



COPING IN CAPE TOWN

Water use restrictions lead to creative conservation techniques as Day Zero looms

By Amy McIntosh

The summer of 2018 was not easy on residents of Cape Town, South Africa. Summer lasts from November through February in this city, located deep in the southern hemisphere at the southwestern tip of Africa, and this year's dry climate landed residents in a state of extreme drought.

In June 2017, the city imposed Level 4 water restrictions, limiting each resident to 100 liters per day. In February 2018, the water restrictions escalated to Level 6B, which meant a 50-liter-per-day limit for all Capetonians. The limit remains as such at press time. Overall, the city's goal is to use no more than 450 million liters per day.

The government initially projected the country would reach Day Zero on April 21, 2018. Day Zero would be the day the reservoirs reached 13.5% of their capacity and the government would shut off the municipal water supply. Residents would be required to collect their allotted 25 liters per day of water from designated water collection points. That date has fluctuated, and the current Day Zero date is

Aug. 27, 2018. Because this falls during the rainy season, officials believe the threat of Day Zero is over until 2019.

Although the date has been pushed back, residents are urged to remain vigilant in their water savings. Those who exceed the 50-liter limit risk fines and installation of water management devices. Cape Town's website is rife with resources to help residents stick to their limits, and local water treatment providers remain on hand with solutions.

Reduce, Reuse, Recycle

Gerhard Cronje, owner of Maskam Water in Cape Town, is one such solution provider. Cronje's primary business is irrigation, but during a 2005 drought, Cronje began experimenting with greywater systems. In 2010, Maskam Water began importing greywater treatment systems from a company in Louisville, Ky., and recently has been manufacturing some of the technology in South Africa.

Cronje sees three viable options for residents to conserve and reuse water: greywater recycling, wastewater—or

blackwater—reuse, and rainwater harvesting. The use of the first two technologies depends on the situation.

"It depends how easily the retrofit is in existing buildings, because many times in an existing building, you cannot split the greywater from the blackwater," Cronje said. "If it is easy to split, then the greywater system works out cheaper, but also you only recover about 75% of your water. If it is not possible to split, or if people want to reuse 100% of the water, they go for the blackwater system." Cronje finds commercial customers often opt for a wastewater reuse system because commercial buildings do not generate enough greywater for reuse.

These recycling systems allow residents to reuse treated greywater or wastewater for toilet flushing and irrigation, in washing machines, or in other applications that do not involve direct human contact.

Rainwater, on the other hand, can be treated for purposes of drinking, brushing teeth or bathing. Cronje said rainwater harvesting is especially beneficial in Cape Town's coastal communities, where most runoff goes into the sea.

"We have millions and millions of square yards of roofs in the Cape and in the country," Cronje said. "If you're inland, that water will run off into the river and will eventually run off into a dam somewhere downstream. In the coastal towns, 80% of the rainfall runs into the sea without even getting close to the dam. The more rainwater tanks we can put up, that would mean in the rainy season we can reduce our dependence on the dams."

One rainwater harvesting solution could literally be found in residents' backyards. Cronje has seen the use of swimming pools as reservoirs increase by approximately 200% since mid-2017. The treatment method is key.

Traditional swimming pool treatment methods, including chlorination and saltwater chlorination, produce byproducts that are unsafe for the environment and water that is unsafe for human consumption.

"Some people think if you have a saltwater pool you don't have chlorine anymore, and that is a myth," Cronje said. "A chlorinator splits up the sodium and chlorine and it again manufactures chlorine gas. In both instances you end up with chlorine in the water."

Maskam Water offers a treatment system that employs a combination of ultraviolet (UV) and copper treatment. The UV light only works while the pump is running, and the copper tends to stain pools when dosed at the high rate required for effective algae removal. Thus, the system requires the proper balance of components.

"[The system] uses a really high dose of UV when the pump is running, and a very low dose of copper to retard the growth of bacteria and algae in the pool while the pump is not running," Cronje said. "That means that we can usually run a pool without chlorine and without salt

PHOTO COURTESY BRUCE SUTHERLAND/CITY OF CAPE TOWN

Southern Hospitality

Known for its natural features, from scenic beaches along the Atlantic coast to the iconic Table Mountain, Cape Town has a hearty tourism industry. According to Cape Town Tourism, the Cape Town International Airport saw more than 5 million arrivals in 2017, and the monthly occupancy rate of hotels increased every month of the financial year.

While Cape Town residents are well-versed in water savings, visitors may not be. Because of this, hotels must be vigilant in maintaining their end of the water restrictions bargain. Commercial properties in Cape Town are required to reduce their water usage by 45% when compared with the corresponding period in 2015, before the drought.

Emmylou Allan, manager of the 16-room Clarendon Fresnaye hotel, said the property was never excessive about water use, but also did not tend to hold back.

"We never wasted water, but we used it as we liked and never thought we would run out," Allan said. "We watered the garden every day. If guests' cars were dirty, we washed them." They also topped up the hotel swimming pool every two days.

The hotel has since installed two tanks: one for greywater and one for rainwater. Ten of the rooms and the kitchen contribute to the greywater tank, and that water is used for irrigation. The remaining six rooms collect greywater in buckets. Rainwater is used to fill the pools when possible. Otherwise, the hotel purchases water from an outside source for this purpose. The hotel also has low-flow fixtures throughout.

On the guest side of the equation, the water restrictions are explained to each person at check-in, and Allan said visitors are excited to help out.

"People are so happy to save and try where they can," Allan said. "I have had 99% of people being super positive and happy to assist where they can (e.g., not showering too long, not changing towels and linen as often as they would normally)."

At The Table Bay Hotel, signs are posted throughout the property alerting guests to the hotel's water saving efforts. In addition to installing low-flow fixtures and collection tanks, the hotel has employed some other less obvious water-saving methods.

All fountains and water features have been turned off, the property uses waterless cleaning supplies and hand sanitizers, and a drip irrigation system is employed at the hotel's main entrance. During housekeeping and restaurant services, melted ice bucket water is collected and added to the greywater collection system.

The hotel also is investigating new initiatives, including the conversion of old boiler tanks to bulk water storage tanks, and harvesting condensate water from the rooms' fan coil units.

Much like its residential resources, the city of Cape Town provides a number of materials to help commercial properties—and hotels in particular—reduce their water use. The Western Cape Government has partnerships with a number of solution providers and an accompanying website to help building owners find the technology they need.

The Water Research Commission offers the AquaSmart Hotels Tool, enabling hotel owners to determine how water is being used in their facility and implement recommendations for further reductions. The tool also stores consumption information. It can be downloaded for free at <https://bit.ly/2qrVfDw>.



PHOTO COURTESY EMMYLOU ALLAN/CLARENDON FRESNAYE



Some Capetonians are using their pools as reservoirs. A system with ultraviolet and copper components can treat pool water to reuse standards.



PHOTOS COURTESY GERHARD CRONJE/MASKAM WATER

CAPE TOWN DROUGHT

and we can have the pool water within drinking water limits, as far as chlorine and salt is concerned.”

With this setup, residents can run their gutters into their swimming pools to collect roof runoff, topping off the pools and using them as reservoirs. The water then can be pumped back into the house to be reused, and the backwash water can be used for irrigation.

Digging In

For Capetonians with adequate land and resources, a well or borehole is an option that can reduce their reliance on municipal water.

Groundwater is not unlimited, and the water table continues to be monitored. The government requires all supplementary wells and boreholes to be metered and water use documented. It is illegal to buy or sell water from wells or boreholes without a permit, and groundwater can only be used for irrigation twice a week, for an hour at a time.

Wells are the most cost-effective solution and can be dug into sandy soils, around 30 ft deep. Boreholes, or deep wells, are more expensive, and can be dug up to 400 ft deep into clay or rocky soil.

“A well with concrete rings can cost anything from R17,000 to R20,000 [\$1,400 to \$1,650] depending on the depth and the amount of water the client requires per day,” said Gavin Bruintjies, managing director of H2O Boreholes in Cape Town. “A wellpoint can cost R5,500 [\$450] but [is] not suitable for clay or rock areas.”

Boreholes, Bruintjies said, can cost R2,000 (\$165) per

meter, starting at R30,000 (\$2,500). Economic inequality is pervasive in Cape Town, and the average annual income is R198,367 (\$16,350), so this ancillary water supply is not feasible for everyone.

Bruintjies has not partnered with a financial institution and thus does not yet offer any financing options. However, he has not increased his prices in two years.

Well water also typically must be treated, but it depends on the water quality at each site. This is an added expense, and can lead to water waste, depending on the treatment type.

Much like the exact date of Day Zero, demand for these systems has fluctuated, Bruintjies said.

“The demand was great when the council announced Day Zero,” he said. “But after [the] Day Zero cancellation and winter approaching, the demand sort of decreased.”

Taking Advice

Bruintjies sees wells and boreholes as a proactive solution for Capetonians to supplement their daily water use.

“Now that winter is approaching, Cape Town is becoming relaxed and hoping for good rains, but if we do not get good rain then everyone [will] want to wake up,” he said. “I would encourage Cape Town residents to keep on

saving water and try to reduce water usage by installing a wellpoint, well or borehole, and use water for pools, washing machine, general cleaning and toilets.”

On the solution provider level, Cronje advises dealers in drought-prone regions to take a customer-first approach to devising a solution. Rather than trying to sell one piece of technology to a customer, take their needs into account. After confirming customers are employing water-saving procedures and fixtures, then devise a custom approach.

He also advises against using reverse osmosis (RO).

“If you have water scarcity then you cannot afford to lose 50% in waste,” Cronje said. “The difference is if you desalinate the sea because then you have plenty of supply, but for any other water source I would say stay away from RO.”

Cronje personally uses a smart irrigation system, and has had a greywater system installed in his own home since 2005. In 2015 he upgraded to the latest version of



PHOTOS COURTESY GERHARD CRONJE/MASKAM WATER



Rainwater harvesting and treatment systems can provide water for direct human contact.

the system and installed rainwater harvesting devices. But Cronje’s water-saving mentality extends to his childhood.

“I grew up in a small town about 200 miles out of Cape Town, which from as long as I can remember always had water restrictions,” Cronje said. “There was always a shortage of water in town, so I grew up working water-wise in the house.”

For those in Cape Town today, the current water restrictions are likely to have a similar lasting impact. The threat of Day Zero may eventually be a distant memory, but the severe drought has made water-wise living a necessity. **WQP**

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Universal Lessons

Water experts weighed in with their thoughts of how to avoid similar threats of Day Zero in drought-prone regions of the U.S.

Gillan Taddune, CEO of Banyan Water, a technology company specializing in data and analytics, emphasized that water is a finite resource, driven by supply and demand.

“If [electric] supply is getting short, we build power plants to combat the problem,” Taddune said. “With water, we can’t just build a water plant in the middle of the grid to solve the problem overnight.”

Low water rates, lack of conservation interest, minimal rainfall and population growth are all ingredients for water scarcity, Taddune said. Municipalities enact water restrictions for a period of time and lift them once the rain picks up. The key is proactive measures, including higher prices and the use of technology to catch problems early. Similar models can be employed on a more individual level.

“Technologies can help to monitor and detect leaks in real-time and also have the ability to do remote shut-off and alerting,” she said.

Taddune said properties with high occupancy benefit the most from technology that monitors water use throughout a building. Using sensors to detect anomalies

in flow, or employing submetering to determine where the highest levels of water use are in a property can help owners gather data to detect issues early.

Anil Ahuja, president of CCJM, spoke at TEDxChicago about modeling sustainable cities after residential greywater and wastewater reuse systems. He proposed the idea of microgrids: water supply networks consisting of smaller water systems built on top of the existing water infrastructure. The network collects rainwater and stores greywater, and all water would be recycled for local use.

This method, already employed in parts of Israel and California, according to Ahuja, could be another proactive solution to the drought epidemic.

“U.S. communities in drought-prone areas need to implement laws and codes to promote recycle of wastewater for non-potable use now to avoid the Cape Town situation,” he told WQP. “[The] reason [the] Cape Town situation happened is lack of building [a] microgrid system that recycles water and adding desalination plants to produce potable water to supplement [the water supply].” Ahuja suggested requiring microgrid systems on new construction projects, and emphasized that departments of public health should universally approve the use of recycled water for non-potable use.



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