

Main Practices and Revelation of Groundwater Reserve Management and Protection in Beijing

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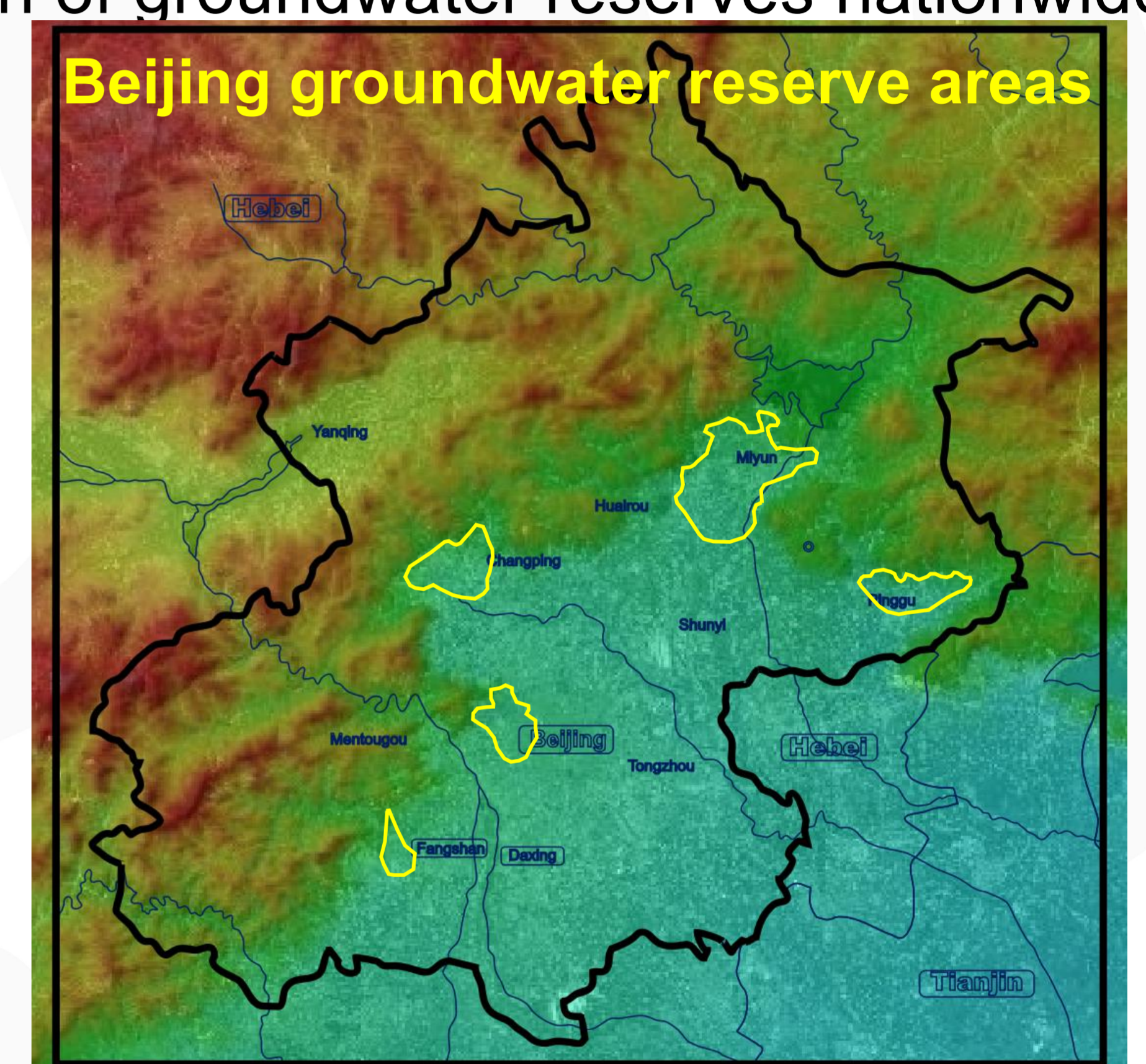
1. Introduction

With the rapid accumulation of population and the rapid development of urban economy, Beijing is facing a severe water resource shortage problem for a long time. In the late 1990s, Beijing planned emergency water supply for groundwater, and in the early 21st century, backup groundwater sources such as Huairou, Pinggu, Fangshan, and Changping were successively used, effectively filling the urban water supply gap and ensuring the successful hosting of major events such as the Olympic Games. Since the first phase of the South to North Water Diversion Project (SNWDP) was put into operation in 2014, with relatively improved water source conditions, Beijing has gradually restored groundwater sources and the groundwater level has significantly rebounded. In recent years, the vivid practice of using and restoring groundwater reserve sources implemented in Beijing has provided valuable experience for strengthening the management and protection of groundwater reserves nationwide and establishing a sound groundwater reserve system.

2. Main practices of groundwater reserve management and protection

2.1 Overall planning and scientific layout of groundwater reserve areas

Beijing is located in the north of the North China Plain, the Taihang Mountains in the west, and the Yanshan Mountains in the north. The piedmont area forms a relatively broad alluvial proluvial fan distribution, which is a unique groundwater storage area. Since the 1990s, Beijing has comprehensively considered factors such as groundwater system, aquifer distribution, and water abundance, and has planned and arranged five major groundwater reserve areas in the mountainous area, namely Mi-Huai-Shun, Western Suburb, Changping, Pinggu and Fangshan. The total area is about 1134 square km², and the storage capacity is about 3.82 billion m³.



2.2 Prudent decision-making and timely activation of backup groundwater sources

The rapid growth of population, society and economy combined with the drought that lasted for many years. Under the severe situation of limited guarantee capacity of other water sources, Beijing had to gradually increase the mining output of groundwater, which led to the overburden of groundwater supply. It was urgent to use backup groundwater sources. After systematic verification, the Huairou emergency water source was connected to the grid on 2003, becoming the first emergency underground water source in Beijing to be put into use. Afterwards, backup groundwater sources such as Pinggu, Fangshan, and Changping were also put into use one after another. From 2005 to 2019, the four backup groundwater sources have supplied over 2.6 billion m³, greatly ensuring water supply safety in the capital.

2.3 Strictly control and regulate the water intake of pumping wells

Beijing is strictly control pumping wells as an important means of protecting groundwater resources and promoting groundwater reserves. At present, all over 57000 motor wells have the ID of "one well, one code", and water users with an annual water intake of 50000 m³ can achieve remote data transmission through online measurement facilities. At the same time, Beijing has launched a large-scale replacement of self owned wells, and "retired" or converted into monitoring wells.

2.4 Seize the opportunity to replenish and restore groundwater reserves

Fully utilize the SNWDP to replenish groundwater reserves. By the end of 2018, the SNWDP had replenished 350 million m³ of water to Mi-Huai-Shun and Western Suburb Reserve Area, accounting for 8.3% of the total water flow into Beijing from the SNWDP. The Miyun Reservoir has been used to implement ecological water replenishment. In 2021, the amount of water replenishment was 1.048 billion m³. The groundwater level in the Mihuaishun Plain was rose by 10 m compared with that in 2020, and the reserves of groundwater resources was increased by 900 million m³.

2.5 Improve regulations and policies, further optimize the reserve pattern

Beijing issued regulation on water saving and a series of groundwater supervision and management policies. Groundwater level and volume control indexes were determined, and violations have been effectively curbed. For the future management and protection, Beijing deploys the research and preparation of the strategic reserve plan of groundwater resources, proposes to build groundwater reserve objectives, projects and institution systems, and further optimize the groundwater reserve pattern.

3. About revelation

Suitable hydrogeological conditions are a prerequisite for building groundwater reserves.

Smooth hydrological cycle is the key to ensure the dynamic equilibrium of groundwater storage.

Necessary water intake facilities are the foundation for maximizing the effectiveness of groundwater storage.

A thorough management and control system is a guarantee for the continuous utilization of groundwater reserves.