



Methods and tools to simulate the effect of economic instruments in complex water resources systems. Application to the Jucar river basin.

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The main challenge of the BLUEPRINT to safeguard Europe's water resources (EC, 2012) is to guarantee that enough good quality water is available for people's needs, the economy and the environment. In this sense, economic policy instruments such as water pricing policies and water markets can be applied to enhance efficient use of water. This paper presents a method based on hydro-economic tools to assess the effect of economic instruments on water resource systems. Hydro-economic models allow integrated analysis of water supply, demand and infrastructure operation at the river basin scale, by simultaneously combining engineering, hydrologic and economic aspects of water resources management.

The method made use of the simulation and optimization hydroeconomic tools SIMGAMS and OPTIGAMS. The simulation tool SIMGAMS allocates water resources among the users according to priorities and operating rules, and evaluate economic scarcity costs of the system by using economic demand functions. The model's objective function is designed so that the system aims to meet the operational targets (ranked according to priorities) at each month while following the system operating rules. The optimization tool OPTIGAMS allocates water resources based on an economic efficiency criterion: maximize net benefits, or alternatively, minimizing the total water scarcity and operating cost of water use.

SIMGAS allows to simulate incentive water pricing policies based on marginal resource opportunity costs (MROC; Pulido-Velazquez et al., 2013). Storage-dependent step pricing functions are derived from the time series of MROC values at a certain reservoir in the system. These water pricing policies are defined based on water availability in the system (scarcity pricing), so that when water storage is high, the MROC is low, while low storage (drought periods) will be associated to high MROC and therefore, high prices. We also illustrate the use of OPTIGAMS to simulate the effect of ideal water markets by economic optimization, without considering the potential effect of transaction costs. These methods and tools have been applied to the Jucar River basin (Spain). The results show the potential of economic instruments in setting incentives for a more efficient management of water resources systems.

Acknowledgments:

The study has been partially supported by the European Community 7th Framework Project (GENESIS project, n. 226536), SAWARES (Plan Nacional I+D+i 2008-2011, CGL2009-13238-C02-01 and C02-02), SCARCE (Consolider-Ingenio 2010 CSD2009-00065) of the Spanish Ministry of Economy and Competitiveness; and EC 7th Framework Project ENHANCE (n. 308438)

Reference:

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