

## World Environment Day

# Singapore's two-front battle with water security and climate change

'Boom and bust' rainfall is one challenge as weather patterns change. The other is how to produce more potable water through processes such as desalination without raising carbon emissions.

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For The Straits Times

Too much, too little, and never quite enough – that sums up Singapore's water challenge now compounded by climate change.

As we mark World Environment Day today, it is timely to take stock of the existential challenge posed by climate change through the lens of water and what Singapore is doing to overcome that.

Singapore is as flat as a pancake and stands no more than 5m above mean sea level. It means the land and water-scarce island must tackle head-on the impact of climate change such as rising sea levels, and has no time to waste. Changing weather patterns also mean that Singapore must ensure there is enough water during prolonged droughts, as well as ensuring good drainage during intense rain.

There is yet another climate change-induced twist to the island's efforts to produce potable water – how to curb the carbon emissions that arise from energy-intensive desalination.

First, consider how extreme meteorological events are affecting Singapore. Floods are becoming more common and intense. Equally, dry spells are becoming worryingly regular and severe.

## DROUGHTS AND DELUGE

On New Year's Day, Singaporeans woke up to a cool and wet morning with temperatures falling below 22 deg C in parts of the island due to prolonged heavy rain, which continued into the following day. The downpour on Jan 1 dumped 318.6mm of rain, causing flash



The downpour on Jan 1 (above) dumped 318.6mm of rain, causing flash floods in several areas. The amount of rain that fell was significantly more than the 238mm historical average for the entire month of January, and within the first percentile of maximum daily rainfall recorded for the past 39 years. ST FILE PHOTO

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Barely four months later, on April 17, another heavy storm dumped 177mm of rain across Singapore, which is again more than a month's regular rainfall for April and among the heaviest on record.

Two days afterwards, Minister for Sustainability and the Environment Grace Fu warned Singaporeans to expect such intense rainfall "more frequently", attributing it to climate change and reiterating the importance of planning ahead.

These are, of course, the ominous signs of climate change impact. When the rain comes, it is increasingly intense, giving rise to the problem of floods. When there is no rain, the problem of acute drought and water shortage rears its ugly head.

For Singapore, 2019 was the

warmest year on record, as it was for many parts of the world. The 1,367mm of rain that fell in 2019 was 37 per cent below the annual average, making it the third-driest year since records started in 1869.

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The second aspect of the climate change-induced water challenge has to do with the relentless effort to meet the demand for this vital resource.

Singapore has to be prepared for the eventual cessation of drawing rights in 2061, of nearly 50 per cent of its current water supply from neighbouring Malaysia.

## CLEAN WATER'S CARBON COSTS

The PUB, its national water agency, has long added wastewater collection, treatment and reuse, and seawater desalination to its portfolio of water sources to meet Singapore's

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water demand. Now it has to find ways to do the same but with reduced carbon emission targets in mind.

The PUB has become a leading exponent of using recycled wastewater, called Newater, as a diversified source of domestic and industrial water supply. For over two decades, Singapore has been collecting all its sewage, treating it properly and transforming it into ultra-high-quality water. The ready availability of recycled and desalinated water has made Singapore's water supply more resilient to vagaries of the weather.

These sources, however, require more energy to produce, and therefore increase its carbon footprint. Singapore has committed to peak carbon emissions by 2030.

To support this target, PUB will also reduce its carbon footprint. Desalinating seawater is the most energy-intensive way to produce drinking water, requiring 3.5kWh of energy for every cubic metre and emitting the equivalent of 1.4kg of CO<sub>2</sub> along the way.

Much of PUB's current R&D

effort is aimed at halving energy requirements for desalination. Reducing the carbon footprint of water treatment is essential for a place like Singapore which has no land to collect and store enough runoff despite tropical rains and can only become increasingly dependent on manufactured sources to quench the thirst of its people and industry.

PUB's R&D includes not only improving the energy efficiency of desalination processes, but also exploring the possibilities of carbon capture and utilisation. These are in addition to its ongoing effort to harvest renewable solar energy and upping operating efficiency through process innovation.

## GLOBAL EFFORTS

The same approach of long-range planning and steady implementation is also being applied to the looming threat of sea-level rise.

Singapore's Prime Minister Lee Hsien Loong noted in his 2019 state-of-the-nation address that "we should treat climate change defences... with utmost seriousness. These are life and death matters. Everything must bend at the knee to safeguard the existence of our island nation".

In true Singapore style, he promptly put money where his mouth is, pledging \$100 billion, around 20 per cent of the country's GDP, towards its coastal protection. As the coastal protection agency, PUB is working to make sure Singapore does not become a modern-day Atlantis.

Singapore was one of 40 countries invited by US President Joe Biden to the virtual Leaders Summit on Climate which he hosted in April this year because of its innovative approaches to adapting to climate change.

The summit was convened to underscore the urgency – and the economic benefits – of stronger climate action. It was a key milestone on the road to the United Nations Climate Change Conference (COP26) to be held in November in Glasgow. As leaders around the world ramp up efforts to cut carbon emissions and put the brakes on devastating climate change, Singapore, a small city-state of six million, is in the forefront of countries that have formulated long-term plans for managing its impact and is steadfastly putting them into effect.

Tiny Singapore's efforts may not amount to much in terms of the entire world's exertions at mitigating the adverse impact of climate change. For sure, whatever it does will never move the global needle. But it does what it can, and should its enlightened policies be duplicated in other countries, the combined effect would most certainly cause the meter to jump. Like water, every drop counts.

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