



## A bottom-up approach to forecast and manage water crises in the Turin area

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In the last twenty years, the Italian territory has been affected by different water crises, which have affected the main sectors of water use, exacerbating conflicts in different territories between these sectors (concerning the priority use of the resource), and requiring the implementation of emergency procedures for impacts management. The recent drought events of 2017, 2021, and winter 2022 saw areas of the country not typically prone to this type of phenomenon, such as north-western Italy, go into crisis.

The term “water crisis” identifies the phenomenon for which the water shortage (a condition resulting from a demand for a resource exceeding the natural availability of renewable resources) reaches a severity demanding a series of management procedures for the phenomenon.

Future water security will depend on the magnitude, rate, and regional details of meteo-climatic changes and non-climatic factors such as agricultural practices, water demand, and governance: improving aspects of water management will be a key to winning adaptation measures. Since drought can be defined in several ways, there are potentially different responses under a warming climate depending on the drought type. Beyond a lack of precipitation, changes in evapotranspiration are critical components of drought, because these can lead to soil moisture declines. Under very dry soil conditions, evapotranspiration becomes restricted and plants experience water stress in response to increased atmospheric demand. Human activities and decision-making have a critical impact on drought severity. The discrepancy between water shortage and the unavailability of the water resource to meet water demand is a function of socio-economic vulnerabilities and gaps in water governance.

In this framework, uncertainty in future water scarcity forecasting and projections makes water security risk assessment and adaptation strategies a top priority scientific challenge: a bottom-up approach for forecasting and managing water crises is particularly advantageous.

Considering the Turin area, Italy, after identifying the events that moved the drinking water supply sources towards crisis, meteorological data and appropriate drought indexes have been analyzed. Critical thresholds and parameters have been identified as a function of water supply sources and response time.

A first forecasting chain was tested to provide monthly forecasts to assess the overcoming of these thresholds for operational purposes.