Maryam Soltani, Reza Kerachian, Mohammad reza Nikoo, Hamideh Noory, 2018, Planning for agricultural return flow allocation: Application of info-gap decision theory and a nonlinear CVaR-based optimization model, *Environmental Science and Pollution Research,* DOI: 10.1007/s11356-018-2544-7.

**Abstract** A new methodology is proposed for sizing the required infrastructures for water and waste load allocation in river systems receiving return flow from agricultural networks. A nonlinear optimization model with a constraint based on Conditional Value at Risk (CVaR) is developed to provide water and waste load allocation policies. The CVaR-based constraint limits the probabilistic losses due to existing uncertainties in available surface water. The deep uncertainties of return flow simulation model parameters, which have significant impacts on the simulated quantity and quality of agricultural return flows, are handled by using the Info-Gap theory. Total Dissolved Solid (TDS) is selected as water quality indicator and diverting a fraction of return flows to evaporation ponds is considered to control the TDS load of agricultural waste load dischargers. Quantity and TDS load of agricultural return flows over a one-year cultivation period are simulated by using a calibrated SWAP agro-hydrological model. The results of many runs of SWAP model for different combinations of important uncertain parameters in their ranges of variations, provide some response (impact) matrixes which are used in optimization model. The applicability of the proposed methodology is illustrated by applying it to the PayePol region in the Karkheh River catchment, southwest Iran. The selected strategy for water and waste load allocation in the study area is expected to provide total annual benefit of 48.64 million US Dollars, while 7.84 million m3 of total return flow should be diverted to evaporation ponds. The results support the effectiveness of the methodology in incorporating existing deep uncertainties associated with agricultural water and waste load allocation problems.

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