Impact of the South to North Water Diversion Project on Groundwater Resources of the Beijing Metropolitan Area: Implications for Sustainable Groundwater Use

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As China's Capital, Beijing currently has a population of 22 million people with per capital water resources of less than 100 m^3, one twentieth of the national average and one eightieth of the global. Groundwater withdrawals (2.3 billion m^3/year) account for approximately two thirds of total water use (3.5 billion m^3/year) in Beijing, resulting in significant groundwater depletion and associated environmental issues, such as land subsidence. Ever-growing population and economy will add further pressure on Beijing's groundwater resources. Unsustainable groundwater use threatens societal and economic development of Beijing and poses a large uncertainty in future water supply. To partly alleviate the water shortage issue in the more arid and industrialized North China, the Chinese government has launched the largest water diversion project in the world, i.e., the South to North Water Diversion Project (SNWD), which is a multi-decadal mega-infrastructure project, with the aim to transfer 44.8 billion m^3 of fresh water annually from the Yangtze River in the more humid south through three canal and pipeline systems (east, central, and west routes). Its central route flows from the upper reaches of the Han River, a tributary of the Yangtze River to Beijing, Tianjin and other major cities in Hebei and Henan Provinces. Since Dec 2014 when the water transferred by the central route reached Beijing to Feb 2017, totally 2 billion m^3 of water has been transferred. This has profoundly altered the structure of water supply in Beijing. This study quantifies how the SNWD project impacts groundwater storage of Beijing using modeling, and ground and satellite observations, and projects how groundwater storage changes in the future under different climate and, social and economic scenarios.

Keywords: Groundwater, South to North Water Diversion Project in China, Beijing

