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Using global Climate Impact Indicators to assess water resource availability in a Mediterranean mountain catchment: the Sierra Nevada study case (Spain) in the SWICCA platform

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Climate services provide water resource managements and users with science-based information on the likely impacts associated to the future climate scenarios. Mountainous areas are especially vulnerable to climate variations due to the expected changes in the snow regime, among others; in Mediterranean regions, this shift involves significant effects on the river flow regime and water resource availability and management. The Guadalfeo River Basin is a 1345 km2 mountainous, coastal catchment in southern Spain, ranging from the Mediterranean Sea coastline to the Sierra Nevada mountains to the north (up to 3450 m a.s.l.) within a 40-km distance. The climate variability adds complexity to this abrupt topography and heterogeneous area. The uncertainty associated to snow occurrence and persistence for the next decades poses a challenge for the current and future water resource uses in the area. The development of easy-to-use local climate indicators and derived decision-making variables is key to assess and face the economic impact of the potential changes.

The SWICCA (Service for Water Indicators in Climate Change Adaptation) Platform (http://swicca.climate.copernicus.eu/) has been developed under the Copernicus Climate Change Service (C3S) and provides global climate and hydrology indicators on a Pan-European scale. Different case studies are included to assess the platform development and contents, and analyse the indicators' performance from a proof-of-concept approach that includes end-users feedbacks. The Guadalfeo River Basin is one of these case studies. This work presents the work developed so far to analyse and use the SWICCA Climate Impact Indicators (CIIs) related to river flow in this mountainous area, and the first set of local indicators specifically designed to assess selected end-users on the potential impact associated to different climate scenarios.

Different CIIs were extracted from the SWICCA interface and tested against the local information available in the case study. The Essential Climate Variables used were precipitation and flow daily values, obtained at different spatial scales. The analysis led to the use of SWICCA-river flow on a catchment scale as the most suitable global CIIs in this area. Further treatment included local downscaling by means of transfer functions and a final relative anomaly correction. Three final end-users (clients) were identified within the water resource management framework: 1) mini hydropower facilities at the head areas, 2) urban supply at the southern area, and 3) water management decision makers (reservoir operation). From the corrected CIIs, local indicators were defined from the interaction with each client, to tailor water services easily and readily usable. Knowledge brokering from this interaction resulted in a first identification of a set of 4, 3 and 4 indicators for hydropower generation, urban users and water resource decision-makers, respectively, with different time scales. The projections of three future climate scenarios were assessed for each indicator and presented to each client.

Local indicators are an efficient tool to assess the potential range of water allocation possibilities in this area on an annual and decadal basis, and get a deeper insight of the seasonal future potential regime of water resource availability. The results are good examples of key information for decision making in the future, and show how to derive local indicators with impact in the short and medium term planning in heterogeneous catchments in this region.