

## Application of simulated annealing algorithm in multi-objective allocation optimization of urban water resources

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## ABSTRACT

A reasonable allocation can improve the allocation rate of water resources, and ensure ecological coordination and promote economic development. However, with cities developing quickly, urban water resources allocation is becoming more and more prominent. This study designs a multi-objective optimal allocation model of urban water resources based on simulated annealing algorithm, introduces the sudden jump of probability, adopts the multi-objective Pareto effective solution, and further improves the simulated annealing algorithm. The actual total water demand in 2022 is 6,606.53 million m<sup>3</sup> larger than the actual water supply 6,556.53 million m<sup>3</sup>. The small probability errors of water demand and water supply forecasts are 0.8532 and 0.9586, the average relative errors are 0.0231 and 0.0212, and the variance ratios are 0.2125 and 0.2109, indicating that the forecasts are valid and the prediction accuracy is good. The model convergence is the fastest when using the multi-objective simulated annealing algorithm to close compared with other algorithms. By using an improved simulated annealing method to solve this multi-objective optimal allocation model effectively avoids the iterative process from falling into local optimum and improves the accuracy of prediction evaluation. The experimental results show that the algorithm has high accuracy and stability for water resources optimal allocation, which has certain practical significance and economic value in water resources.

*Keywords:* Multi-objective allocation; Simulated annealing algorithm; Water resources; Water supply; Water demand

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