Water Resources management and environmental flows under physicochemical and ecological considerations.

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Multidisciplinary models are useful for integrating different disciplines when addressing water planning and management problems. Coupling tools of water resources management, water quality and habitat analysis is important to propose water allocation solutions in different environmental flows scenarios. The Decision Support System AQUATOOL allows the construction of the three kinds of models: the SIMGES model solves the allocation problem through network flow optimisation and considers the environmental flows in selected river stretches; the GESCAL model performs the water quality in rivers and reservoirs; and the CAUDECO model assesses habitat suitability, providing Habitat Time Series for each available WUA-flow curve. Furthermore, the general methodological framework is improved by implementing a hydrological alteration assessment of the e-flow regime scenarios.

This approach was applied in the Tormes River Water Resources System, where agricultural demands endanger the environmental needs of the river ecosystem. Moreover, the wastewater loading and the agricultural pollution result in water quality problems in some river stretches. Our methodological framework can be used to define water management rules that maintain water supply, aquatic ecosystem and water quality legal standards. The integration of ecological and water management criteria in a software platform allows the optimization and application of environmental flows, considering the real constrains in the legal and economical framework of a river basin.