Sustaining water supplies across the UK

The Googong non-potable water recycling plant, New South Wales, Australia

Neil Gardener, Stantec's water recycling subject matter expert, explores the role recycling could play in drought proofing the UK's water supply.

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"Daddy, did you know we're probably drinking dinosaur wee?" This video call interruption from a colleague's daughter was not commentary on local tap water taste, but a summary of what she had just learned about the water cycle at primary school.

The world has always been recycling water. Transferring it by rivers, filtering it through natural media, desalinating it through evaporation – then rinse, rain, and repeat. Anything that drinks water is part of that process, so what is in your squash could well have been in a stegosaurus. However, human activity is changing where and how easily we can access fresh water. Population growth, industrial and agricultural demand, and particularly climate change are all placing increasing strain on our water supplies. While these challenges are being more acutely felt elsewhere around the globe, their impact on the UK's water security is already being seen in the South of England.

England is forecast[1] to have a water supply deficit of over 4 billion litres per day compared to our target of 1-in-500 year drought resilience levels by 2050, the equivalent of having to supply 38 million new customers. For context, the summer of 2022 was considered a 1-in-500 year event in parts of Europe, and climate change studies are consistent in their predictions of more frequent and more extreme drought events here in the UK.

Water companies in the UK are working on ways to address this shortfall. Demand management and water efficiency initiatives will play an important part in this, as will leakage reduction. However, we will need to unlock new water supply resources too. This includes building reservoirs on a scale we have not seen in decades, adopting seawater desalination technologies more commonly deployed in countries with arid coastal areas, and planned water recycling. None of these options are as cheap or straightforward to implement as conventional water treatment, but extensive water resource modelling has shown that we have run out of "easy" conventional options in several areas. We need to do things differently and choose the best new supply option based on local environmental, social, and economic factors.

So, what does planned water recycling mean, and how does it differ to the natural water recycling the planet has been doing for millennia? It is deliberately reengineering the water cycle, short circuiting it so we can safely fast track water we have already used back into the supply, rather than letting nature apply its time tested but slow approach. In practice, this involves taking water treated by a conventional wastewater treatment works, applying additional advanced treatment technologies, and then discharging that recycled water into the environment for abstraction to a potable water treatment works.

This type of water recycling is often called "Indirect Potable Reuse" (IPR). Plenty of places have successfully taken this approach since the mid twentieth century. Some authorities have gone even further by purifying water to a level where it becomes drinking water (termed "Direct Potable Reuse"). At Stantec, we have been involved in designing and operating these systems for decades, particularly in North America and Australia.

In San Diego, for example, we have been working with the local government on a water recycling programme since 2004. By 2035, we will have helped ensure that a third of the city's water supply – serving millions of people – comes from recycling. Up the coast in Los Angeles, we are helping the local authority ensure that all of the city's wastewater is recycled and put to beneficial use. These processes are expensive, but they are considered worth the investment and more sustainable than alternatives.

When you start to reengineer the water cycle, you can open up new opportunities, particularly when you are developing whole new residential areas. In the new and growing Australian town of Googong, we have helped design a water cycle that includes non-potable water recycling. We have created a safe resource specially designed for irrigation and street cleaning that has reduced potable water demand by 60%. Eventually, the town's 19,000 inhabitants will use the same amount of water as 7,000 people served by a conventional water supply approach. If we are going to address the UK's housing crisis with 300,000 new homes built every year, we should be taking a similar approach to large new developments as the rule rather than the exception.

Inside the Water reuse plant at Gibson Island, Brisbane, Australia.

So, what is the catch? It's the elephant in the room, the infamous "yuck" factor. The more you think about the details, the more your glass of lovely tap water might seem to taste like dinosaur wee. Public perception is a complex issue and can be a big challenge for prospective schemes. A recent Drinking Water Inspectorate report set out to better understand this, assessing public attitudes towards water recycling as a source of drinking water. The study[2], carried out by Cranfield University, indicated that general support was relatively high, with 79% of those asked in favour of the concept. International experience shows that good engagement can provide reassurance, explain benefits and win people over.

This experience is reflected in the Cranfield report's conclusions, which also state that simple, plain and transparent communication is best, using consistent, accurate and neutral language. After all, a significant portion of the UK's supply already comes from a water cycle that is effectively IPR – without the deliberate planning, but still with effective control measures implemented through our business-as-usual practices.

There are other significant technical challenges we are seeing on Stantec's UK schemes. These include:

- The lack of water recycling specific regulation, a contrast to many areas we work in internationally that facilitate safe and consistent scheme development.
- Limitations in national laboratory capacity, which is important because of the breadth and depth of analyses we are undertaking for water recycling.
- Managing the risks associated with chemicals approved for use in the UK, as it is impractical to measure them all.

The good news is that we are rising to the challenge. Utilities, regulators, consultants and contractors are all playing a role, and it is anticipated that there will be over 200 million litres per day of new IPR capacity deployed in the South of England by 2035 – the equivalent of filling 80 Olympic swimming pools per day. Some of the five schemes that Stantec is working on in the UK are even providing additional benefits above and beyond resilience. For example, one project we are developing in the West Country will help prevent river levels dropping to environmentally damaging levels whilst providing additional natural capital in the form of a new constructed wetland.

Water scarcity may be taking the UK industry back to school, but with the right investment and clever water cycle engineering, we can pass with flying colours.

References

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2 https://www.dwi.gov.uk/research/completed-research/consumer/public-perception-of-water-recycling-for-drinking-water-use/