



Decision support system based on DPSIR framework for a low flow Mediterranean river basin

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The application of decision making practices are effectively enhanced by adopting a procedural approach setting out a general methodological framework within which specific methods, models and tools can be integrated. Integrated Catchment Management is a process that recognizes the river catchment as a basic organizing unit for understanding and managing ecosystem process. Decision support system becomes more complex by considering unavoidable human activities within a catchment that are motivated by multiple and often competing criteria and/or constraints. DPSIR is a causal framework for describing the interactions between society and the environment. This framework has been adopted by the European Environment Agency and the components of this model are: Driving forces, Pressures, States, Impacts and Responses.

The proposed decision support system is a two step framework based on DPSIR. Considering first three component of DPSIR, Driving forces, Pressures and States, hydrological and ecosystem services models are developed. The last two components, Impact and Responses, helped to develop Bayesian Network to integrate the models. This decision support system also takes account of social, economic and environmental aspects. A small river of Catalonia (Northeastern Spain), Francolí River with a low flow (~ 2 m³/s) is selected for integration of catchment assessment models and to improve knowledge transfer from research to the stakeholders with a view to improve decision making process. DHI's MIKE BASIN software is used to evaluate the low-flow Francolí River with respect to the water bodies' characteristics and also to assess the impact of human activities aiming to achieve good water status for all waters to comply with the WFD's River Basin Management Plan. Based on ArcGIS, MIKE BASIN is a versatile decision support tool that provides a simple and powerful framework for managers and stakeholders to address multisectoral allocation and environmental issues in river basins. While InVEST is a spatially explicit tool, used to model and map a suite of ecosystem services caused by land cover changes or climate change impacts. Moreover, results obtained from low-flow hydrological simulation and ecosystem services models serves as useful tools to develop decision support system based on DPSIR framework by integrating models. Bayesian Networks is used as a knowledge integration and visualization tool to summarize the outcomes of hydrological and ecosystem services models at the "Response" stage of DPSIR. Bayesian Networks provide a framework for modelling the logical relationship between catchment variables and decision objectives by quantifying the strength of these relationships using conditional probabilities. Participatory nature of this framework can provide better communication of water research, particularly in the context of a perceived lack of future awareness-raising with the public that helps to develop more sustainable water management strategies.

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