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Foreword

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By now it is quite clear that the world is plunging headlong into water crisis. The warnings have been loud, and they are dire. Some of the latest come from the World Economic Forum (2015), which has unequivocally declared water – the scarcity of, the lack of access to, and the poisoning of – to be the biggest threat to human life in the next decade.

Water and the security of its supply have preoccupied Singapore's leaders and decision makers since the city-state's independence half a century ago. The late Lee Kuan Yew, Singapore's first prime minister, recognized from day one that enduring water security was nothing less than an existential challenge. Mr Lee had devoted his entire political life to securing Singapore's water future and once famously recalled, "Water dominated every other policy. Every other policy had to bend at the knees for water survival." So, perhaps more than any other country, Singapore has always treated the possibility that there would not be enough water as neither novel nor remote.

Unsurprisingly, then, reuse is a plank of Singapore's water strategy. At PUB – Singapore's national water agency – sewage treatment works are called *water reclamation plants*. Because, in our minds, the H_2O molecule is never lost and water is an endlessly reusable resource. Water can always be reclaimed and retreated so that it can be drunk again. PUB leads the world in this, and today we are able to, literally, turn wastewater into sweet water for very little money. PUB reclaims every drop of sewage and, for more than a decade, has turned much of it into drinking water again.

The Industrial Revolution gave humanity machines, factories and mass production, and greatly increased incomes and the standard of living. It also gave us an economy that takes, makes and disposes, generating massive amounts of waste in the process. Now, of course, we readily admit and acknowledge that taking the earth's resources to make the things that we desire, and then throwing them away when we do not want them anymore, is just not a sustainable way of doing things. Indeed, when it comes to life-giving water, it is simply unacceptable that it should be discarded after just one use.

Very early on, Singapore invested great effort and resources into researching technologies that would make wastewater potable again. When these become viable at the turn of new millennium, PUB adopted them with great zeal and promptly started manufacturing NEWater, which is ultra-high-quality recycled water, on an industrial scale. Today, we have enough NEWater capacity to supply about 40% of Singapore's daily demand.

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Wastewater reuse is particularly attractive to Singapore because it is a drought-resistant source of potable water. The requisite treatment technologies that are involved have become commonplace; their reliability and efficacy are well-established and still improving by the day. Even better, and unknown to most, making sewage potable actually requires, litre for litre, far less energy than desalinating seawater.

Of course, the challenge, even for us in Singapore, is to persuade people to imbibe it after we have made the stuff. This remains a tricky issue the world over, as the various contributors to this volume make amply clear. Like it or not, the average person, if free to choose, will shun drinking processed wastewater, even if he believes it to be perfectly safe.

Public acceptance of NEWater has been high in Singapore, bolstered in part by the country's pre-existing water-stressed conditions. But we take nothing for granted, and continue to retain a careful and cautious approach. Thus, even though NEWater is entirely potable, we have not yet rushed into direct potable reuse.

When it comes to direct potable reuse, public acceptance and good regulation are two sides of the same coin. One reinforces the other. My own view is that, driven by necessity, direct potable reuse will come sooner rather than later. And it will become widely practised and a new norm once enough reputable jurisdictions enact suitable regulation.

Every Singaporean grade schooler is taught the hydrologic cycle and knows how Mother Nature reclaims and recycles water in all its forms. What we do in PUB's water reclamation plants and NEWater factories is, in essence, copying nature's way. In Singapore, we have every motivation to do this. I suspect the rest of the world will increasingly have to do the same.

Reference

World Economic Forum. (2015). Outlook on the Global Agenda 2015. Retrieved from http://reports.weforum.org/outlook-global-agenda-2015/wp-content/blogs.dir/59/mp/files/pages/files/outlook-2015-a4-downloadable.pdf