



Reaching a watershed

Future-proofing an urbanising world's water sources and infrastructure requires unprecedented flexibility and collaboration, and a willingness to embrace innovation, writes [Gregory Smith](#) of InstarAGF

WATER UNDERPINS EVERY aspect of our existence. It sustains natural systems and human life. It also enables the economy, from consumption to energy, agriculture, industry and recreation. In the 21st century, traditional models of financing, designing and delivering water infrastructure are trailing the pace of urbanisation, population growth and climate change, leaving many communities in every part of the world – including North America – without stable access to clean water.

Nearly 40 percent of the world's projected population will be subject to severe water stress by 2050, according to the Organisation for Economic Co-operation and Development. The United Nations reports that about 80 percent of countries – developed and

developing – currently have insufficient funding to meet national requirements and targets for drinking water and sanitation. In 2017, American drinking water systems were graded a “D” by the American Society of Civil Engineers based on safety, condition and capacity, among other criteria. As many water pipes and treatment plants in the US reach the end of their useful lives, the Environmental Protection Agency estimates that more than \$600 billion is needed for water infrastructure capital improvements over the next 20 years.

Scarce water, in terms of quantity, quality and accessibility, is emerging as the single greatest limiting factor in the growth of regional economies. According to research conducted by the US Water Alliance, the US economy stands

to gain more than \$220 billion in annual economic activity by meeting its water infrastructure needs. Similarly, water service disruptions put more than \$40 billion in daily economic activity at risk.

Globally, water use has grown over the past century at more than twice the rate of population increase, and demand is projected to soar by 55 percent between 2000 and 2050. These facts accentuate the limitations of our current models, and the urgency of finding new, sustainable approaches to ‘future proof’ the most basic of all resources. Water scarcity and the crumbling of associated infrastructure is at a boiling point with profound implications for our environmental ecosystems, socioeconomic and urban development and, potentially, social and political stability. As our water

challenges converge, waves of change are coming by necessity.

NEW FUNDING APPROACHES

As water demand and costs grow, private sector expertise and capital is key to accelerating water infrastructure renewal.

Public-private partnerships in the water sector can take many forms – from more traditional PPP models to asset monetisation or privatisation, or even public investment in private water infrastructure, such as government financing for water conservation or treatment measures in industrial or commercial settings. A common challenge for investors in the water sector can be cost recovery, as water in many jurisdictions is unsustainably cheap. Bridging the vast funding gap to attract urgently needed investment requires governments and the private sector to collaboratively demonstrate and deliver greater quality and value for money, and to promote adoption of innovative market mechanisms, efficient technologies and operating practices, and regulatory frameworks that enhance accountability.

There are already more than 2,000 community water or wastewater facilities across the US that are designed as PPPs, and momentum is likely to continue given the fiscal constraints governments are facing. Learning from these experiences, the industry is beginning to establish best practices for PPPs, including shifting to performance-based contracts that are focused on the entire project lifecycle and transfer risk to the private sector. PPP bundling could also be an attractive option for governments to bring private capital and the benefits of the PPP model to smaller water assets within a region.

Similarly, entities such as the Canada Infrastructure Bank and comparable state agencies can be a vital catalyst in facilitating effective structuring, procurement and financing of community-level projects while bringing a pool of expertise and resources to the table. The CIB, for example, plans to invest C\$5 billion in green

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infrastructure projects across Canada with C\$2 billion specifically allocated to improving the reliability of water infrastructure.

MORE FLEXIBLE, LOCALISED SYSTEMS

The complexities and growing footprints of our cities, along with the reality of depleting freshwater resources, are shaping a new understanding of water management, presenting alternatives that respond to specific environments or communities, and are local in scope.

Decentralised water systems include technologies and initiatives such as rainwater harvesting, onsite wastewater treatment and re-use, and water-efficient appliances – all of which can significantly improve water supply reliability. Historically associated with rural areas, decentralised systems are increasingly being deployed in urban settings within specific neighbourhoods, green buildings, campuses, commercial and industrial settings, or in conjunction with conventional utility services. An example is the Solaire high-rise apartment building in New York City, where a wastewater treatment and

recycling plant in the basement collects storm water for toilet flushing, irrigation and cooling. This building has reduced water consumption by 50 percent compared with other similar residential buildings without such water reclamation systems.

Decentralised systems strengthen a community’s resilience and integrate redundancies into a nation’s water infrastructure, thereby helping to improve water reliability, security and quality while significantly reducing costs for consumers. Other benefits include energy savings, improved air quality, creation of new green spaces, habitat restoration, and stimulus for new companies and jobs – all of which contribute to more vibrant, prosperous and healthy cities.

Another alternative approach is the use of recycled water for potable purposes. Orange County in California is a global leader in this area, with the world’s largest water purification system for indirect potable reuse. The system takes highly treated wastewater that would previously have been discharged into the Pacific Ocean and purifies it using an advanced treatment process that produces water that meets or exceeds all state and federal drinking water standards. While such systems are not yet in widespread use, owing at least in part to public scepticism and to existing legal and regulatory hurdles, they represent a viable solution to meet current and future needs and are attracting greater public funding.

STIMULATING A NEW INNOVATION ECOSYSTEM

Bringing about new infrastructure financing solutions and improving water production capacity requires greater innovation on a number of fronts: the adoption of new technologies, new approaches to management in the form of better collaboration and new business models, and new techniques that increase the efficiency of existing systems.



The Solaire (left): The New York building is at the cutting-edge of water management

Water management has generally evolved slowly throughout history, especially in the absence of regulatory pressure and public funding. While inertia tends to accompany any existing regime and create various dependencies that are highly risk-averse and resistant to change, the water sector suffers from a particularly significant innovation deficit. The supply and delivery of water has a uniquely powerful moral dimension that heightens the complexity of infrastructure renewal, with questions of conservation and health melding with matters of social justice and equity, and questions of sustainability intertwined with questions of governance and policy. But whatever form our water infrastructure takes in the future, it will necessarily be very different from how it is today and will require greater public participation in the way it is managed.

At least part of the obstacle to greater private sector investment in water infrastructure lies in regulation and governance, and governments' willingness to make decisions based on data and

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long-term objectives. According to the World Bank, the negative impacts of climate change on water could be neutralised with better policy decisions: when governments respond to water shortages by boosting efficiency and allocating even 25 percent of water to more highly valued uses, such as more efficient agricultural practices, losses decline dramatically – and for some regions, may even vanish.

Transparent public communications and stakeholder engagement are likewise essential to facilitating greater private sector investment in water

infrastructure and to tackling the social and psychological barriers to change: in a study by Stanford University, 90 percent of respondents were in favour of using recycled water for non-potable purposes, yet only 11 percent said they would be willing to drink it. In North America, unlike many other places in the world where nearly 1 billion people lack ready access to safe water at home, the reality of our diminishing resources and the state of our water infrastructure is often not publicly evident until a disaster strikes. To create sustainable water in our communities, we must change our water mindset and assumptions, and collectively recognise that even small, individual actions can add years of viability to our water sources and systems – just as single drops pooled together make up an ocean.

As Benjamin Franklin noted, when the well is dry, we will know the worth of water. In the late 18th century, Franklin was in many respects an environmental advocate ahead of his time, bequeathing funds to the city of Philadelphia, then the fastest-growing city in the American colonies, expressly for the construction of a water pipeline to provide clean, fresh water to local citizens. Today, Philadelphia reportedly has among the worst water-testing systems in the US. More than 200 years later, we are still grappling with the question – and challenge – implicit in Franklin's words.

Water shapes the environment, buoys prosperity and underpins the social fabric of our communities. It is the lifeblood of our economy and well-being, linking us to one another in a deeply profound and complex way. If we fail to rethink the value of water today, we will almost certainly discover what it means to live without it. ■

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