

Development of an intelligent decision support system for the management of water resources in a low flow river basin

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Abstract

This thesis presents a study of the applicability and suitability of ELECTRE-III-H, an adaptation of the classical ELECTRE-III method to a hierarchical structure of criteria, for evaluating sectorial water allocation policies for a water-stressed Mediterranean area of Northeastern Spain, in particular the Tarragona city. The proposed method to target this problematic is based on the outranking model of decision support systems, which constructs a partial preorder based on pairwise preference relations among all the possible actions. This work has addressed the multi-criteria water management problem considering several water allocation strategies to mitigate water scarcity induced by climate change. We compare several adaptation measures including alternative water resources, inter basin water transfer and sectorial demand management coming from industry, agriculture and domestic sectors.

First, a formalization of the problem using a hierarchical model is proposed, several subsets of criteria have been determined at different levels of generality, according to the needs of the decision maker.

Once the environmental experts have provided us with the set of rules regarding water supply and demand corresponding to different strategies, a set of alternatives and their corresponding evaluations have been built, for this task we have designed and implemented a software tool that is able to generate the scenarios for this case study.

Then, several tests with different parameters for ELECTRE-III-H model have been run with the software developed by the ITAKA research group, finding the most appropriate values for the configuration of these parameters for this problem.

Finally, the obtained results have been analyzed and a final recommendation has been made and discussed with the decision makers.