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# Integrated water resources modelling for assessing sustainable water governance

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Climatic variations and resulting future uncertainties, increasing anthropogenic pressures, changes in political boundaries, ineffective or dysfunctional governance of natural resources and environmental degradation are some of the most fundamental challenges with which worldwide initiatives fostering the "think globally, act locally" concept are concerned. Different initiatives target the protection of the environment through sustainable development; Integrated Water Resources Management (IWRM) and Transboundary Water Resources Management (TWRM) in the case of internationally shared waters are frameworks that have gained wide political acceptance at international level and form part of water resources management planning and implementation on a global scale. Both concepts contribute in promoting economic efficiency, social equity and environmental sustainability.
Inspired by these holistic management approaches, the present work describes an effort that uses integrated water resources modelling for the development of an integrated, coherent and flexible water governance tool. This work in which a sequence of computer based models and tools are linked together, aims at the evaluation of the sustainable operation of projects generating renewable energy from water as well as the sustainability of agricultural demands and environmental security in terms of environmental flow under various climatic and operational conditions. More specifically, catchment hydrological modelling is coupled with dams' simulation models and thereafter with models dedicated to water resources management and planning,while the bridging of models is conducted through geographic information systems and custom programming tools. For the case of Mesta/Nestos river basin different priority rules in the dams' operational schedule (e.g. priority given to power production as opposed to irrigation needs and vice versa), as well as different irrigation demands, e.g. current water demands as opposed to those defined in the River Basin Management Plan (RBMP), are thoroughly examined in order to ascertain the river's capability to cover multi water demands and the potential of further infrastructure development. Due to the transboundary nature of the river basin in question, different scenarios quantify the maximum water volumes that could be further exploited in the upper part of the basin in order to avoid adverse consequences to the downstream regional economy, power productivity and environmental flow, and in terms of water governance to satisfy the need to balance water use between socio-economic activities and ecosystems.