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NUMERICAL OPTIMIZATION STUDY OF THE NANFEI RIVER ECOLOGICAL WATER REPLENISHMENT PLAN

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Abstract

This study investigates the effects of water quality improvements under various water replenishment conditions of the Nanfei River, aiming to identify an optimal scheme that maximizes ecological and environmental benefits. A numerical simulation that integrates water quantity and quality was used to model the Nanfei River. The calibrated and validated model simulated the water quality response in the river's main stream under different replenishment pathways and scales. Results show that high-quality water inputs from the Chuhe Main Canal significantly improve the river's water quality, with larger replenishment volumes enhancing this effect. The Banqiao River tributary, located upstream of the Nanfei's urban reach, provides the best overall ecological improvements to the main stream when replenished. Simultaneous inputs from the Ershibu and Dianbu Rivers improve tributary water quality but may negatively impact upstream improvements in the main stream. Therefore, coordination between systems is crucial for effective regulation. The study recommends prioritizing the replenishment of the Banqiao River for optimal water quality and ecosystem benefits.

Key words: ecological water replenishment, Nanfei river, numerical simulation, water resource scheduling

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