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Assessing Environmental Benefits in the Hydro-economic Model of the Ebro Basin

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The increasing concern about the degradation of water-dependent ecosystems calls for consideration of ecosystem benefits in water management decision-making. Sustainable water management requires adequate economic and biophysical information on water systems that support both human activities and natural ecosystems. This information is essential for assessing the impact of water allocation options on social welfare. This paper evaluates various alternative water management policies by including the spatial and sectoral interrelationships between the economic and environmental uses of water. A hydro-economic model is developed to analyze water management policies in response to reduced water availability in the Ebro Basin of Spain. The originality in our contribution is the integration of environmental benefits across the basin, by using endemic biophysical information that relates stream flows and ecosystem status in the Ebro Basin. The results show the enhancement of social welfare that can be achieved by protecting environmental flows, and the tradeoffs between economic and environmental benefits under alternative adaptation strategies. The introduction of water markets is a policy that maximizes the private benefits of economic activities, but disregards environmental benefits. The results show that the practiced institutional policy where stakeholders cooperate inside the basin water authority, provides lower private benefits but higher environmental benefits compared to those obtained under water markets, especially under situations of severe droughts. However, the water authority is not allocating enough environmental flows to optimize social welfare. This study informs strategies for protection of environmental flows in the Ebro Basin, which is a compelling decision under the imminent climate change impacts on water availability in coming decades