A study of runoff and water quality changes under the influence of different climate and land use —— Taking the Yongding River Basin as an example

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Abstract

Global warming has caused changes in the spatial and temporal distribution of water resources and affected the water environment. Land use change is mainly influenced by human activities, which is also one of the reasons for the water environment problems have become increasingly serious. The Yongding River basin is important water connotation area and ecological barrier in Beijing-Tianjin-Hebei region in China. The basin has been affected by human activities and climate change, there are problems such as significant reduction in runoff and serious water pollution. To study the effects of climate change and land use on runoff and water quality, this paper simulates runoff and water quality by the Hydrological Simulation Program FORTRAN(HSPF) model, then studied the changes of runoff and water quality under different land use and climate scenarios. The results show that: the HSPF model has good applicability in the Yongding River basin, the Relative Error (Re) of runoff and water quality simulation is within 10%, the Nash Coefficient (NSE) and Correlation Coefficient (R) are above 0.6. The simulation results of different land use scenarios show that the expansion of construction land has a facilitating effect on runoff and also leads to the increase of pollutant concentrations in river; forest and grassland inhibit the generation of runoff, while having a purifying effect on water quality. The simulation results of different climate scenarios show that the rainfall rising has a positive effect on runoff generation and water quality improvement and the temperature rising has a negative effect on runoff generation and water quality improvement. At the same time, the "evaporation paradox" also affects the runoff change. In the integrated scenario, simulation results show that the land use and climate change influence the changes in runoff and water quality, but the influence mechanism is not a simple superposition.

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