

GestAqua.AdaPT – Mediterranean river basin modeling and reservoir operation strategies for climate change adaptation

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Climate change (CC) scenarios for the Mediterranean region include an increase in the frequency and intensity of extreme weather events such as drought periods, higher average temperatures and evapotranspiration, combined with the decrease of annual precipitation may strongly affect the sustainability of water resources. In face of these risks, improving water management actions? by anticipating necessary operational measures is required to insure water quantity and quality according to the needs of the populations and irrigation in agriculture.

This is clearly the case of the Alentejo region, southern Portugal, where present climatic conditions already pose significant challenges to water resources stakeholders, mainly from the agricultural and the urban supply sectors. With this in mind, the GestAqua.AdaPT project is underway during 2015 and 2016, aiming at analyzing CC impacts until 2100 and develop operational procedures to ensure water needs are adequately satisfied in the Monte Novo and Vigia reservoirs, which supply water for the city of Évora and nearby irrigation systems. Specific project objectives include: a) defining management and operational adaptation strategies aiming to ensure resource sustainability, both quantitatively and qualitatively; b) evaluate future potential costs and available alternatives to the regional water transfer infrastructure linked with the large Alqueva reservoir implemented in 2011; c) defining CC adaptation strategies to reduce irrigation water needs and d) identification of CC adaptation strategies which can be suitable also to other similar water supply systems.

The methodology is centered on the implementation of a cascade of modeling tools, allowing the integrated simulation of the multiple variables under analysis. The project is based on CC scenarios resulting from the CORDEX project for 10 combinations of Global and regional climate models (GCMs and RCMs). The study follows by using two of these combinations, selected on the basis of comparison with regional climate data for the control period of 1971-2005, and implementing the eco-hydrological model SWAT (Soil and Water Assessment tool) in order to obtain runoff flows and quality and evapotranspiration for representative agricultural systems. Outputs from SWAT are used as inputs for the hydrodynamic and water quality model CE-Qual-W2 to simulate both the Monte Novo and Vigia reservoirs, thus enabling sustainability evaluation in terms of water quantity and quality. Reservoir water balances are used to estimate water transfer energy costs. GestAqua.AdaPT also includes hydrometric and water quality monitoring tasks, some of them focused in evaluating changes in water quality caused by extreme hydrological events.

The combination of the implemented methods will allow the development of CC adaptation strategies for the operation of reservoirs and for the agricultural sector. This includes the definition and implementation of reservoir operation curve rules, as well as the assessment of structural solutions for the water transfer from Alqueva. In the agricultural sector will be evaluated alternative agricultural practices focused on water resources sustainability.

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