

LESSON 5

RECOGNIZE WATER RECYCLING IS WIDELY USED TODAY

The barriers to water recycling: social, technical and legislative.

On 29 July 2006, the City of Toowoomba, Queensland, Australia held a referendum on whether recycled water from the city's sewers should be used as a source for drinking water. This was the culmination of the lack of infrastructure investment combined with a severe drought and changing weather patterns which had led to unprecedented water restrictions. Further water restrictions saw a ban on the use of town water to irrigate gardens and lawns. Initially, a proposal to recycle water from the city's sewerage system was well received by city politicians. However, it was ultimately rejected by 62% to 38% due to misinformation and lack of support from outside leaders.

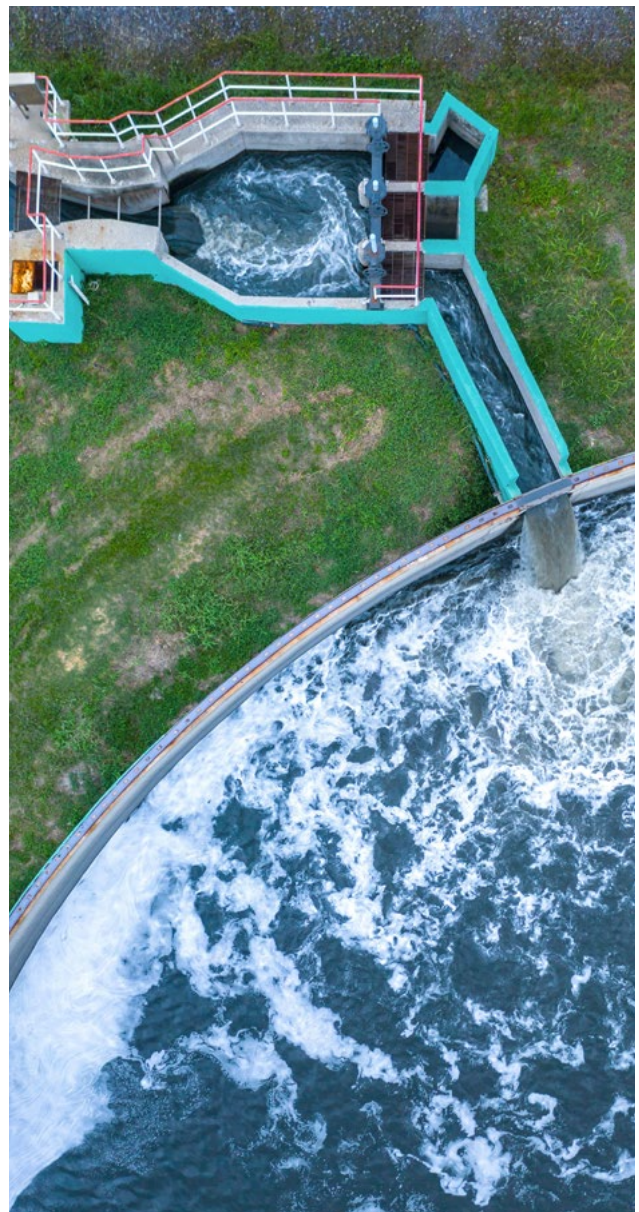
Successful water recycling needs to be more than a technical solution

Direct Potable Reuse (DPR) – where treated wastewater is fed directly to the drinking water network – is widely used across the world today. Windhoek in Namibia has been drinking purified wastewater since 1968. Two Texas cities, Wichita Falls and Big Spring, do the same in the USA. Many other regions run Indirect Potable Reuse (IPR) systems – using a buffer like a river, reservoir or aquifer between treatment and reuse. Orange County Water District's Water Factory 21 project in California has been operating since 1975.

So what have these schemes, and those delivered by the companies we interviewed, taught us? It's a critical question because water recycling is a viable solution to the water resources challenge. Because more regions will need to use this approach in the future. And because neglecting wider engagement can mean that technical solutions can be rejected, as San Diego PUC found in its attempt to introduce recycled water in the 1990s.

Secure public acceptance: "Seeing is believing"

Fundamental to the success of recycled wastewater is gaining public engagement and acceptance. The key to that is first demonstrating the concept and proving beyond all doubt the quality of the water. Economic benefits of recycled water or even future water security arguments are not the primary concerns for consumers.



San Diego PUC's second attempt at launching purified water, named Pure Water, a decade later was grounded on a comprehensive public outreach and engagement strategy. This included demonstration facilities, community events, educational visits, online resources and virtual tours. The first Pure Water plant has been producing 1 million gallons (4.5m litres) daily since 2011 and a second plant is currently under construction. Materially engaging the local population in the construction phases with hiring targets for city residents has further strengthened local acceptance.

The first Pure Water plant in San Diego has been producing 4.5m litres daily since 2011.

Public engagement was also a strategic imperative in the development of Singapore PUB's recycled water, NEWater, to complement the island state's existing water sources. Its launch was timed to coincide with National Day public holiday, with 60,000 people supplied with bottles of NEWater to toast the nation's birthday, and supported by government officials, including the then Prime Minister, who showed their support by drinking NEWater publicly.

In Australia and despite the experience in Toowoomba, wastewater reuse for human consumption has remained on the agenda in other water-stressed authorities. Most recently, Sydney Water opened the doors to its Quakers Hill Purified Water Discovery Centre. The demonstration plant's purpose is not to supplement the city's water supply - no purified recycled water (PRW) is added to the network - but rather to showcase the PRW treatment technology to produce safe reliable water to its stakeholders, customers and communities. It's the first key step to gaining their trust and acceptance. As Sydney Water says: "Seeing is believing".

Fundamental to the success of recycled wastewater is gaining public engagement and acceptance.

Demonstrate stringent quality standards

Demonstrating an unwavering focus on quality and testing is crucial to securing and maintaining public trust. Utilities that have successfully integrated recycled water into their operations have heavily emphasized the quality testing in their public outreach, citing compliance with World Health Organization guidelines and regional/national water standards.

In reality, the purity of recycled water typically exceeds that of drinking water standards. One option is to divert it for specific uses, relieving the pressure on traditional sources. The quality of Singapore's NEWater is such that the bulk is supplied via a dedicated pipe network to Singapore's wafer fabrication, semi-conductor and biopharmaceutical sectors which require ultra-pure water. Only during dry periods is NEWater used to top up Singapore's reservoirs for potable use.

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Challenge lagging legislation

Nevertheless, in many jurisdictions, legislative rather than technical or even perception challenges remain the biggest obstacle. Legislation around wastewater reuse is better defined in regions with long histories of water scarcity but in others, only more recently experiencing supply and demand pressures, the technology is outpacing the policy. For example, in the UK where currently recycled water is not yet used for drinking purposes, the debate revolves around the legal definition of 'wholesome' to which water utilities must comply.

Using treated wastewater to replenish aquifers or reservoirs (IPR) provides a stepping stone in the legislative process towards DPR water. That's been the case in California where IPR has been in use for years, and where in December 2023 state regulators voted to streamline regulations opening the way to DPR use in the future.

50,000 quality tests for
IPR-produced Pure Water
since 2011

San Diego PUC

15,000 scientific tests
since IPR-produced
NEWater's launch

Singapore PUB

DPR-produced reclaimed
water is tested
every two seconds

Namibia's New Goreangab Water
Reclamation Plant (NGWRP)



In others where there is no precedent for any form of recycled water, demonstrating the principle and technology, initially for use in non-potable applications, will help engage key stakeholders and start conversations at legislative level.

RecoLab, a showcase development plant and test bed for sustainable use of water (and waste) in the Swedish City of Helsingborg, is a good example. Inaugurated in 2021, it produces 70,000 litres of drinking quality water daily. Swedish legislation does not currently allow for this water to be used for human consumption, and in the interim it is to be diverted for use in a local swimming pool. The lab provides a focal point from which to start a national dialogue with legislators, which ultimately will open the way to wastewater recycling at scale in the future.

Explore recycled water for non-potable uses

Recycled wastewater doesn't necessarily have to meet drinking water standards. It can be used for non-potable purposes to offset potable water demand as part of a 'fit for purpose' water strategy. Advantageous from a cost standpoint also, this can represent the first step in introducing reclaimed water, especially in countries where historically water has been abundant and acceptance of the concept low.

In California, San Francisco is pioneering decentralized onsite water reuse in new development projects over a certain size. These systems can offset potable water use by collecting and treating alternate sources, including stormwater, rainwater, greywater, blackwater, and foundation drainage, for non-potable applications such as toilet flushing and irrigating crops.

Recycled wastewater can offer an alternative for water intense mining operations too, reducing mining companies' reliance on local groundwater or surface water supplies. For example, mining major Freeport-McMoRan has been sourcing and treating municipal wastewater from utilities in the vicinity of several of its global mining operations since 2016 to support its water supply requirements.

Countries worldwide are now exploring the opportunities. Following crippling droughts, a

'[water sobriety plan](#)' was unveiled for France in March 2023. Amongst the plan's 53 measures is a goal of increasing wastewater reuse for non-potable uses to 10% of all water by 2030, from 1% currently, through the development of 1,000 wastewater reuse projects by 2027. Updated [legislation](#) simplifying the uses and conditions for reuse of rainwater and treated wastewater was published in August 2023.

Malaysia too is looking to recycled water for non-food related uses to alleviate demand on its freshwater supplies. Under the country's [Green Technology Master Plan 2017-2030](#), it wants treated effluent to make up one third of the water used – 1,500 million litres per day (MLD) – by 2030. Malaysia's national sewerage company, [Indah Water Konsortium Sdn Bhd](#), is already working with water suppliers, including Penang Water Supply Corporation and Syarikat Air Melaka Berhad on water reclamation projects, which combined could produce over 300 MLD for supply to industrial and manufacturing clients.

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