

New technologies and design of future urban water systems

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The demand for water worldwide has increased substantially over the past decades. Increasing prosperity comes with the challenge to provide a growing urban population with safe quality freshwater. At the same time, the global market for wastewater recycling and reuse reached nearly US\$12.2 billion in 2016 and is estimated to reach US\$22.3 billion by 2021. This market expansion is in response to a growing demand from cities and industry for water against a backdrop of increased urbanisation, population growth and climate variability. To address these challenges and opportunities requires advanced treatment technologies, a focus on innovation and advancing technology.

The water industry, and in particular urban water utilities, needs to adapt to meet the emerging demands of a dynamic, highly deregulated and competitive environment with the context of a changing climate. Water 4.0 is the era of cyber-physical systems, digitalisation and big data where software, sensors, processors, communication and control technologies are increasingly integrated, to deliver sustainable and resilient water management in an increasingly changing, complex and uncertain world.

The opportunity for digital water technologies is especially promising for water professionals in emerging economies. The cost of centralised water and wastewater systems in rapidly expanding cities can be prohibitive and as a result, emerging economies can develop and manage off grid and localised water systems from scratch, much as the competitive mobile (and now smart) phone access allowed billions of isolated individuals to “leapfrog” the old world of monopoly controlled fixed landlines. Dynamic and data-driven (as opposed to mechanistic) models can help integrate and optimise smart pumps, valves, sensors and actuators; each device can “talk” to each other, or for that matter to a customer’s iPhone, and send real-time information to be accessed and shared via the cloud.

Digital water technology adoption requires the engagement and commitment of incumbents, start-ups and entrants from other sectors. Water professionals often lack information technology skill sets and the perspective to appreciate what is possible, while technology entrepreneurs may not understand the nuances of complex water systems affected by multiple factors. By collaborating, urban resilience will emerge faster and smoother.