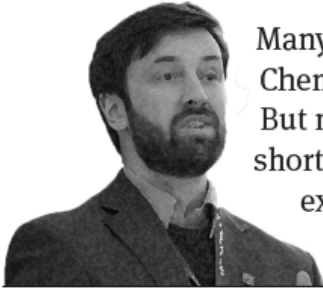


PLANNING FOR A WATER-RESILIENT FUTURE



Many cities around the world, including Cape Town and Chennai are facing life with significant water shortages. But more extreme weather also threatens the UK with water shortages, altering patterns of rainfall and bringing more extended droughts – and rainwater harvesting could offer a solution. **Peter Melville-Shreeve** reports



A water crisis is looming for countries and cities that don't prepare for it. Big infrastructure is one part of the response but it's also vital that we make better use of the water we have got. An eco estate in south Devon shows that smart rainwater harvesting can make all the difference.

Broadhempston is a thriving village set among green fields and winding country lanes. It's not the obvious place to host a smart revolution in water management. But seven years ago, six local families formed a community land

trust and built eco homes in the village. Aiming to be affordable as well as sustainable, the homes are effectively off-grid for water. The families get most of their water from an on-site borehole and return cleaned wastewater to a drainage mound.

To conserve supplies from the aquifer, the householders agreed to take part in a rainwater-harvesting project. It turned to OTA Water for advice and expertise in smart rainwater management. OTA conducted the installations as part of a University of Exeter research project for

the Centre for Water Systems under a work package of the Engineering and Physical Sciences Research Council's TWENTY65 project.

Each house has an above-ground 800-litre water tank that captures rainwater from the roof, plumbed in to a downstairs toilet. The roof serves as a hard surface to catch the water and capturing it as soon as it flows off the roof helps to prevent flooding, by holding back water from overwhelmed sewer systems.

Using rainwater for flushing toilets seems so obvious you wonder why it isn't

standard practice. You do not need highly treated drinking water, or scarce water from an aquifer, to flush a toilet.

Each water tank is also smart. Data flows back to servers minute by minute, generating enough data to enable optimum management.

Building on its work with the Met Office and Exeter's Environmental Futures and Big Data Impact Lab, OTA Water can manage tank levels. That means the rainwater tanks can be lowered immediately before a storm, maximising the water capture and, crucially, holding back water from overloaded sewers during storm peaks.

Using Internet of Things (IoT) systems to get flow data out of the tanks shows exactly how much water is being saved and how much is being re-used, operating the tanks for maximum benefit. Each tank has flow meters and level sensors. Data is transmitted in near real time and processed and analysed by OTA Water software.

Better weather forecasting supports more accurate assessment of how much rain is likely to fall, making it easier to release the right amount of water. Thanks to our smart system, we know exactly how much water is in the tank, how much is likely to be used, and therefore the minimum amount we should release.

Installing these systems in locations with a combined sewerage network brings an immediate benefit to the local water company, holding back surface water from that house during that storm. The water company does not need to pump and treat that water, and the risk of overflows and flooding is reduced.

When extreme rainfall isn't on the horizon the water is used for toilet flushing, displacing potable water demand and reducing treatment costs. And for customers, this means lower water bills and a sense of pride in doing something good for the planet.

The system can become a valuable water conservation and communication tool, showing customers how much water they save, and the water company could use it to promote other water-saving messages. It can be used alongside work in schools, teaching children about water sustainability, to support a powerful, multi-layered way to educate people about the need to save water.



SUPPORTERS

Back in Broadhempston, the residents need no persuading of the benefits. If they put too much strain on their borehole there is a risk it will run dry. Using rainwater tanks helps to prolong the life of the aquifer during dry spells. "We have been supporters of rainwater re-use since the inception of our community development," says householder Hugo Davies.

"The borehole that feeds our potable system has recently been upgraded, as the original system meant that we ran out of water a few times each year. By having rainwater available to flush the toilet, the pressure on our borehole has been reduced and we have experienced fewer supply issues."

Scaling up, this approach could work across the globe. It could help small island communities to conserve their fragile water sources. In flood-prone areas it can help to reduce pollution and the damage and dangers of flooding.

For developers, collecting and storing rainwater helps to reduce water demand, offering all the benefits of sustainable drainage systems with none of the land-take. A district system could easily be integrated into a small housing estate, say by putting the tank below a parking area. Designing it in from the beginning could hugely trim the costs.

The system could even work in areas with more seasonal rainfall patterns. Cities like Cape Town and Chennai will have to throw everything at tackling drought. Every drop of rainwater re-used is a drop of tap water saved to tackle the next drought. And monsoon areas have massive problems with surface water and pollution – contaminating precious drinking water. With other investments

3 CASE STUDIES

1. WATER COMPANY PROJECT IN AN AREA WITH HIGH WATER BILLS

Data show that in one property, from January-May 2018, water-use from the tank was 15m³. Mains water sent to the tank via top-up was 0.8m³. The approximate annual water bill saving was £225.

2. SCHOOL IN A FLOOD-PRONE TOWN

From 22 October 2018 - 6 December 2018: cumulative total water delivered to toilets was 43,259 litres. Total mains top-up was 9,578 litres. Therefore a total of 33,681 litres of rainwater were re-used to flush toilets, or approximately 4,800 litres per week.

3. DOMESTIC HOUSE IN A DROUGHT-PRONE AREA

From 6-16 November 2018; flow meters installed: mains backup, pumped overflow systems, feeds to an upstairs toilet and a washing machine. Water use: the results show that the washing machine is used every two to three days and is the primary user of the gathered rainfall. The toilet is used less frequently and consumes less water. In total, over nine days, 860 litres of rainwater have been supplied to the washing machine and toilet. Average daily demand decrease: 95 litres. ○

SOURCE: OTA WATER, 2019

and changing attitudes to water conservation, smart rainwater management could be a hugely valuable tool. We can't make more water but we can make the water we have got go further. The problems of drought and flood are intimately connected. Our smart rainwater-management systems are all about tackling both those problems ○

Peter Melville-Shreeve is chief executive of OTA Water