

Threatening of climate change on water resources and supply: Case study of North China

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Abstract

This paper is to highlight the threatening of climate change on the water shortage problem in North China, a semi-arid and arid area. Observations show that the runoff of the major rivers is decreasing dramatically especially in the lower reaches where water is highly demanded. Most noticeable are the dry-outs of the Yellow River, the so-called ‘mother river of China’. Water scarcity would be the most front challenge for the society and economy in China, especially the urban area with extremely high population density. The government already paid attention to the deepening of the underground water level at Beijing. Sustainable water resource management should be the top priority for the local community to adapt to climate change. Studies show that human activities heavily impact on the local climate and environment in China and a dramatic amount of clean water is wasted or polluted.

Keywords: Climate change; Water resource; North china; Yellow river; Beijing city

1. Water problems in NW China

1.1. Yellow River Basin

Yellow River, the second longest in China with a length of 5400 km after Yangtze River, is called ‘the mother river of China’, which is home to some 110 million people or around 9% of China’s total population. While urbanization is increasing rapidly, about 3/4 of the basin residents are still classified as rural and most

of them depend on agriculture for their livelihood. It was in 1972 that Yellow River dry-out was observed. Since then the problem got worse. In 1997, the river bench kept dry for 226 days and no water flew into ocean for more than 300 days, reported by Xinhua News (<http://unn.people.com.cn/GB/14751/2452543.html>). Observations show that the rainfall decreased dramatically in the middle and lower reaches of Yellow River while it increases in upper reaches [1]. As the warmer surface temperature predates the thawing process of snowmelt in the upper reaches of the Yellow River, the discharge in snowmelt period is increased as well. The current

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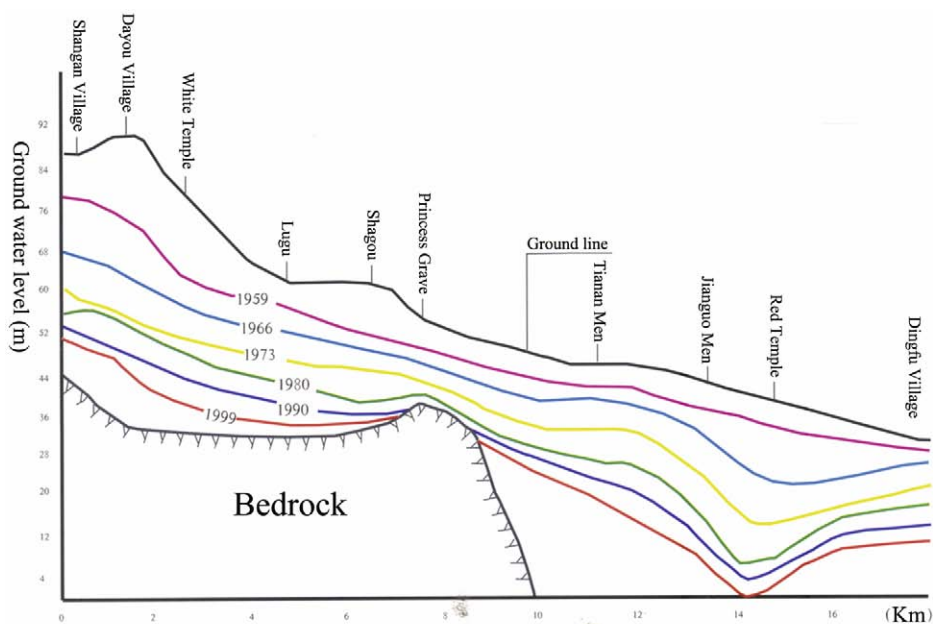


Fig. 1. The variations of underground water level at various sites in Beijing. Cited from [2].

trend will lead to a significant increase in the total runoff volume of rivers in North China, which is in favour of the arid landmass in the region. On the contrary, the intensification of drying in middle and lower Yellow River might imply that natural changes of runoff are not the only reason. Another consideration is the highly increased water usage due to the increasing population and rapid economic development. Wasted or polluted water are equally important. Water scarcity and its economic and environmental consequences have moved to the forefront as major issues for basin administrators, residents, and the nation as a whole. The first challenge is How to solve the imbalance of water demand/supply at regional scale and the inter-region conflict of water usage between different parts along the river catchment.

1.2. Beijing

Beijing and Tianjin are the two major cities in China with massive economic values and huge population. As located in the semi-arid area, the water shortage problem has always attracted public and governmental concerns. The current available water sources decrease to less than half of that in 1950s. It seems that only because of doubled population. However, Fig. 1 illustrates the

water supply is in debt of decrease of underground water level. The underground water level has been deepening during 40 years. If this trend keeps, the underground water will be used up and cause serious consequences in the urban environment.

2. Discussions

Water scarcity problem in North China is discussed in this paper by showing from the Yellow River basin and Beijing region. The increases of dry-out period and frequency in middle and lower reaches of Yellow River are partly due to the recent decrease of precipitation and also the increase of water usage. Meanwhile, the runoff in the upper reach of Yellow River is increased due to increased precipitation and earlier thaw processes and longer snow melting due to warmer climate [1]. The water shortage problem in Beijing is getting worse and worse showing from less water source per capita, more important illustrated by deeper underground water level and less water capacity in drinking water supply.

As IPCC pointed out, warming is projected to be similar to global mean warming in East Asia and greatest in the continental interior of Asia [3]. Precipitation is projected to increase in East Asia [4]. These changes

will be associated with an increase in frequency of intense precipitation events, partly associated with increased intensity of tropical cyclones in East Asia. However, such projection has large uncertainties.

Besides the natural changes of water supply, management of water waste and pollution is more practical and more urgent. Since 1998, China has put forward new development strategies in two major categories for water management. The first focused on the construction of large-scale infrastructure which increased supply as well as raising capabilities of disaster mitigation, for example the Sanmenxia and Xiaolangdi reservoir. In parallel, Chinese have been promoting the sustainable use of water resources by attaching great importance to water resources management, especially emphasizing allocation, saving and protection of water resources.

Another important project worthy to mention is the South-North Water Transfer (SNWT) project in China which is to transport water from water-rich South China to water-poor North China.

Acknowledgments

This study is to highlight the water problem in North China and to possibly investigate its linkage with recent

climate change. The authors are trying to develop an integrated consortium project to focus on this topic. Any further interest or comments are welcome to address to the authors.

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