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Hydro-economic assessment of the impact of climate and socio-economic changes on water resources in the MENA region

Samar Asad, Reetik-Kumar Sahu, Dor Fridman, Barbara Willaarts, and Taher Kahil

International Institute for Applied Systems Analysis (IIASA), Biodiversity and Natural Resources, Austria (asad@iiasa.ac.at)

The Middle East and North Africa (MENA) region is struggling with a continuous decline in water availability, attributed to climate change and variability, exacerbating the existing water scarcity. At the same time, factors such as population growth, urbanization, economic development and mismanagement further stress the scarce water resources. This study aims to assess the impact of climate and socioeconomic changes on the availability and use of water resources and related economic and environmental conditions in the MENA region at high spatial and temporal resolutions, in order to provide insights into cost-effective and sustainable water management options to reduce water scarcity. To do so, we apply a set of potential future climate and socio-economic change scenarios, based on combinations of the Shared Socio-economic Pathways (SSPs) and Representative Concentration Pathways (RCPs) and informed by a review of regional development visions and consultations with key regional experts. Scenario simulations are conducted using the hydro-economic model ECHO in combination with the hydrological model CWatM at subbasin and monthly levels for the whole MENA region. Results of this study shows the escalating deficit in renewable water resources and the rising water demand, exacerbating water scarcity across the majority of the MENA countries. Therefore, meeting the increasing water demand becomes an even greater challenge in the region. To address this challenge, our results underscore the need for a more efficient allocation of water resources among sectors and subbasins at the regional level and a shift towards more advanced water conservation and reliable water supply technologies.

Keywords: Hydro-economic assessment, Water scenarios, Water scarcity, MENA region.