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Participatory Planning for the improvement of water management in uncertain conditions: Case study of the Souss-Massa basin in Morocco

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Due to its geographical location and to the natural features of its climate, Morocco is known as a drought prone and water scarce country. However, the country now faces, in the current context of Climate Change, an increasing and alarming water scarcity due to the combined effects of a strong decline of precipitations and a growing pressure on water resources induced by the economic development and demographic growth. Aware of this pressing issue, Morocco implemented a national water strategy based on the decentralization of water management at the river basin level and the establishment of Integrated Water Resources Management master plans for each basin. Unfortunately, these plans often underestimate the impact of uncertainty and this may lead to inefficient and unsustainable water management strategies. In this context, the aim of this study is to develop an innovative approach for robust decision making in uncertain conditions by coupling the WEAP (Water Evaluation and Planning System) model and the "XLRM" robust decision making framework to support the evaluation of management options and promote long-term sustainable integrated water management strategies at the basin level. The Souss-Massa basin, located in the south-western part of the country was retained as a case study because of its strategic importance but also because it now faces, as a consequence of the irrational use of water resources during the last decades significant water resources management challenges mainly due to the overexploitation of ground water resources, the increased of water demand due to the irrigation development, the urban and industrial growth and the expansion of tourism. Thus, in this study, a three step methodology was developed. First, the WEAP model were developed and calibrated for the Souss-Massa basin. In a second step, a XLRM participatory workshop gathering the basin main stakeholders were organized in order to identify the EXogenous factors (key uncertainties confronting water managers in the basin), the Levers (management actions aiming to improve the system outcomes in the face of the identified uncertainties) and a set of Metrics that can be used to evaluate the ability of specific actions to improve water management outcomes in the basin. In a third step, the R (Responses) component of this XLRM framework were given by the WEAP model that were iteratively used to capture the identified uncertainties, represent the identified strategies and produce the identified metrics. Results of this study focuse on water demand, unmet demand and supply delivered under scenarios of increasing drought periods frequencies, full penetration of drip irrigation and use of desalinated water for irrigation.