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A combined linear optimisation methodology for water resources allocation in Alfeios River Basin (Greece) under uncertain and vague system conditions

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In the present study, a combined linear programming methodology, based on Li et al. (2010) and Bekri et al. (2012), is employed for optimizing water allocation under uncertain system conditions in the Alfeios River Basin, in Greece. The Alfeios River is a water resources system of great natural, ecological, social and economic importance for Western Greece, since it has the longest and highest flow rate watercourse in the Peloponnisos region. Moreover, the river basin was exposed in the last decades to a plethora of environmental stresses (e.g. hydrogeological alterations, intensively irrigated agriculture, surface and groundwater overexploitation and infrastructure developments), resulting in the degradation of its quantitative and qualitative characteristics. As in most Mediterranean countries, water resource management in Alfeios River Basin has been focused up to now on an essentially supply-driven approach. It is still characterized by a lack of effective operational strategies. Authority responsibility relationships are fragmented, and law enforcement and policy implementation are weak. The present regulated water allocation puzzle entails a mixture of hydropower generation, irrigation, drinking water supply and recreational activities. Under these conditions its water resources management is characterised by high uncertainty and by vague and imprecise data. The considered methodology has been developed in order to deal with uncertainties expressed as either probability distributions, or/and fuzzy boundary intervals, derived by associated α-cut levels. In this framework a set of deterministic submodels is studied through linear programming. The ad hoc water resources management and alternative management patterns in an Alfeios subbasin are analyzed and evaluated under various scenarios, using the above mentioned methodology, aiming to promote a sustainable and equitable water management.

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Bekri, E.S., Disse, M. and P.C.,Yannopoulos, (2012), Methodological framework for correction of quick river discharge measurements using quality characteristics, Session of Environmental Hydraulics – Hydrodynamics, 2nd Common Conference of Hellenic Hydrotechnical Association and Greek Committee for Water Resources Management, Volume: 546-557 (in Greek).