the maintenance backlog and to sort out other water and sanitation priorities. To put these figures into perspective, bear in mind the department's combined budget for 2023/24 totals about R37-billion. And these big bills are before we even consider the likely consequences and costs of dealing with climate change. Add to this, the migration of people from the countryside to cities and towns, and the reality that South Africa is a water-scarce country.

Which is why a September 2022 Water Research Commission (WRC) report warns that "more of the same... infrastructure, practices and processes" won't not cut it. Instead, it calls on us to find and put into place significantly better, cheaper and more green-friendly solutions.

Of course, this is easier said than done, and *Understanding the policy and regulatory barriers for water and sanitation research development and innovation implementation in South Africa (WRC Report No. 3031/1/22)* sets out to explain why.

It's a big topic dealing with a fragmented sector and the report takes a necessarily wide view as it draws on the results of a questionnaire-survey, interviews with innovators, and a review of hundreds of innovations. It notes that our water treatment and wastewater plants and the extensive networks linking them to our homes – and back to our rivers – have traditionally required big spending so had to be built for the long haul. Planning and financing such centralised systems does not encourage the rapid rollout of new technology, even as 'disruptive innovations' hold the promise of solutions to the development-financing difficulties facing our country.

The report included a detailed survey of the health, environmental and water laws; the laws that regulate local government; and the laws that put strictures on how municipalities may raise finance and how they may spend that money. We are reminded these laws are frequently not in concert. And the authors explained how even policies expressly intended to spur innovation can end up reigning it in.

"National acts and legislation have the tendency to encourage bureaucracy to minimise risk. Bureaucratic government structures aim for precision, reliability and efficiency, therefore pressing for officials to be methodical, prudent and disciplined to attain conformity. Innovation is often the opposite of conformity," the report observed.



AshrafHendricks / Groundup

*Drilling emergency boreholes in Cape Town in 2018. Emergency situations, such as Cape Town's recent 'Day Zero' scare, can make government authorities more open to implementing research, development and innovation but it is not the ideal way to spark progress.*

The authors quoted Nico Steytler, a local government law expert, who believes a plethora of policy and legislation could be suffocating or overregulating municipalities. “The long-windedness and minute detail contained in a number of pieces of legislation leave little room for innovation, experimentation, local responsiveness and discretion,” he writes. What’s more, “The ‘one-size-fits-all’ approach, which underlies all local government legislation, means the same set of rules regarding institutional structures, administrative and financial duties and processes apply, irrespective of the resources (human, financial, etc) available within the municipality.”

None of which is to suggest the report’s authors – Melanie Wilkinson, Louiza Duncker and Thandokazi Kolisi, of consultancy Sustento Development Services – favoured the wholesale scrapping of regulations and policies. Rather, they recommend review, revision and reform. And they would like to see the sector cultivate a bigger appetite for risk. “There is no innovation without failure,” as they observe.

In a telephone interview from her East London home-office, Wilkinson told *The Water Wheel* that a government-backed review should extend to strategy. It should look at how the government, working within the existing frameworks, might better support those things that make innovation possible. And by innovation, Wilkinson had more in mind than “widgets” – toilets that flush frugally, for example. While such things must be pursued, innovation was equally about finding better systems and processes, including innovative environmental policies and financing models, she said.

Crucially it was also about marketing and other tools to take us beyond research and development to “deployment/diffusion, localisation and socialisation”. Which is to say, the demanding and often overlooked business of getting innovations to users and finding ways to make them appealing, or at least more acceptable.

It was assumed that designers and developers should be taking their innovations to market. “However, experience has shown that very different skill sets are required for each stage in the water, sanitation and hygiene innovation value chain.”

We will return to the value chain concept and notions of a ‘circular economy’ later, but first, let’s consider a few things that can make innovations a tough sell. The ‘yuck factor’ was one

of the reasons the market may be unwilling or not ready to adopt disruptive innovations “which require capture, treatment, recycling and reuse of wastewater, faecal sludge, faeces or urine”. National standards, including those of the South African Bureau of Standards (SABS), were another bugbear.

The report noted that national water and sanitation norms and standards, while recognising the importance of water conservation, recycling and environmental practices, insisted on reliable and repeatable services. This led to a “reluctance to try new and relatively untried ideas”. Similarly, the national building regulations and codes, as published by SABS, promoted unity – but “innovation and unity do not necessarily go together”.

But if the existing, stultifying standards were giving some innovators a headache, then the total absence of standards for a lot of new or newish technology was the stuff of migraines for others, denying them market access. “It’s one of the biggest challenges,” said Wilkinson, “we need to adapt to South African conditions,” she said, mentioning that in the hygiene sector standards for menstrual products were adopted only a few years ago. “One of the requirements is if a product is given to the community it needs to be SABS approved.”

The report noted that health and safety regulations sometimes conflicted with water, sanitation and hygiene goals. And it quoted from the international literature, which listed “concerns about public health and possible risks associated with adopting new technologies with limited records” as among the primary barriers to innovation in the water sector.

Another barrier was “unrealistically low water pricing rates”. In percentage terms, South Africans were the least likely of all Southern and East African urban consumers to have water meters, the report said, quoting a 2019 UNICEF paper. Although those South Africans who do have meters pay higher tariffs than their counterparts in all but one of the countries surveyed, this remained insufficient to recover the cost of the service.

“Poor pricing, poor billing, and poor payment by consumers together with the increasing cost for the operation and maintenance . . . have led to financial instability in South Africa’s water, sanitation and hygiene value chains,” the authors said. This instability made it harder for water service providers and authorities to adopt innovations.

## Summary of the Water Supply, Sanitation and Hygiene (WASH) Challenge

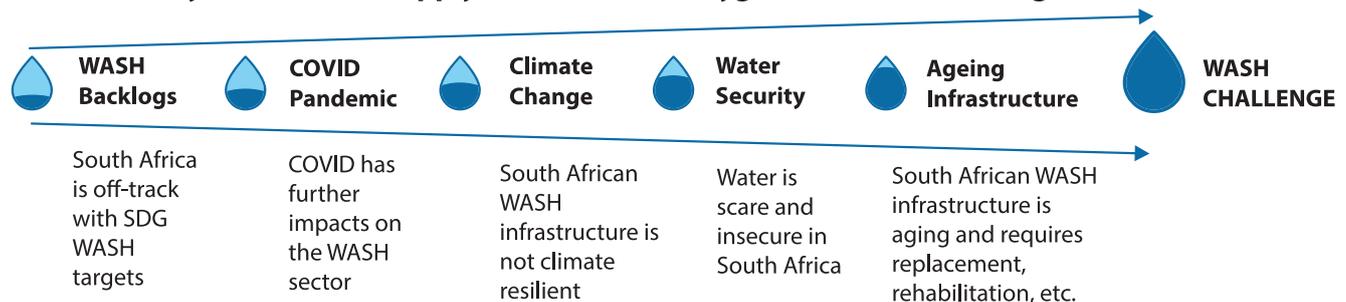


Figure 1. Why innovation is important – the WASH challenge.

*“The long-windedness and minute detail contained in a number of pieces of legislation leave little room for innovation, experimentation, local responsiveness and discretion.”*

Let’s return to the value chain, we touched on earlier. The authors use the concept, which has its origins in management science, to describe the succession of activities that take water and waste, from one ‘pillar’ to the next on its journey to and from consumers. A value chain links a water source to the conveyance pillar, which might be in the form of a bulk network and include piping, pumps and storage. Thereafter the water reaches the treatment pillar, followed by the distribution pillar and then on to the end-user pillar – households and industry. Wastewater distribution is next, followed by treatment and disposal, and ideally, reuse.

Reuse, recycling, replenishing resources and keeping waste to a minimum, the authors said, were vital if we were to achieve economic growth while protecting the natural environment and ensuring the wellbeing of future generations. Water and waste value chains needn’t be ‘linear’ – taking water from source to disposal. Innovation could reforge the chains to form part of a ‘circular economy’, wherein “the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised”.

The authors tallied 314 innovations along the different water, waste and hygiene value chains they surveyed. But while they found an abundance of innovation, it was neither balanced, nor coordinated. A “crowding” of innovation was observed at some points and pillars. There were a “significant number of water saving/reduction innovations... such as low-flow taps and shower heads and the innovations in low-flush sanitation”. But serious gaps in innovation were identified at other points, particularly at the intermediate pillars, including conveyance, water treatment, distribution to the user, distribution from the user and wastewater treatment.

More innovations were needed in green pumping and piping systems; real-time leak detection and monitoring; low-energy and natural chemical use in wastewater treatment; and recycling of treated faecal sludge from municipal facilities. There were also many unrealised opportunities for innovation in materials.

All in all, it’s a daunting to-do list. But happily, Wilkinson sees hope. She pointed to rapid changes in hygiene practice and near universal introduction of hand sanitiser sparked by the Covid-19 pandemic. She cited too the big, rapid water-saving strides made in Cape Town as “Day Zero” loomed during the 2017/18 drought.

She was excited by the range of innovations her team encountered and the new technologies emerging. These included “closed loop” and “off-grid” solutions like the all-in-one water treatment plants pressed into service in the wake of last year’s KwaZulu-Natal floods. “Next generation innovations could fundamentally change the manner in which basic water services

are provided in the country in that in-situ treatment, reuse and recycling innovations could shift the role of local government in provision of water services and impact on their regulatory role and financial status,” the report noted.

In a sense, technology may rewrite the ground rules, even as rules, regulations and policy directed technology. Among its recommendations, the report called on the government to support a review of policies and regulations. It wanted more support for innovation; better monitoring of innovations; the deployment of new and existing financing tools; and a more zealous enforcement of tariffs.

The country’s procurement policies would need a thorough wash and clean too.

As Steytler, the law expert, said in the report: “There is a balance to be struck between letting the flowers of local initiative and innovation bloom, and preventing the weeds of mismanagement, incompetence and corruption from taking over the flower beds.”

We need more arum lilies.

To download the final report, Visit: <https://bit.ly/3oJ7WuO>

