Expert Insights

Sustainable Forms of Water Use Systems

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After positions that included Associate Professor, Department of Civil Engineering Hydraulics, Kyushu University; Associate Professor, Department of Civil and Urban Engineering, Ibaraki University; Associate Professor and Professor, Department of Urban Engineering, University of Tokyo, he took up his current position in 2006.
His other roles include Board of Director of IWA; IWA Fellow 2010; Chairman of IWA Japan national committee; President of the Japan Society on Water Environment; Chairman, Research committee on nonpoint source pollution; Editorial committee members of Water Research, Urban Water Journal, Hydrological Research Letters, and Journal of Climate Change; Chairman, Editorial committee of Journal of Japan Water Works Association; Technical committee member of Japan Sewage Works Association; and Chairman, Research committee on asset management of the Institute of Electrical Engineers of Japan.
His specialty is urban environmental engineering.

The Basic Act on Water Cycle was enforced in July 2014 and the cabinet decision on the Basic Plan for Water Cycle was made in July 2015.

The aims of the Act and the Plan are to maintain and restore a sound water cycle, and to achieve sound progress on the socioeconomic state of the nation and bring greater stability to our way of life by undertaking comprehensive and consistent measures in relation to the water cycle within watersheds.

The next step is for the “water cycle council” established for each watershed to start formulating the watershed water cycle plan. To ensure a sound water cycle within watersheds, it is stipulated that storage, infiltration, replenishment, and retention of water should be handled in a sound manner, and that efficient systems should be constructed for water use in urban areas.

When considering future water use systems, it is essential to be cognizant of the Basic Strategy for Urban Regeneration based on the Act on Special Measures Concerning Urban Regeneration that was partially amended in August 2014. Urban regeneration needs to be undertaken with consideration for what form urban structure will take in 50 or 100 years’ time. Based on the assumption of a falling population due to aging and the low birth rate, it also needs to take account of a wide range of viewpoints, including compacting cities, securing a high quality of life, developing cities that are resilient to disaster, and are attractive, reducing the environmental loads and living in harmony with nature.

Put another way, taking account of the future urban structure, there is a need to ensure that the manmade parts of the water cycle (water supply and sewerage systems) co-exist harmoniously within the natural water cycle. To achieve safe and reliable water use in urban areas together with a sound water environment and waterfronts that are pleasant and peaceful, we need to find appropriate answers to the questions of how to maintain sufficient quantity and good quality of water in cities, and how we should be getting along with water.

Since 2009, I have been conducting a project of the Core Research for Evolutional Science and Technology (CREST) under the strategic basic research program of the Japan Science and Technology Agency (JST). The objectives of the project are to predict the future quantity and quality of water resources in the Arakawa watershed under climate change, and to study possible sustainable systems of urban water use that encourage effective use of the self-owned water resources in cities such as groundwater, rainwater, and reclaimed water. Through this research we have found that, to optimize urban water cycle and water use systems, it is essential that those who are responsible for managing the rivers, groundwater, water supply, and sewerage and have a practical involvement, share information on water resources and water use within the watershed. Then they should identify sustainable ways of using water, and to adopt these as common goals. To support the building of a consensus among these stakeholders, we have developed a tool to generate various scenarios for water use systems using multi-objective optimization algorithms that consider a wide variety of indicators.

Rather than optimizing the individual systems managed within single municipalities, the tool transcends administrative borders to consider water supply and sewerage systems across the entire watershed. I anticipate that the developed tool will be used to explore and develop sustainable water use systems, examining a variety of water use scenarios. I also think that it is now time to propose how our research outcomes can be incorporated and reflected in the creation process of the above-mentioned watershed water cycle plan.