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Water resource management in river oases along the Tarim River in North-West of China

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Tarim River is one of the longest inland rivers in the world. It flows its water in the northern part of the Taklamakan desert in Xinjiang, North-west of China, which is a very hostile region due its climatic conditions and particularly due to low precipitation and very high evaporation rates. During the past five decades intensive exploitation of water resources, mainly by agricultural activities, has changed the temporal and spatial distribution of them and caused serious environmental problems in the Tarim River Basin. The support measures for oasis management along the Tarim River under climatic and societal changes became the overarching goal of this research.

The temperature has risen by nearly 1˚C over the past 50 years in the Tarim River Basin so more water was available in the mountainous areas of Xinjiang, leading to an increasing trend of the headstream discharges of the Tarim Basin. Aksu, Hotan and Yarkant Rivers are three tributaries of the Tarim River, as well as its main water suppliers. However, under the condition of water increase with the volume of 25×10^8 m^3 in headstreams in recent 10 years, the water to the mainstream has increased less than 10^8 m^3 (in Alar hydrological station), which is less than 3% of the increased water volume of runoff. Moreover, the region is one of the biggest cotton and other cash crops producers in China. In addition, expansion of urban and, in particular, of irrigation areas have caused higher water consumption at different parts of the river, leading to severe ecological effects on rural areas, especially in the lower reaches. Moreover, it also highly affects groundwater level and quality.

The aim of this research is to support decision makers, planners and engineers to find right measures in the area for the further development of the region, as well as adaptation to changing climate. Different scenarios for water resource management, as well as water distribution and allocation in a more efficient and water-saving way, in order to obtain optimal benefit for society, economy and natural environment in a sustainable manner, are the target outcome of this research. Therefore, a more general approach is needed for the macro and whole Tarim River (app. 1321 km long) scale. For addressing water allocation, conjunctive use, water quality issues and surface water interaction with groundwater in this research, GIS-based water-balance model MIKE BASIN (DHI) is employed to meet these objectives for the regional and Tarim River scale.