

New methodology for adapting Mediterranean basins to the demands of climate change

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Corentin Girard, researcher at the Polytechnic University of Valencia's Research Institute of Water and Environmental Engineering (IIAMA-UPV), has developed an innovative methodology to assist planning at the scale of the river basin during periods of uncertainty such as those caused by climate change.

The paper, published in *Global Environmental Change*, is the result of a research project designed to establish selection criteria when choosing what climate change actions to take, based on economic and environmental principles.

Evaluating all options before embarking on expensive projects

By means of an optimisation model, the system selects the best combination of actions based on the nature of the basin, demand planning forecasts, economic factors and different plausible [climate change scenarios](#).

The model highlights the advantages presented by the different measures designed to improve the efficiency of irrigation channels for agriculture or drinking [water](#) networks in terms of their ability to help face an uncertain future.

Girard comments: "It is necessary to evaluate the whole spectrum of possibilities before implementing actions that require significant investment, such as building desalination plants or performing water transfers, in order to avoid regretting the decision later on."

Ensuring water supply for all users

The project aims to ensure long-term water supply for all users, while maintaining a balance between resources, demand and the impact of the measures taken.

To this end, Girard tells us that various adaption action plans were evaluated against different possible scenarios, ultimately "defining a relatively low-cost action plan that is robust in the face of climate change."

Methodology

The methodology developed enables the study of tradeoff solutions between different planning objectives, such as ecological flows, irrigation development, guaranteed supply for urban demand and the cost of the action plan.

Similarly, the interdisciplinary framework developed integrates an innovative, top-down perspective, in which the different possible courses of [global climate change](#) and their impacts on river basins at the local level are evaluated from a bottom-up perspective, which allows different scenarios of water demand and local adaptation measures to be considered, as defined in collaboration with users of the basin via participatory workshops.

Case Study: Orb river basin, France

The work is based on the study of the Orb river basin, which flows into the Mediterranean Sea in Valras-Plage, located between Montpellier and Perpignan.

Various studies agree that the regions around the Mediterranean Sea will be significantly impacted by climate change, although there is no agreement on the severity with which the region will be hit. This makes action plans very necessary, "given that the future is so uncertain," the IIAMA-UPV researcher warns.

Participation of stakeholders in the decision-making process

One of the main contributions of Girard's model is the participation of the different stakeholders in the decision-making process. "It is interesting to build consensus based on the proposals of irrigators, water companies, governments and people living in the area. Everyone has something to say," he says, adding that in this respect the pilot study has been very helpful.

"The manager of the Orb river basin told me that there is increasing talk about climate change, but that they still do not know how to face this problem in all its complexity. What we have done it to provide them with a tool that enables them to discuss the future with a view to preparing the best possible solution, and continue living in their region," Girard explains

In this regard, the French researcher says, "You have to make sure that there is no social conflict. You might devise an excellent plan, but if no one is willing to implement it, it is worthless."

Ultimately, adaptation to [climate change](#) is a challenge to conventional

water resource planning and management approaches. For the time being, this study is an innovative contribution to the arduous task of tackling the new environmental challenges society faces.

Implementation of this model in the Júcar river basin

For its part, the research group focusing on Hydro-Economic Models for Water Resource Engineering at IIAMA-UPV, coordinated by Manuel Pulido, is working on the development of methods and systems for decision-making and support for the integrated, sustainable and efficient management of water resources, combining economics, systems analysis, hydrology, agent modelling and public participation.

Specifically, it is developing a methodology similar to that implemented in the Orb [river basin](#) for the river Júcar as part of a national multidisciplinary research project coordinated by the UPV known as IMPADAPT (Methodologies and tools for analysing impacts and adaptation to global change on water resource systems).

More information: Corentin Girard et al. Integrating top–down and bottom–up approaches to design global change adaptation at the river basin scale, *Global Environmental Change* (2015). [DOI: 10.1016/j.gloenvcha.2015.07.002](#)

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