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Developing a perceptual model for socio-hydrological modelling in a semi-arid region of Iran

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Hydrological processes in semi-arid areas are usually poorly understood and groundwater is commonly the most important water resource in these areas. In other hand, changing climate and rapid groundwater depletion have a lot of influence on socio-economic conditions with a specific response lag in these regions. Thus, understanding historical water-human relationships and analyzing the impacts of anthropogenic activities on hydrological systems is of great importance for sustainable development of human societies in the semi-arid regions. As a first step for assessing this complex system, this study aims at providing a perceptual model to analyze socio-hydrologic behavior in one of the most important semi-arid regions of Iran, KashafRud basin. The KashafRud basin is located in a semi-arid region with the average annual rainfall of 236 mm. The basin faced with an extensive agriculture activity and the main source of water provision is groundwater that has been overexploited to meet the increasing trend of water demand during the past 20 years. The perceptual model was developed based on six key components of the coupled system dynamics (Elshafei et al., 2014): catchment hydrology, population, economics, environment, socio-economic sensitivity, and collective response. The preliminary results showed that prioritized effects are: increasing the population due to migration and international refugees to the region, relying on transboundary water supply for about 70% of potable water, rapid groundwater depletion, while the agricultural activities rely on it and finally increasing the waste water volume in the region. In this case study results also show that most of changes in socio-economic conditions are related to behind the basin boundaries. However, the farm level socio-hydrological system (Pande and Savenije, 2016) can specifically shapes the basin level coupled human-water system dynamics.