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A disappearing river – the role of irrigation, afforestation, and climatic variability in the discharge drop of the Guishui River, Beijing, China

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Guishui river (Beijing, China) is one of the three major rivers feeding the Guanting reservoir, which played a great role in flood control, irrigation and power generation for the city of Beijing. In addition, this watershed is an important water conservation district and the place where the 2022 Winter Olympics will be held. Due to the cold and arid climate on its catchment, the river has always been occasionally intermittent, yet its discharge dropped to its former fraction in the last 15 years. This caused a parallel degradation of aquatic ecosystem and damaged the river's self-purification function.

This study investigated a) the impacts of afforestation campaigns against desertification of the region, b) the recent shift in the agricultural crops towards more water-demanding types such as fruits and flowers and the consequent increase in irrigation volumes, and c) the recent climatic variability on stream-flow with two hydrological models, a conceptual and an empirical one. The results suggest that these three factors explain the majority of observed flow deficits. Based on them, recommendations for future sustainable water utilization are formulated.