

Water: Societal changes boost systems innovation

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In the search first for sustainability, and later looking to build resilience, Singapore started encouraging out-of-the-box, creative thinking in all fields of water resources management decades ago.

Innovations have included policy, planning, management, development, and institutional, technological and financial aspects. Next up: societal changes.

After independence in 1965,

water supply planning criteria had to change radically. At that time, development of all available internal resources as fast as possible became of utmost priority.

Innovation started incubating, and planning was considering the situations at the specific moment in time but also looking towards the future. This became the first innovation: plan ahead of time and on long-term horizons.

Singapore outlined plans for a diversified water resources portfolio back in 1972, more than 40 years ago. These included not only local water resources and imported water but also, more

importantly, development of unconventional sources of water such as recycled used water and desalinated water to cover future water and development needs. It was several decades later that the rest of the world realised the value of used water as a resource.

Another example of innovative and long-term planning has been the fast development of additional water resources. In the 1970s and 1980s, there was the realisation that rapid growth of residential needs and industries would place increasing pressure on resource use.

The need to build up local water sources – by expanding water catchments and creating new reservoirs to store the rainwater that falls on these catchment areas – was recognised.

Singapore was among the first, if not the first, to turn tidal rivers into estuarial reservoirs and also collect storm water from urbanised catchments for potable use. The difference between Singapore and other cities in infrastructure planning and construction was the fast speed at which these water resources schemes have been implemented.

Institutionally, PUB, the national water agency, is one of the few agencies in the developed and developing world that manages all aspects of water resources.

Normally, services are divided among two or more organisations. The disadvantage is that institutional fragmentation leads, in many cases, to lack of coordination. This is more unlikely to happen when only one agency is in charge.

Management innovations include the very efficient water management at the catchment level that has been developed gradually for both protected and unprotected catchments. This has been so successful that approximately 60 per cent of the city-state's land has become a catchment area, meaning that water is collected from 60 per cent of the land area. Already an enormous achievement globally, the rate is expected to rise to 90 per cent.

Waterways restoration, known as the Active, Beautiful, Clean Waters (ABC Waters) programme, is another innovation. It aims at integrating as much as possible of the 8,000km of drains and of the 17 reservoirs with the surrounding environment. Bishan Park is one example of a successful ABC project where the natural and human environments have been improved significantly.

Singapore has earned its place in the world of frontier research and technological development of water. The objectives are to increase availability of clean water

resources, reduce cost of production and improve water quality and security.

Catchments, waterways, waterworks and reclamation plants are used for research purposes and also for testing. Projects in catchment areas include, for example, solar-based water desalination.

The Marina Barrage is also used for testing new technologies, particularly those related to intelligent watershed management. The barrage, built across the mouth of the Marina Channel to form Marina Reservoir, is crucial for managing floods in the low-lying city areas. The barrage is controlled using a predictive control system that anticipates storms, surface run-off and downstream tidal levels in an integrated manner, assisted by models that take into account atmospheric processes, rainfall, run-off, reservoir dynamics and coastal hydrodynamics.

Other priorities in Singapore's total water management solution include detection and removal of pollutants and reduction of energy requirements for desalination and Newater production.

Also of concern are restoration of wetland ecosystems, recovering water from desalination brine, smart water metre systems to analyse residential water flow data;

early warning systems to detect chemical or biological contaminants in water supply and identification of the contaminant sources; and intelligent technologies to detect and reduce water leakage in pipes.

In spite of the progress, much remains to be done. A frontier development still in its infancy is innovation to engage society towards more responsible behaviour and a common goal of efficiency. Given that water will continue to be a scarce resource for tiny Singapore, citizens themselves must be drivers of the water conservation message.

For this goal, however, the work of formal institutions will not be enough. Long-term engagement and collaboration with society will be of utmost importance to move forward.

While systems innovations are essential to boost efficiency, only societal innovations make for permanent solutions. And permanency should be the goal to look for.

Despite its complexity, a good water management solution requires societal changes as they are the only ones that will ensure permanent progress.

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