Integrating stakeholders' inputs to co-design climate resilience adaptation measures in Mediterranean areas with conflicts between wetland conservation and intensive agriculture

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Abstract

Designing sustainable management strategies in groundwater-dependent socio-economic systems in areas with scarce water resources and protected wetlands is a challenging issue. The high vulnerability of these systems to droughts will be exacerbated even further under future climate change (CC) and socio-economic scenarios. A novel integrated bottom-up/top-down approach is used to identify “climate resilient pathways”, from which to co-design adaptation strategies to reduce the impact of potential future CC and socio-economic scenarios. The approach followed two steps (1) the generation of local CC and socio-economic scenarios by downscaling global/regional climate models and (2) the identification and assessment of potential adaptation strategies through an iterative bottom-up/top-down approach. Top-down assessments of the impact of CC have been undertaken by propagating local scenarios within a chain of mathematical models based on expert criteria/assumptions. This allowed us to analyse of the physical vulnerability of the system under different potential CC and socio-economic scenarios by simulating them with a sequential modelling of rainfall–recharge, agriculture, and hydrological processes through a distributed groundwater finite difference model. These model results were discussed with the stakeholders at a first workshop, which aimed to identify potential adaptation strategies. The influence of the adaptation strategies on the future hydrological status was assessed by simulating them through the chain of models. These results were the inputs into the discussions at a second workshop, which aimed to validate and/or improve the results of the first workshop. The methodology was applied in the Upper Guadiana River Basin, where there is a long-standing conflict between wetland conservation

and groundwater overexploitation for intensive agriculture. The future horizon 2016–2045 is analysed with the scenarios compatible with the emission scenario RCP4.5. The research has allowed us to conclude that groundwater pumping reduction would be the most robust and effective measure to reduce the impact of CC in the area. © 2023 Elsevier B.V.
Author keywords
Bottom-up/top-down approach; Climate change adaptation strategies; Climate resilience pathways; Droughts and groundwater overexploitation, wetland conservation; Intensive agriculture