Case Study

Managing Water Supply and Demand: 'Closing the Water Loop'

Singapore

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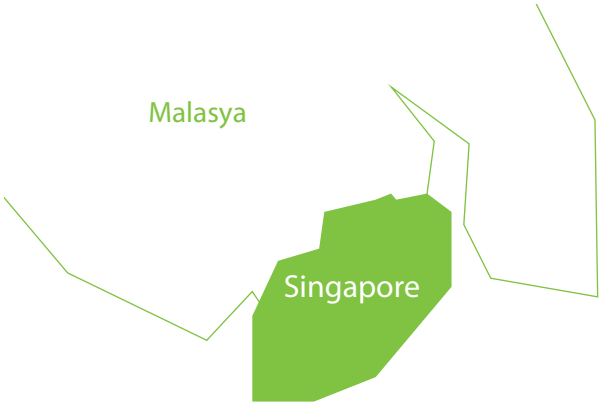

Quick facts	
Zone	National Territory
Key Words	Water Scarcity, Water Supply and Demand Policies
Theme	Water Management
Leading Agency	National Water Authority

Background Information

Singapore is a city nation in Southeast Asia with a land area of 716.1km^2. The nation boasts the highest per capita income in Asia and its economy is primarily service based (approximately 64 per cent of GDP). The island's location means that it is strategically important as a major international shipping port. Singapore's population has grown by a factor of 2.5 over the past 40 years, reaching 5.4 million in 2013 and resulting in a high population density of 7422 people/km^2.

Challenge

Singapore is a small island with finite space and no natural resources. Therefore, Singapore faces challenges to sustainable development, including those imposed by continued population and economic growth. This growth stresses the islands scarce resources, which increases the challenge of ensuring that economic growth does not come at a high environmental cost.

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Singapore needs to adapt to growing resources constraints and use non-renewable (and certain renewable) resources more efficiently, essentially achieving more with less. Additionally, Singapore faces the challenge of climate change and the need to mitigate and adapt to the phenomena's destabilising impacts.

Singapore has a scarcity of freshwater resources. The city has no large water catchments or groundwater reserves. The nations per capital natural freshwater resources are 211m^3 per person, below the absolute water scarcity index of 500m^3 per person. Rapid population growth and economic development culminated in water rationing in the 1960's and water had to be imported from neighbouring Johor in Malaysia under water transfer agreements. The 1962 Agreement is still in effect and will expire in 2061. This solution was perceived to be politically problematic due to the national security implications of being dependent on an outside source and so unsustainable.

The Singaporean government has attempted to maximise local resources through building reservoirs and setting aside two-thirds of the island for water catchment. Nonetheless, with Singapore's population potentially reaching 6 million people in 2020, even with imports, water will potentially become a bottleneck for development.

Institutional Bodies

Singapore's water resources are managed by its National Water Authority, PUB. Initially, PUB was Singapore's Public Utilities Board, which coordinated electricity, piped gas and water supply under the Ministry of Trade. In 2001 PUB was restructured into the National Water Authority. Sewage and drainage were transferred to the new agency, and the regulation of energy and gas industries were transferred to Singapore's Energy Market Authority. PUB manages the entire 'water loop', from supply to treatment to discharge. This allows a holistic approach that considers all aspects of water management.

Approach

Singapore's aim is to be a sustainable, high-density city that is clean and green. This requires balancing economic growth and environmental protection, essentially breaking the link between economic development and environmental degradation.

Singapore aims to achieve this vision through taking a long-term and integrative planning approach by aligning policies across sectors. This complete vision of the country's needs is considered to be a key strength. The nation looks to achieve the dual goals of environmental protection and economic development in a pragmatic and cost effective manner, including undertaking long-term measures despite potential initial high costs. Lastly, the government looks to be flexible in adjusting to new technologies and changes in the global environment. This includes investing in capacity building to better respond to challenges.

In the water sector, the government embarked on a 50 year water plan to diversify Singapore's water sources and reduce its dependency on imported water. Singapore's water policy includes both supply and demand management measures and is implemented through the Four National Taps and '3P Approach' (People, Public and Private), which are run by PUB.

A large proportion of water demand originates from the domestic sector (53 per cent of total water consumption). Therefore, weight is placed on demand management and targets to reduce per capita water consumption to 140 litres per day by 2030 have been established. So far, per capita water consumption has steadily decreased from 165 litres in 2003 to 151 litres in 2013. This has been partly through the '3P' Approach, which raises awareness, engages the community and makes water management everyone's responsibility.

PUB has also reduced demand through water

tariffs. Water is priced progressively and in reflection of its true value and so not subsidised. Tariffs in Singapore are comparatively higher compared to economically similar cities. Water is priced according to the cost of desalinating a litre of water, currently Singapore's most expensive water source. This allows the cost of desalinated water to be recovered, making it economically viable, and helps fund research and development.

On the supply side, Singapore is looking to increase its local water sources through its Four National Taps. The 'Taps' refer to Singapore's four water sources, local water from catchments, imported water, reclaimed water and desalinated water. To increase supply, Singapore has undertaken ground-breaking work in reclaiming wastewater. This results in ultra-clean water that surpasses WHO standards and branded 'NEWater' to reflect its purity. NEWater accounts for 30 *per cent* of the nation's freshwater and by 2060, is planned to account for 55 *per cent* of freshwater. NEWater is primarily used in industries but a small amount is blended in reservoirs for consumption. Desalination is set to increase from accounting for 10 *per cent* of freshwater to 25 *per cent* by 2060. PUB is working closely with several private technology companies to reduce the energy requirement of desalination to make the water source more economical.

By taking a holistic long-term approach to increasing local water sources, Singapore hopes to 'close the water loop' by minimizing waste and increasing efficiency. This is anticipated to allow the nation to be self-sufficient by the time the 1962 Agreement expires.

Singapore's success can be attributed to its visionary long-term leadership and government investment in infrastructure, community commitment and the technological innovations of the private sector. The city has transformed into a 'global hydrohub' turning a resource constraint into an economic advantage, it's water sector is expected to see its value-added contribution to the country's GDP to increase from USD 0.4 billion in 2003, to USD1.36 billion in 2015.

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