

Water for All: Conserve, Value, Enjoy



As the water purveyor of Singapore, the Public Utilities Board (PUB), aims at ensuring efficient, adequate and sustainable supply of water. In an interview with EverythingAboutWater Khoo Teng Chye, Chief Executive, PUB, talks about the initiatives taken by the board and how their efforts have been successful.

Q. PUB has done an excellent job at ensuring water sustainability for Singapore. How have you planned and managed this effort?

As the national water agency of Singapore, PUB adopts a holistic and integrated approach to managing our water resources. We take care of everything from rainwater collection and the purification and supply of drinking water, to the collection and treatment of used water, and its reclamation into NEWater.

In ensuring a robust and sustainable water supply for Singapore, we employ a long-term strategy known as the Four National Taps. This refers to water from four diversified sources: local catchments, imported water, reclaimed water, which we call NEWater, and desalinated water.

NEWater is the pillar of our water sustainability efforts. Produced using advanced membrane technologies, it is mainly supplied to wafer fabrication plants, industries and commercial buildings for industrial and air-conditioning purposes. A small amount is also blended with raw reservoir water before undergoing treatment at the waterworks for the drinking water supply.

Q. Tell us about the NEWater experience. How successful has this been for Singapore?

NEWater is undoubtedly the success story of Singapore's water strategy. Treated used water is purified using advanced membrane technologies involving microfiltration, reverse osmosis and ultraviolet disinfection. The result is an ultra-clean product that has passed more than 30,000 scientific tests, and which surpasses World Health Organisation standards for drinking water.

There are currently four NEWater plants which can meet 15 per cent of Singapore's water needs, with a fifth plant in the pipeline that will boost the total capacity to 30 per cent by 2010.

The public has also embraced NEWater. To get Singaporeans' support for NEWater prior to its launch, we carried out a comprehensive campaign that was targeted at various sectors. Briefings were held for community leaders, business groups, government agencies and the media. Journalists were taken on an educational tour to the US and Europe, where they visited cities with successful water reuse programmes. Finally, a documentary about NEWater technology and the experience of other countries in using reclaimed water was broadcast on television. The NEWater Visitor Centre was also set up to cement public acceptance by showcasing the technology and explaining the role of NEWater in Singapore's water strategy. In tandem with the public education campaign, PUB has been distributing bottled NEWater, with more than 8 million bottles sampled so far.

A survey by Forbes Research in 2002 indicated that 82 per cent of Singaporeans would drink NEWater directly and another 16 per cent would drink it mixed with reservoir water.

Q. Another outstanding effort has been in raising water awareness and public consciousness of water use through initiatives such as the NEWater Visitor Centre. Could you tell me about the centre and other public education efforts?

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The NEWater Visitor Centre is the centrepiece of our public education efforts on water. Through interactive exhibits and

multimedia displays, it offers visitors a learning journey through NEWater technology and Singapore's water management strategy. Since its opening in 2003, it has drawn more than 500,000 visitors and even won awards. It was named Best Sightseeing/Leisure/Educational Programme at the 2005 Singapore Tourism Awards, and highly commended in the 2006 International Water Association – Marketing and Communication Award for School Information Programme.

We believe that water sustainability goes beyond simply putting in place the right infrastructure for a robust water supply. Sustainability is also about managing the demand for water and the way it is used and treated by consumers. The NEWater Visitor Centre is one avenue for us to actively reach out to our stakeholders, to get them interested in water issues and keen to do their part for Singapore's water management.

We also have programmes to help owners make their homes and buildings more water efficient. Through these efforts, Singapore households' per capita water consumption has dropped from 165 litres a day in 2003 to 157 litres a day currently.

Another initiative has been our Friends of Water initiative, which encourages organisations and individuals to "adopt" bodies of water such as reservoirs, and work towards raising awareness about Singapore's water supply. Outstanding Friends of Water are acknowledged with an annual award known as the Watermark. The idea is to get Singaporeans to develop a bond with water. Our reservoirs have become a haven for waterfront activities, and a backdrop for weddings and filming.

Last year, we launched a hip lifestyle magazine called PURE, to get young people interested in water issues. We also created Water Wally, a friendly mascot shaped like a water droplet, who has been a hit with both young and old.

Q. Share with us some of the facts about Marina Barrage. What benefits will it bring?

The Marina Barrage is a unique project that will enhance Singapore's waterfront landscape. But it is more than just a dam to increase our water supply. It will also alleviate flooding in low-lying areas in the city, and be transformed into a lifestyle attraction offering a host of recreational possibilities for all to enjoy. When completed, it will be Singapore's 15th reservoir and the first reservoir in the city. Together with two other new reservoir schemes, it will help increase the existing water catchment coverage from half to two-thirds of Singapore's land area by 2009.

Q. Tell us about the Deep Tunnel Sewerage System.

The Deep Tunnel Sewerage System is PUB's answer to Singapore's long-term used water needs, and is designed to change the way we manage used water.

The system comprises two long, deep tunnels crisscrossing the island; a network of link sewers; two large centralised water reclamation plants at the eastern and western ends of the island; and deep sea outfalls through which used water will be dispersed into the sea. The deep tunnels act as a kind of superhighway to channel the used water to the water reclamation plant, where it will be treated to international standards before being discharged into the sea, or channelled to the NEWater plant to be further purified into NEWater.

The DTSS is an innovative system that offers several benefits. The deep tunnel and link sewer system will work entirely by gravity, eliminating the need for pumping stations. The centralised treatment plant will eventually replace three out of the six existing water reclamation plants in Singapore, freeing up the prime land that has been occupied by these plants.

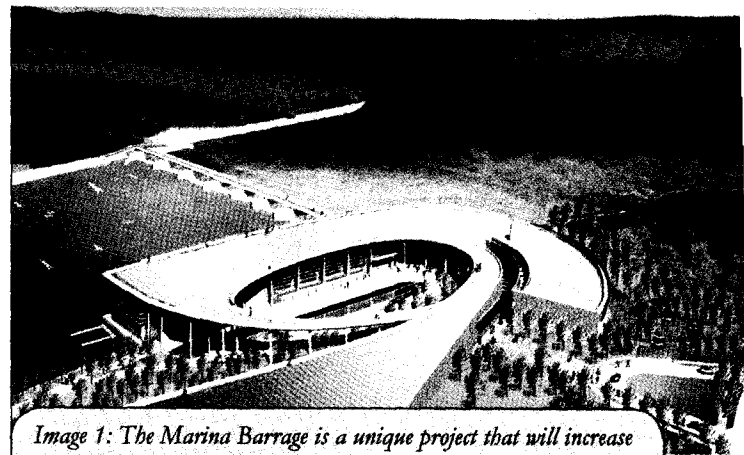


Image 1: The Marina Barrage is a unique project that will increase the island's water supply, alleviate flooding in the low-lying areas in the city and its freshwater lake will be transformed into a lifestyle attraction offering a host of recreational possibilities for all to enjoy.

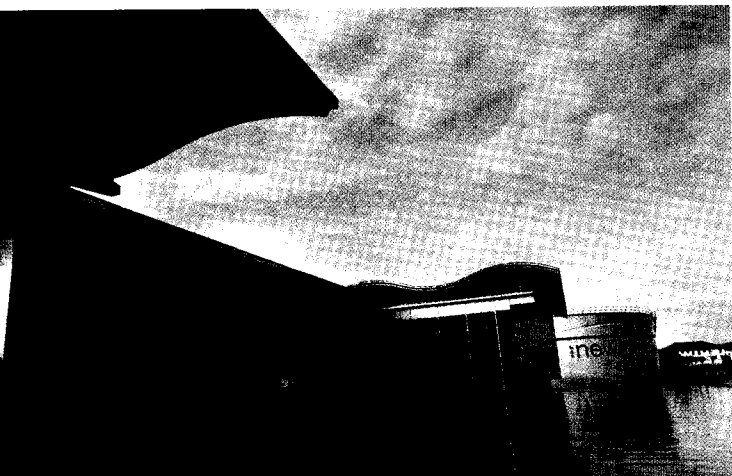
Q. Our readers would like to know about Singapore's earth control measures. How effective have they been in tackling the problem of muddy water?

Earth control measures have been a key measure in tackling the problem of muddy water in our waterways. We have adopted a three-pronged approach in this area: working with the construction industry and professional bodies on awareness and collaboration; promoting best practices and new technology; and enforcing regulations.

To promote awareness, PUB has collaborated with key players in the construction industry to hold seminars and workshops and produce guidebooks on erosion and sedimentation control. To raise the level of professionalism in soil erosion practices, PUB amended its Code of Practice on Surface Water Drainage to provide more prescriptive guidelines on how developers and contractors can effectively apply appropriate earth control measures at worksites. Now, developers

and contractors are required to provide appropriate earth control measures designed and endorsed by qualified erosion control professionals before construction work can commence.

As a result of these efforts, all construction sites have, in the last few years, moved to using treatment technology to clean up silty water before discharging it. We have also stepped up enforcement of such regulations at construction sites. Besides using the treatment technology, minimising bare earth within construction sites is key to preventing silt. This can be done through practices such as the phasing of earthwork, reinstatement and covering up using canvas sheets. PUB is working with the industry to promote such best practices and self-regulation, and stepping in to enforce the rules when necessary.



Through interactive exhibits and multimedia displays, the NEWater Visitor Centre offers visitors a learning journey through NEWater technology and Singapore's water management strategy

Q. PUB recently signed a memorandum of understanding with Nitto Denko and Mitsubishi Rayon. What are your expectations with this project? Do you plan to enter into similar ventures in the future? The MOU with Nitto Denko Corporation and Mitsubishi Rayon Engineering, two renowned membrane companies in Japan, is a boost to our R&D activities here in Singapore as we continue to invest in finding new and more cost-efficient ways of producing water.

Under the MOU, PUB will collaborate with Nitto Denko and Mitsubishi Rayon to develop membrane bioreactor systems for the treatment of municipal and industrial used water, and explore the use of membrane bioreactors combined with reverse osmosis systems in the production of recycled water. Our partnership will allow us to tap on one another's strengths and experiences as we explore new membrane bioreactor technologies. Besides this latest MOU, we have entered into R&D partnerships with several international water players such as Toray, Siemens Water Technologies and Mekorot in the last two

years. These collaborations are a significant step forward for PUB as we actively develop Singapore into a hub for water R&D.

Q. Singapore is developing into a global centre for water R&D. Tell us more about the PUB's efforts to promote this.

Yes, in fact water has been identified as a new growth sector for Singapore, and S\$330 million will be pumped into water R&D over the next five years. Today, we are home to a thriving cluster of more than 50 home-grown and international water companies spanning the entire value chain. Singaporean companies, who have built up a name for themselves by participating in projects as such NEWater, Marina Barrage and DTSS, are now exporting their expertise to places such as China, India, the Middle East and Europe.

We are actively promoting Singapore as an ideal place for water R&D, a fact that has been recognised by major players such as Siemens Water Technologies, General Electric, Delft Hydraulics, Keppel Corporation and Hyflux, which have set up research centres here. Top multi-nationals such as Black and Veatch and CH2M Hill have made Singapore a key focus in their business expansion plans by setting up their regional headquarters here.

Last year, the International Water Association announced its first regional office at PUB's WaterHub, a centre we set up for partners and stakeholders in the water industry to engage more closely with one another. We are also working closely with leading universities and international organisations such as the Massachusetts Institute of Technology, Swiss ETH and the Asian Development Bank to set up knowledge hubs and research campuses specialising in water and the environment.

This June, we will be organising the inaugural Singapore International Water Week, a global platform for water solutions. It will see policymakers, industry leaders, experts, and practitioners come together to address challenges, showcase technologies, discover opportunities and celebrate achievements in the water world. The highlight of the event is the Lee Kuan Yew Water Prize, a prestigious international prize that recognises outstanding contributions towards solving global water problems.

Q. Is PUB looking at the possibility of exploring other water technologies?

NEWater was the result of PUB's continuous investments in technology, and has borne out our longstanding belief in the value of R&D. We are therefore constantly on the lookout for advanced water technologies and R&D opportunities to achieve even greater efficiency in our treatment processes. For example, a full-scale Variable Salinity Plant capable of treating both freshwater and seawater was built last year to enable us to tap water from marginal catchments. And PUB's Bedok NEWater Factory was the first in the world to introduce the 16-inch reverse osmosis membrane in water reclamation in 2006.

Q. Singapore is fast becoming a model city for sustainable water management. Can PUB's expertise and experience be used by Indian cities for better water management?

Singapore's water management model has generated a lot of interest from countries keen to learn from our experiences. We are happy to share the experience that we have gained over the last 40 years.

Through PUB's commercial arm, Singapore Utilities International (SUI), we export PUB's expertise by providing training and engineering consultancy services in integrated water resource management, water audits and non-revenue water management.

In addition, SUI has numerous bilateral training arrangements with countries in the Middle East and South-East Asia, as well as India and China.

Through the WaterHub, PUB's centre for technology, learning and networking, we also collaborate with Singaporean and overseas partners to conduct capacity building programmes, talks and seminars. Training tie-ups with the industry and academia are also explored at both local and international levels.

Q. What can we expect to see from PUB in India?

PUB has been actively participating in technical exchanges with India. Since January 2008, PUB has participated in two major events in Mumbai and Indore organised by the Indian Water Works Association. PUB also has an ongoing training arrangement with the Administrative Staff College of India to provide water and wastewater management training for water utilities and government officials. Through SUI, PUB is also supporting Singapore-based companies in bidding for projects in India.

Q. What else does PUB have in store for Singapore?

We are currently rolling out a new long-term initiative called the Active, Beautiful, Clean Waters (ABC Waters) programme, which will transform Singapore into a city of gardens and water. This is part of PUB's larger strategic objective, which is to bring people closer to water so that they can better appreciate this precious resource.

Through this programme, we will transform our drains, canals and reservoirs into a vibrant and beautiful network of streams, rivers and lakes, making them a feature of Singapore's landscape that will improve our quality of life.