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Ph. D. Thesis

The Effects of Adaptation Strategies on Water Resources Management in Mashhad Plain: The Application of Hydro-Economic Modeling

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Abstract

Khorasan Razavi Province suffers from the most critical groundwater resources in Iran, i.e. the groundwater decline has reached 1 m; 34 out of 37 water plains are banned in Khorasan Razavi Province. Recently, Mashhad plain has been fighting with the crisis of drought and water scarcity. Illegal harvesting from groundwater resources and the warming trend caused by change in climate have exacerbated the crisis. Comprehensive water resources management, assuming the complicated nature of water-related issues, rapid growth of population, water requirement for a variety of purposes, and limited water resources, requires novel methods to stack up technical, economic, environmental, social, and logical perspectives in an integrated forum. One of the tools for comprehensive water resources management is utilizing hydro-economic models to simulate the preesent status of drainge basins and evaluate the impacts of different scenarios and policies. The current study used a hydro-economic model to simulate the hydrological status of Mashhad plain and evaluate the impacts of different scenarios. Then, the agent-based model (ABM) was used to come to an agreement with stakeholders on executing different conservation scenarios. The hydro-economic model results revealed that reducing the water demand of the agricultural sector and, as a result, surface and groundwater consumption is possible through following adaptation scenarios. Implementing various adaptation scenarios may alter the present cultivation pattern. Moreover, the ABM results showed a significant difference between the volume of available water, due to the execution of strategies, and water demand, bringing about the lack of farmers' cooperation regarding the implementation of conservation scenarios. However, through applying some incentive policies, a number of representative farmers may agree to pursue adaptation scenarios.

Keywords: adaptation strategies, water resources, hydro-economic model, agent-based models (ABM)