Geophysical Research Abstracts
Vol. 16, EGU2014-8657, 2014
EGU General Assembly 2014

Investigation and incorporation of water inflow uncertainties through stochastic modelling in a combined optimisation methodology for water allocation in Alfeios River (Greece)

Eleni Bekri (1,2), Panayotis Yannopoulos (1), and Markus Disse (2)

(1) Environmental Engineering Laboratory of Civil Engineering Department,University of Patras, Patras, Greece (ebekri@upatras.gr, p.c.yannopoulos@upatras.gr), (2) Chair of Hydrology and River Basin Management of Faculty of Civil, Geo and Environmental Engineering, Technische Universität München, Munich, Germany (eleni.bekri@tum.de, markus.disse@tum.de)

The Alfeios River plays a vital role for Western Peloponnisos in Greece from natural, ecological, social and economic aspect. The main river and its six tributaries, forming the longest watercourse and the highest streamflow rate of Peloponnisose, represent a significant source of water supply for the region, aiming at delivering and satisfying the expected demands from a variety of water users, including irrigation, drinking water supply, hydropower production and recreation. In the previous EGU General Assembly, a fuzzy-boundary-interval linear programming methodology, based on Li et al. (2010) and Bekri et al. (2012), has been presented for optimal water allocation under uncertain and vague system conditions in the Alfeios River Basin. Uncertainties associated with the benefit and cost coefficient in the objective function of the main water uses (hydropower production and irrigation) were expressed as probability distributions and fuzzy boundary intervals derived by associated α-cut levels. The uncertainty of the monthly water inflows was not incorporated in the previous initial application and the analysis of all other sources of uncertainty has been applied to two extreme hydrologic years represented by a selected wet and dry year.

To manage and operate the river system, decision makers should be able to analyze and evaluate the impact of various hydrologic scenarios. In the present work, the critical uncertain parameter of water inflows is analyzed and its incorporation as an additional type of uncertainty in the suggested methodology is investigated, in order to enable the assessment of optimal water allocation for hydrologic and socio-economic scenarios based both on historical data and projected climate change conditions. For this purpose, stochastic simulation analysis for a part of the Alfeios river system is undertaken, testing various stochastic models from simple stationary ones (AR and ARMA), Thomas-Fiering, ARIMA as well as more sophisticated and complete such as CASTALIA. A short description and comparison of their assumptions, the differences between them and the presentation of the results are included.

Li, Y.P., Huang, G.H. and S.L., Nie, (2010), Planning water resources management systems using a fuzzy boundary interval-stochastic programming method, Elsevier Ltd, Advances in Water Resources, 33: 1105–1117. doi:10.1016/j.advwatres.2010.06.015

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).