INTERNATIONAL JOURNAL OF WATER RESOURCES DEVELOPMENT, 2017
VOL. 33, NO. 1, 1–3
http://dx.doi.org/10.1080/07900627.2016.1272208

Routledge
Taylor & Francis Group

Editorial

The *International Journal of Water Resources Development* was first published more than 30 years ago. Since then, there have been numerous innovations in science and technology that have acted as knowledge inputs for policy making, and vice versa.

The 1980s saw the beginning of the 'computer age': *Time* magazine named "The Computer" its Man of the Year, and Microsoft released the first word processing programme as well as Microsoft Windows. Planetary exploration, beginning with NASA's launch of the *Galileo* spacecraft, changed the way we look at our solar system.

The 1990s saw many more innovations: the Hubble Space Telescope was launched, and the Human Genome Project was started. Dr Tim Berners-Lee invented the World Wide Web, which, needless to say, has revolutionized information and communication globally; the Global Positioning System (known as GPS) became fully operational, and mobile phones were launched. The first genetically modified food was sold in the United States, and Dolly the sheep was cloned. Dark matter and dark energy, as well as black holes, were discovered.

From the 2000s, the number and type of innovations and the speed at which they have been developed have made the world a different place. There have been so many changes that numerous things have become 'vintage'—denoting, as mentioned by the Oxford Dictionary, something from the past of high quality, especially something representing the best of its kind. Scientific achievements have been numerous, including broadband Internet being used globally, Google as an indispensable search engine for all purposes, mobile phones and text messaging as everyday life instruments, and social networking as a completely new medium of communication.

In the field of water resources, innovations seem to have been much more modest. They also seem not to have had the same impacts globally. This may be why, in general, water resources are increasingly scarce, polluted, mismanaged and misallocated, creating the sense that the world is 'running out' of water. While this is not likely to happen, water scarcity in quantity and quality, and the increasing competition for the resource, can have negative impacts in terms of overall development.

In advanced countries, innovations have focused on management and technological achievements. An example is Singapore, which has developed a whole new array of possibilities to sustain development, for example:

- Detection and removal of pollutants and reduction of energy requirements for desalination and production of high-grade reclaimed water, known as NEWater.
- Intelligent watershed management and monitoring of water quality in reservoirs; early-warning devices that target odour-emitting microorganisms; and restoration of wetland ecosystems.
- Membrane technology: improving membrane permeability by mimicking nature; improving membrane performance; recovering water from desalination brine.
- Network management: smart water meter systems to analyze residential water-flow data; early-warning systems to detect chemical or biological contaminants in water supply and identify the contaminant sources; intelligent technologies to detect and reduce water leakage from pipes.

- Wastewater treatment: treating municipal used water using anaerobic systems; real-time aeration control systems to reduce energy footprint; monitoring volatile organic compounds in used water.
- Water quality and security: investigating environmental control of blue-green algae in reservoirs; monitoring of fish behaviour that change whenever there are contaminants; monitoring of organic compounds.
- Water treatment: carbon filters to remove micropollutants from water; maximizing water recovery from wastewater reclamation; reducing energy consumption for desalination; finding alternatives to reverse osmosis technology that can further reduce energy requirements.

In an increasingly globalized world where change seems to have become a permanent feature, it is essential to discuss what types of innovations are needed in order to achieve more efficient regulatory, institutional, management, development and governance decisions. Discussion of the institutional settings to make them implementable is also of utmost importance. These are issues that not only governments should address, but also every other individual and group that is part of the numerous formal and informal institutions in different sectors locally, nationally and internationally whose decisions affect water resources availability and use in the short and long terms.

In the January 2017 issue, the several articles focus on important topics that affect water resources availability and use. One example is the role of the private sector in water services in Asia (Jensen, 2016). The analysis of two decades of experience of public–private partnerships (PPPs) identifies cyclical patterns of development of PPPs in the water sector across countries and the use of hybrid contractual and institutional arrangements. The article discusses evidence of the increasingly important role of local companies and mixed-ownership companies in Asian water PPPs. It mentions that the development of institutions of economic regulation has lagged behind the introduction of PPPs, and that a related feature of PPPs in the region is that water has actually been a leading sector in the shift from planned to market economies, including in China, Vietnam and Cambodia.

The three articles that focus specifically on China (Xiang, Svensson & Jia, 2016; Shang, Wang, Ye, Lei, Gong and Shi, 2016; Li and Feitelson, 2016) indicate the extent of the impacts of economic growth in the country and how they have affected water use and availability. Xiang et al. use the case of the Yellow River basin to illustrate the extent of competition over water resources by the energy and agricultural sectors and quantify the future water demands of the two sectors. Shang et al. analyze the case of Tianjin, a water-scarce city, where industrial development is promoted without direct consideration of water availability or efficiency. Li and Feitelson discuss the use of desalination as a more effective means for water supply compared to water diversions because of their respective economic costs. The study provides a general cost overview of water supply options for North China, which is among the most challenging in the world due to the scale of population and economic activity involved.

A very interesting account is the interplay of activists and dam developers in the case of Myanmar's mega-dams, the dynamics of social and environmental activism in South-East Asia, and its implications for the energy landscape of the region (Kirchherr, Charles and Walton, 2016). The study finds that conflicts persist, that activists have professionalized, and that dam developers now attempt to engage with civil society, although not with much success in this case.

A final example is the analysis by Hutchings, Franceys, Mekala, Smits and James (2016) of community management for rural drinking water supply in India. The authors analyze three broad models of community management, each with a different decision-making method. In the first, the community oversees the service and decides on technology choices and tariff levels. In the second, the community establishes a voluntary body for the operation and minor maintenance of schemes. In the third, the community contributes directly through either tariffs or tax revenues. In all these cases, communities require different levels of support, which the governments should be able to provide.

In all cases, it is clear that more innovations of all types are necessary and will be welcomed by the water sector.

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Cecilia Tortajada
Editor-in-Chief
Cecilia.tortajada@gmail.com