# Editorial: Integrated management of rivers and reservoirs

## PROMISING FEATURES

Climate change has altered hydrologic conditions, which directly affects water resources. For example, under the influence of rising temperatures, water vapor content in the atmosphere increases and precipitation changes, leading to a significant increase in the frequency and intensity of extreme hydrometeorological hazard events such as floods and droughts, and causing changes in water resources (Allen *et al.* 2010). In addition, increasing human activities have an impact on water resources, water environment and water ecology. Recent studies have shown that large-scale human activities in many areas have strongly influenced surface water balances (Farley *et al.* 2005; Murray *et al.* 2012). Rivers are important channels of water cycle, the main source of fresh water for human consumption and an important renewed resource, which play essential roles in material cycle, energy flow and climate regulation. Reservoirs are semi-natural and semi-artificial ecosystems, which are 'artificial lakes' formed by damming natural rivers (Hashimoto *et al.* 1982). They are important components of water conservancy constructions, and play vital roles in regional flood interception, water storage, and the regulation of water flow (Jackson *et al.* 1980; Labadie 2004). Rivers and reservoirs are natural and artificial water resource carriers. As a result, to promote ecological environment protection and high-quality development, it is of great significance to study the mechanism of the water cycle under the changing environment and build an optimized water resource management based on it.

However, rivers and reservoirs are faced with many problems, which have attracted the attention of experts and scholars. (i) Human activities and natural changes in the upper reaches of the reservoir, such as soil surface erosion caused by excessive agricultural activities, have led to rivers carrying large amounts of sediment into the lakes and reservoirs. (ii) The decrease in water inflow and increase in salinity of rivers, which are caused by climate change, excessive agricultural activities and inappropriate water withdrawal by human activities, have led to serious ecological disasters. (iii) Chemicals and pesticides have polluted rivers and reservoirs. It includes non-point source pollution caused by unconscionable cultivation and farming, as well as point source pollution caused by inadequate water sewage disposal in urban sewage treatment plants and direct discharge of domestic or industrial sewage. (iv) Nutrients, carried by domestic or industrial sewage, agricultural drainage and precipitation, flowing into reservoirs, as well as the change of flow velocity and the excess of nutrients, resulting in eutrophication. (v) The reservoirs are acidified due to the acid rain. (vi) Reservoirs have serious impacts on the river, which mainly include the shrinkage of river channels and the reduction of flood plains; destruction of aquatic habitats, with fewer birds and species; reduction or even disappearance of migratory fish; invasion of seawater and deterioration of estuarine ecosystems; and invasions of alien species (Kingsford 2000; Poff & Hart 2002). In view of the above problems, it is necessary to study the optimal management of water resources in rivers, lakes and reservoirs, the hydrological mechanism and ecological environment process (including experimental and numerical simulation methods), the optimal operation of engineering facilities and their natural and social effects, as well as the mitigation of water security problems and ensuring the sustainability of ecosystem through the integrated management of rivers and reservoirs (Richter *et al.* 2003, 2007).

## THIS SPECIAL ISSUE

The papers in this special issue of *Water Supply* contribute to various aspects of integrated management of rivers and



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reservoirs. Topics covered include water quality related to environmental ecology and agriculture, reservoir management, and river engineering and floods.

This special issue compiles the recent main results of the integrated management of rivers and reservoirs. It confirms the modernization of reservoir management under the concept of coordinated development (Yu *et al.* 2020), and flood prevention emergency plans during reservoir construction based on generalized intuitionistic fuzzy soft sets and TOPSIS (Wu *et al.* 2020). Numerical simulation of groundwater pollutant transport in unsaturated flow (Yang *et al.* 2020) and an integrated allocation model of water quantity and quality in the Yellow River are explored (Zhou 2020). According to the impacts of precipitation and topographic conditions on the model simulation, a study suggests that the method of incorporating additional runoff generation module in the traditional model can significantly improve the accuracy of flood simulation (Sun *et al.* 2020). In addition, water security is evaluated based on the capacity for socio-economic regulation, which shows that strengthening economic and social control measures are conducive to solving the problems of regional water resource shortage (Tang *et al.* 2020).

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