

Integrated management of over-exploited aquifers: an extreme case study in southern Spain

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Abstract Integrated Water Resources Management (IWRM) of water systems supplied by groundwater is an unconsidered matter; even more in the case of groundwater-based systems in which over-exploitation of aquifers takes place. There are plenty of stressed water systems based on groundwater with serious and multidisciplinary conflicts due to the absence of a real integrated management, which offers integrated solutions. This study proposes a methodology for undertaking an integrated analysis of water systems supplied by groundwater. This methodology is applied to examine a water system called “Altiplano” located in southern Spain, where the water abstraction from the aquifers greatly exceeds recharge (147 hm³/year vs 35 hm³/year), and the irrigated areas supplied by those aquifers have a very high agrarian profitability. For this study a Decision Support System (DSS) based on the application of different techniques such as Object-Oriented Bayesian Networks (OOBNs), Evolutionary Multiobjective Optimization (EMO) and Multicriteria Analysis (MCA) is presented. This DSS allows us to model the real problems of the water system and to quantify the impacts of different water management scenarios on the aspects involved in the case study. Dealing with the Water Framework Directive (WFD) requirements, any attempt to restore the aquifer systems generates strong socio-economic impacts which, in some cases, could be assumed by society.

Key words Integrated Aquifers Management; Decision Support Systems; aquifer overexploitation; object-oriented Bayesian networks; Murcia, Spain