



## Compound events of drought and salt intrusion in the Greater Bay Area and adaptation countermeasures

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Dongjiang River drains into the Pearl River Delta in China and waterworks near the delta serves as the main water supply source for cities in the Guangdong-Hong Kong-Macao Greater Bay Area, including Shenzhen, Guangzhou and Hongkong. The basin experienced a severe drought in 2021, with the average streamflow in the downstream gauge reaching its lowest value since 1956. Meanwhile, the most important upstream reservoir, Xinfengjiang Reservoir, experienced a low water level operation period, with the water level declined below its dead water level in Jan. 2022. Coupling with weak river discharge, astronomical tides led to severe salt intrusion in the delta area. The compound events of drought and salt intrusion threatened the urban domestic water supply. According to scenario analysis, the water supply for about 20 million people would have been affected during Nov. 2021 and Jan. 2022 if no countermeasures had been adopted. Comprehensive countermeasures were carried out to prevent the extreme impacts from the compound events, which include engineering and non-engineering ones. The engineering ones include blocking the salt water with temporary batardeau and soft purdah into the water. And non-engineering ones include chlorinity monitoring and forecasting on the strength of in-situ gauges measurements and a three-dimensional baroclinic saltwater intrusion model. The model provided real-time chlorinity forecasting for the waterworks. The bias of peak chlorinity was less than 20%, and the bias of the peaking time was less than 2 h. The forecasting results supported decision making on timing of water intaking for the waterworks and other local water storage infrastructure. In addition, the water authorities carried out tiered prices and imposed limitations to high water use of some industrial water users. With all these strategies, the domestic water supply was well maintained across the compound events, which ended in Mar. 2022. The river basin authority played an important role in communicating the necessary information and coordinating all the countermeasures among associated stakeholders.