Water Reuse for Global Warming Mitigation

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1. Trends in the reduction of energy consumption of water cycle systems.

As global warming mitigation becomes an international challenge, lowering energy consumption of water cycle systems, which include water supply and sewer systems, has become important. Most of the energy consumed in water supply systems is used for water intake and conveyance, water distribution and other water transport functions. It is reported that relocating water intake sites and purification plants upstream could cut total emissions of carbon dioxide from water works in the Tokyo region by approximately 60% [1].

In sewer systems on the other hand, approximately 98% of treated wastewater is discharged into the ocean or rivers without reuse. But treated wastewater is considered as a fresh water source available near urban areas. It is expected that reusing treated wastewater as "reclaimed water" for toilet flushing and environment water could lead to further reduction of energy consumption in urban water cycle systems [2]. The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) released the Report of the Panel on Waster Reuse in 2009 [3] to encourage the use of reclaimed water for global warming mitigation.

2. Assessment of the global warming mitigation effects of water reuse.

The Wastewater and Sludge Management Division of the National Institute for Land and Infrastructure Management (NILIM) collaborating with the Sewerage and Wastewater Management Department of MLIT conducts surveys and research on reclaimed water quality management and environmental and socio-economic assessment of water reuse systems.

Establishing reclaimed water quality standards is an important role of the national government in ensuring the sustainable use of reclaimed water. In 2005, the Sewerage and Wastewater Management Department of MLIT and the NILIM established the Guidelines for Reclaimed Wastewater Quality Criteria based on the discussions of a committee of academic experts. Guidelines have been enacted outside Japan in recent years, including Water recycling criteria of the California Code of Regulations ("Title-22"), which assume multi-purpose reclaimed water uses including agricultural irrigation, and the WHO Guidelines for the Safe Use of Wastewater, Excreta, Greywater (3rd ed.) which aims at safe use of reclaimed water in developing countries (revised in 2006) [4]. Revision of the Guidelines for Reclaimed Wastewater Quality Criteria of Japan might be needed as uses of recycled water expand.

With regard to the assessment of water reuse systems, research is being performed regarding LCA for water reuse systems including wastewater reclamation facilities, reclaimed water distribution facilities and users [5] and the evaluation of the socio-economic benefits of water reuse [6].

3. Development and Evaluation of Water Reuse Technologies for the Establishment of a 21st century type Water Circulation System (CREST)

To reduce energy consumption by water cycle systems, the Wastewater and Sludge Management Division implements the CREST project named "Development and Evaluation of Water Reuse Technologies for the Establishment of a 21st century type Water Circulation System" (2009 – 2014) funded by the Japan Science and Technology Agency (JST) collaborating with the Water Management and Dam Division and Research Coordinator for Environmental Affairs of NILIM, Kyoto University, and private companies on membrane filtration. Considering technology development on energy saving of membrane treatment, the project aims at developing and assessing cascade water use systems (Figure) including the relocation of water supply and sewer systems, water reuse and the heat utilization of wastewater for further reduction of energy consumption of water cycle systems inside and outside of Japan.

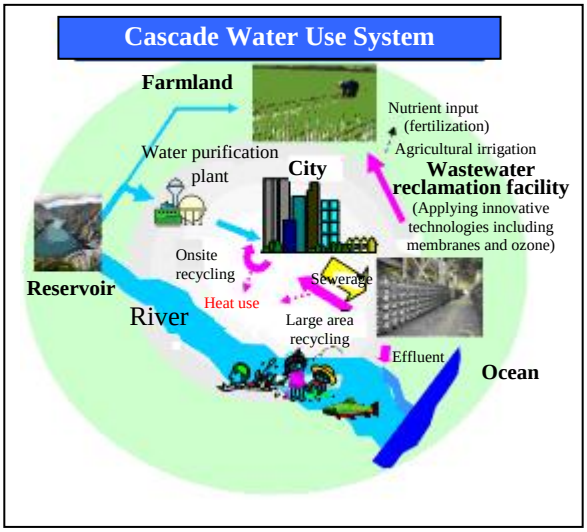

Figure: Concept of Cascade Water Use System

[Sources]

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