

Optimal allocation of system dynamics models for urban water management

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ABSTRACT

Water resources management possesses an essential influence on the socio-economic advancement of cities in the region. In order to ensure that the urban economy develops on the basis of healthy and sustainable water environment and ecology, this research constructs a system dynamics model of urban water environment carrying capacity, and constructs a water environment carrying capacity evaluation index system. The level and trend of water environment carrying capacity of a city in southwest China from 2005 to 2019 were analysed through the model study, and the future trend of water environment carrying capacity of the city was also predicted and analysed. In the experiment, the prediction performance of the system dynamics model is analysed through historical tests, and the results show that in the four indexes of population, water supply, wastewater discharge, and chemical oxygen demand discharge, the prediction of the model has an error of less than 1.12%, 0.5%, 0.33%, and 0.1% from the actual value, respectively. Meanwhile, in the estimation of water resources carrying capacity, it is found that the city has the worst management effect in 2009, with a score of -2.58, and the best water environment carrying capacity evaluation in 2019, with a score of 2.88. In the control of drainage and pollution prevention programme, water conservation and environmental protection programme and the integrated programme, it is found that the integrated programme is better able to avoid the water environment crisis in the future, and improves the future carrying capacity of the city's water environment.

Keywords: Water resources; System dynamics modelling; Carrying capacity; management; Principal components

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