

Eco-efficient water infrastructure practices in Republic of Korea

One of the ways to promote the eco-efficient water infrastructure in Asian countries is to refer to good practices through benchmarking. The benchmarking approach provides some of the best practices within a sector through selection of plausible indicators with a comparison of performance. This method also helps explore the advantages and disadvantages and make the best practice (ESCAP, 2007b).

The Republic of Korea appears to enjoy a sufficient level of annual precipitation, approximately 1,245 mm/year, which is estimated 1.4 times larger than the global average, 880 mm/year. But such rosy picture becomes bleak if the per capita precipitation in the country is estimated, about 2,600 m³/year. This level of precipitation per capita reaches only one eighth of the world's average, 19,635 m³/year, because of the high population density (around 49 million in 2006 in the area of 98,477 km²). According to the United Nations, the country is classified as one of the water stress ones, ranked No.146 among 180 countries for per capita water availability (Ministry of Construction and Transportation, 2007; Lee and Kim, 2008).

Confronted with such water supply challenge, water managers in Korea have so far devoted themselves to securing sufficient water resources for households, industries and agriculture. The sufficient provision of drinking, industrial and agricultural water for Korean society has been possible via an array of small and large dams, including 16 multi-purpose dams in operation and three multi-purpose dams under construction in 2007. In particular, the multi-purpose dams in Korea have played a significant role in boosting up socio-economic development by providing water for various purposes, including managing disastrous floods and generating hydroelectricity which has been instrumental for the fast industrialization from the 1960s to the 1990s (Ministry of Construction and Transportation, 2007).

In spite of the substantial contribution for society, dams became the target for criticism in the mid-1990s, especially by environmental NGOs. There had been an emergence of civil movements against dams with reference to negative impacts on natural ecosystems. Faced with the voice from society, policy makers in the country began to take into account environmental concerns in dam construction as well as operation.

The central government enacted the 'Guidelines for Environmentally Friendly Dam Construction' in 2003 and the 'Environmentally Sound and Sustainable Development Guidelines for Dam Construction' in 2006 in which environmentally sound sustainable evaluation methods had been introduced. The guidelines encompass a list of principles to accommodate different voices from diverse stakeholders in water policy-making, to reflect socio-economic variables, and to encourage local residents to set up resident councils for submitting their opinions to concerned authorities. A cascade of the innovative ideas are included in the guidelines, such as installation of fish ways, wild animal passages, eco-bridges to avoid disruption of the ecosystem around dams, and alternative environments, i.e. eco-parks or artificial islands as habitats for wild animals (Ministry of Construction and Transportation, 2007). This case shows a good example of the government's effort to reflect eco-efficiency (emphasis on the ecological aspect) in physical (dam construction) as well as non-physical (enactment of new guidelines) water infrastructure management and development.

Another example in related to eco-efficient water infrastructure in Korea is linked to the reuse of treated sewerage water. As discussed earlier, social opposition to building more new dams is too strong that the government cannot afford to pursue water resources development through the conventional approaches, such as construction of dams, aqueducts and reservoirs. Led by the Ministry of Environment, Korea has begun to focus on the reuse of treated sewerage water. In recent years, the country had produced a large amount of decent quality of treated sewerage water (6.4 billion tons/year) thanks to cutting-edge sewerage treatment technologies. The ministry has been promoting the reuse of treated sewerage water as one of the best alternative water resources in order to achieve four primary aims: 1) the treated water will be able to relieve the imbalance of the regional water supply; 2) the water can enhance the water quality of rivers through reduction of pollution loads; 3) the method can level up corporate competitiveness via provision of low-cost industrial water; and 4) the treated water can be used for urban streams (Ministry of Environment, 2007).

A myriad of laws and regulations have been issued by the government to support this initiative to bring about eco-efficiency in water infrastructure development. The Sewerage Act was amended in March 2001 and September 2006 to reflect the strategy for the reuse of treated sewerage water and make the mandatory reuse of a certain proportion of treated sewerage water when a new sewerage treatment plant is constructed. And water quality recommendations were drawn up in November 2005 to monitor the reuse of treated sewerage water. The most recent effort was the creation of the Framework for Water Circulation in February 2007. This framework includes various practical tools to implement the policy of the reuse of treated sewerage water: 1) the mid-to long-term goals; 2) an implementation mechanism; 3) financial support and tax credits; and 4) the mid-to long-term road map for recycled sewerage water (Ministry of Environment, 2007).

As a result, the percentage of the reuse of treated sewerage water had been rising, from 2.9% in 2000 to 5.4% in 2003 and to 7.7% in 2006. The level of the reused treated sewerage water reached 490 million tons in 2006 out of the total amount of treated water, 6.4 billion tons. Such water was used for cleaning, washing and cooling in treatment facilities and also for environmental flow in rivers and agricultural activities (Ministry of Environment, 2007). However, this innovative approach has some challenges. First, there is a suspicion that microbial pathogens such as bacteria and viruses might be active in the reused water. Second, the reused sewerage water might emit odor and dark color, and third, the construction costs to install facilities for the process can be high.

In response to these challenges, the government has already enacted water quality recommendations which provide principles how to deal with potential health and environmental risks. In addition, the government has decided to supply 30-70% of the total cost of installation of the facilities for the reuse of sewerage water to municipalities since 2006. This can release the financial burden of the municipalities which are willing to adopt this eco-efficient option to improve water supply and water quality situations. The completion of policy efforts to promote the reuse of treated sewerage water will be the enactment of Water Circulation Promotion Act in the foreseeable future (Ministry of Environment, 2007).