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Trading the Economic Value of Unsatisfied Municipal Water Demand

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Modelling and optimization techniques for water resources allocation are here proposed to identify the economic value of the unsatisfied municipal water demand against demands emerging from other sectors. While this is always an important step in integrated water resource management perspective, it became crucial for water scarce Countries. In fact, since the competition for the resource is high, they are in crucial need to trade values which will help them in satisfying their policies and needs. In this framework, hydro-economic, social equity and environmental constraints need to be satisfied.
In the present study, a hydro-economic decision model based on optimization schemes has been developed for water resources allocation, that enable the evaluation of the economic cost of a deficiency in fulfilling the municipal demand. Moreover, the model enable efficient water resources management, satisfying the demand and proposing additional water resources options. The formulated model is designed to maximize the demand satisfaction and minimize water production costs subject to system priorities, preferences and constraints. The demand priorities were defined based on the effect of demand dissatisfaction, while hydrogeological and physical characteristics of the resources are embedded as constraints in the optimization problem.
The application to the City of Amman is presented. Amman is the Capital City of the Hashemite Kingdom of Jordan (Jordan), a Country located in the south-eastern area of the Mediterranean, on the East Bank of the Jordan River. The main challenge for Jordan that threat the development and prosperity of all sectors that depend on water, is the extreme water scarcity. In fact, Jordan is classified as semi-arid to arid region with limited financial resources and unprecedented population growth.
The model case study divides the Amman area in two domestic demand centres, one agricultural demand centre and one industrial demand centre. The model identifies both existing and potential water supply sources from different resources to satisfy the demand for these centres.
Model application to other areas, especially those characterized by an increasing dissatisfaction of municipal water consumers, will be beneficial and will facilitate its endeavour for sustainable water management.