THE WALL STREET JOURNAL.

From Toilet to Tap: What Cities Need to Overcome to Make That Happen

Recycled sewage will be a part of more cities' water supplies in the future. But how do you get past the yuck factor?

The city of Los Angeles aims to upgrade the Hyperion Water Reclamation Plant, seen above, as part of a plan to recycle 100% of its wastewater by 2035. PHOTO: DAVID MCNEW/EPA-EFE/SHUTTERSTOCK

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May 17, 2019 11:05 a.m. ET

Would you drink recycled sewage? It's a question you may need to think about someday.

In recent years, the idea of creating a circular economy—in which all of the resources coming into our cities are recycled after they are used—has taken hold. We now routinely recycle paper, glass and food scraps, as well as parts of demolished buildings and crumbling highways. Widespread sewage recycling could be the next frontier.

Productively reusing sewage is nothing new. For centuries, people have used their wastes for irrigation. Then, about 50 years ago, engineers developed technologies that allowed them to turn sewage back into drinking water. Since then, water-stressed cities across the country have quietly begun to close the loop on their water systems. Today,

more than four million Americans in Atlanta, Northern Virginia, Phoenix, Southern California, Dallas, and El Paso, Texas, get some or all of their drinking water from treated sewage.

Many more cities are likely to follow that same path. Their current water supplies aren't likely to be adequate in the future, given the many continuing stresses they face—in particular, droughts, the shifting and uncertain precipitation patterns due to climate change, increasing urban populations, more-stringent regulations to protect endangered fish or other wildlife, and the water needs of agriculture and industry.

One of its greatest benefits is that sewage keeps flowing even during droughts. And once it's purified to drinking-water quality, it doesn't require the installation of any new pipes to carry it to people's homes.

But cities interested in taking the toilet-to-tap plunge must overcome several hurdles.

Overcoming reluctance

First, of course, the sewage needs to be made clean enough to drink. Fortunately, modern technologies can produce recycled water that is even cleaner than much of the drinking water we get from rivers, lakes and groundwater wells. Reverse-osmosis membranes remove bacteria, viruses, pharmaceuticals and other chemicals in sewage. Follow that with exposure to ultraviolet light and hydrogen peroxide to mop up anything that gets through the membranes, and you have water that meets all drinking-water standards. In fact, recycled water can be so clean that, just like the popular brands of bottled water produced by the reverse-osmosis process, minerals have to be added back in to make it taste like the water we're familiar with.

The next hurdle is surmounting the disgust associated with drinking recycled water. In other words, the yuck factor. Treated sewage has long been widely used to water lawns and golf courses, without much fuss. But it's obviously an entirely different story to ingest it, even if people know it's clean.

The yuck factor can seem like an insurmountable barrier, especially in an era when public confidence in the safety of tap water has been shaken by reports of lead and fluorinated chemicals in water supplies. But it has proved not to be.

Through decades of experience with sewage recycling—also known as potable water reuse—in different locales, water utilities have learned that communities support potable water reuse when it meets a perceived need and is managed by trusted and competent institutions.

To overcome the queasiness, utilities planning recycling projects conduct extensive outreach programs to address community concerns. That can include community meetings, public tours of the utility's facilities that end with an opportunity to drink recycled water, and bottles of recycled water being given away at public events. The

Orange County Water District in Southern California held thousands of tours and community meetings on its potable reuse project.

Beyond sharing their story, water utilities cultivate public trust by demonstrating a commitment to transparency and competency. The utilities that have overcome the yuck factor are the ones that include physicians and public-health specialists on their oversight boards, invest in state-of-the-art treatment and monitoring technologies, make their water-quality data public and otherwise go the extra mile when it comes to ensuring their process is safe and reliable.

Retaining trust

Once the public is on board and utilities start recycling sewage, they need to be vigilant to ensure that the water remains safe to drink. Treatment plants should continuously monitor for contaminants of all kinds, not just those they are required to watch for by the federal Environmental Protection Agency and local regulatory agencies. When a new contaminant is discovered or when an unexpected hiccup happens in the treatment process, the utility has to respond before public health and/or confidence are compromised.

That requires investment in the people and equipment needed to stay ahead of the curve. For example, in the late 1990s, N-nitrosodimethylamine (NDMA)—a potent carcinogen—was detected in recycled water by the Orange County Water District. The utility surmised that local industries were discharging chemicals into the sewer that its water-treatment processes were converting into NDMA. Rather than falling back on the excuse that there wasn't an established drinking-water standard for the chemical, the utility suspended recycling operations until it developed ways to reduce these industrial NDMA-precursor discharges to the sewer, as well as minimize NDMA formation during treatment by acquiring new approaches for destroying the chemical in its treatment processes.

This response wasn't cheap: It required investing millions of dollars in research and development despite the absence of a government mandate to do so. Considering the cash-strapped state of utilities in many of the nation's cities, it is worth considering how the vigilance of the early adopters can be replicated by the next set of water-recycling utilities.

Let it flow

Another concern looms as potable water reuse becomes more common: In arid regions, treated wastewater is all that keeps some rivers flowing in the dry season. Parts of the Los Angeles River, where canoeing is becoming more popular, would no longer flow if the city expanded its potable water reuse program. If Dallas recycled more sewage, Houston's water supplies could suffer: The Trinity River, which consists primarily of Dallas's treated sewage during periods when it hasn't been raining, would no longer help refill one of Houston's main reservoirs. (The water from the river is made

acceptable for drinking by natural purification during the long trip downstream and Houston's drinking-water treatment plants.) Some of these issues can be circumvented with agreements with downstream users before potable reuse systems are built, but this issue is likely to grow in importance as more cities turn to water recycling.

Finally, it's important to note that potable water reuse is expensive, so it's unlikely that a city would consider it in the absence of significant concerns about its water supply. Ultimately, in cities that can make a case for recycled water, the future of potable water reuse depends upon the willingness of water providers to do what it takes to make sure that the public can be confident about the quality of water coming out of their tap.

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