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Adaptation strategies in alluvial aquifer under future climate change (Case study: Hamadan aquifer, West of Iran)

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Abstract:
Groundwater is the main source of water in arid and semi-arid regions, so it is very important to recognize vulnerable parts of aquifer in future under climate change. In this research, sixteen climate models were evaluated based on weighting approach. HADCM3 and CGCM2.3.2a models were selected for temperature and precipitation predictions in the future, respectively. LARS-WG was used for downscaling AOGCMs outputs. Results show that temperature will increase by 1.4°C and precipitation changes between +10% to -6% under B1 and A2 emission scenario, respectively. Simulated runoff by artificial neural network indicates reduction in the future runoff by -39% under A2 emission scenario and increase by +12% under B1 emission scenario. In order to simulate the direct impacts of climate change on groundwater resources, the projected precipitation and resulted runoff in the future were used as inputs to the groundwater model. Simulation of the groundwater head changes by MODFLOW software indicates more groundwater depletion under A2 scenario compared to B1 scenario. The groundwater model results indicate that areas with low aquifer transmissivity and high density of extraction wells are more vulnerable to the future climate change. According to the aquifer critical conditions in current situation, groundwater artificial recharge plans do not have adequate efficiency and the most suitable adaptation strategies in the aquifer include enhancement of irrigation efficiency, plugging of unlicensed wells and establishment of water markets. Because of the lack of water pricing in Iran, water marketing can make a fundamental attitude in adaptation to the future climate change and paving the way for other adaptation strategies.

Keywords: Adaptation strategies; Climate change; Emission scenario; Groundwater depletion; Hamadan aquifer; Vulnerable areas