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Water accounting to assess climate change impacts on available water for agriculture

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Climate change will impact water availability in drought-prone agricultural regions of Europe, as for example in the Segura river basin (southeastern Spain). The impact involves altered flows, stocks, consumption and services rendered in the basin related to agriculture. The goal of this study is to assess climate change impacts on water resources for agriculture, using a novel methodological framework to synthesize the available data and future predictions, called Water Accounting+ (WA+).

The WA+ framework was designed to communicate water resources-related information and the services generated from consumptive use in a river basin to users such as policy makers, water authorities, decision-makers and other stakeholders. So far, water accounting frameworks have been used principally for communicating information on the current or past situation but not for future studies or climate change impact assessments, given their relatively recent development. At this point, the methodologies are sufficiently mature to be used to communicate on water resources and impacts under future change. Rather than merely relying on water accounts from the past, this will allow policy makers to go one step further and anticipate on climate change impacts in the development of water resources plans.

For this assessment, a combination of open-access data from earth observation measurements, outputs from different Regional Climate Models (CORDEX), hydrological modelling (SPHY) and water resources allocation modeling (WEAP) was used. We developed water accounts for a 30-year baseline period and for two future horizons: (i) foreseeable future 2030-2050, and the (ii) far future end of century.

Water accounting sheets were developed and a number of climate impact indicators were derived to illustrate the impact on water consumption in agriculture, dependencies from different sources and exposure to water stress. The Sustainable Development Goal (SDG) indicator 6.4.2 that tracks how much freshwater is being withdrawn by the economic activities in the basin, compared to the total available blue water, is one of the assessed indicators.

This assessment is part of a larger effort to assess climate change impacts on water resources for agriculture in several key basins in Europe within the IMPREX (www.imprex.eu) project. This should lead to a clear message to policymakers at the European level on the challenges for agriculture imposed by increased future water scarcity.