

# Multi-criteria decision making for water resource management: A case study of the Gediz River Basin, Turkey

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## Abstract

In this study, a water resource management model that facilitates indicator-based decisions, with respect to environmental, social and economic dimensions in a multiple criteria perspective, is developed for the Gediz River Basin in Turkey. The basic input of the proposed model is the quantity of surface water that is mainly allocated to irrigation purposes. The model has been applied under 3 different hydro-meteorological scenarios that reflect baseline as well as better and worse conditions of water supply and demand, not only to reach a comprehensive assessment of the water budget in the Gediz Basin, but also to evaluate the impacts of proposed management alternatives under different conditions. The Water Evaluation and Planning (WEAP) software is used as a simulation and evaluation tool to assess the performance of possible management alternatives; performance is measured by 9 indicators representing economic, social and environmental sustainability. The study has delineated the best management alternative on the basis of 3 different multi-criteria decision making (MCDM) methods, including simple additive weighting (SAW), compromise programming (CP) and technique for order preference by similarity to ideal solution (TOPSIS). Each method is also applied with 7 different sets of criteria weights that represent objective judgements as well as subjective preferences of decision makers. The results of the study indicate that the decision on the best alternative is basically independent of the MCDM method used, but slightly sensitive to the weights assigned to the criteria as well as the data used in the analyses.

**Keywords:** MCDM, water resource management, WEAP, Gediz River Basin