

Water scarcity in the Spanish part of the Douro basin: current status and future scenarios

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In general in Europe only 5 % of renewable freshwater resources is abstracted each year however, water availability and populations are unevenly distributed. Except in some northern and sparsely-populated areas that possess abundant resources, water scarcity occurs in many areas of Europe, particularly in the Mediterranean countries. It has been accentuated in the past decades by the increase of drought periods due to climate change. In this regard, the European Policy has addressed both drought (related to natural processes) and water scarcity (influenced by human activity) through several Directives and Communications. These have considered a common water stress indicators such as the Water Exploitation Index (WEI) and its upgraded version WEI+. They quantify the percentage of total freshwater used compared to the total renewable freshwater resources available. Their estimations help the stakeholders identify territories vulnerable to human activity pressure on water resources, and hence prone to suffer problems of water stress.

The index WEI+ estimates better than WEI the actual balance between renewable water resources and water consumption, since it include the returns from water uses in its calculation. In addition, the European Community is still working on issues dealing with the temporal and spatial scaling and have suggested to adopt the river basin and monthly temporal resolution instead of the national scale and annual basis considered in the former documents.

Within this context, this study assesses the water scarcity in the Spanish part of the Douro basin estimated by the WEI+ index. According to previous studies and depending on the specific period selected, this basin is near 'water stress'. In order to clarify this issue, the WEI+ index has been estimated. A detailed methodology for its calculation is presented which uses information from the water resources management model 'Aquatool' and its simulation module SIMGES which is widely applied in many European studies. This model is used by the Spanish National Hydrological Authority to develop the River Basin Plans.

The study has considered a monthly time step resolution and four scenarios: the present state (2015), and the prediction for 2021, 2027 and 2033 which will highlight future water demands and water availability in the area considering climate change assumptions. Results showed that for a given scenarios, water scarcity is only highlighted if the WEI+ indicator is calculated at a monthly basis but not necessarily at the annual one. Hence, the monthly resolution would be preferred to study seasonal water shortages.