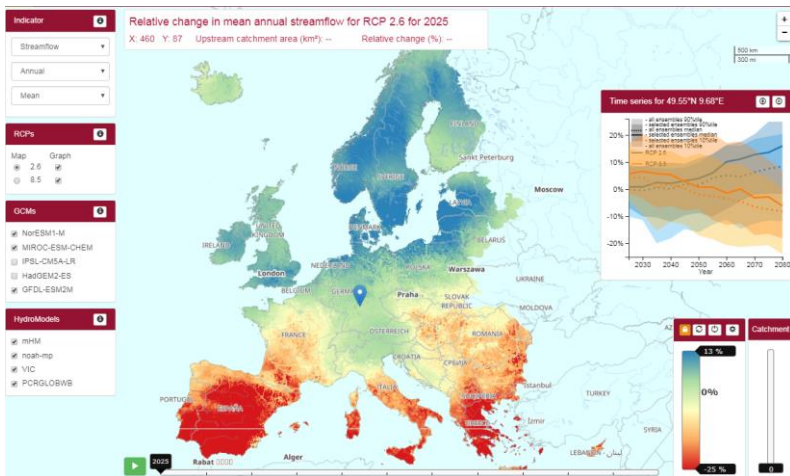


Climate change impact on water and adaptation measures in Spain

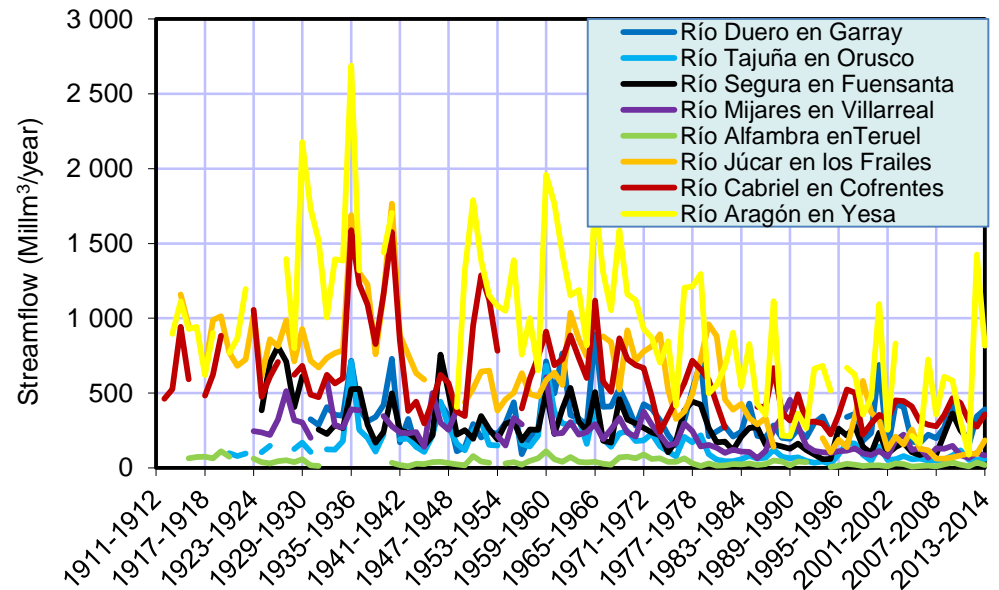
Teodoro Estrela Monreal
Director of Water Planning of Júcar River Basin Authority
President of Standing Committee on Water of World Council
of Civil Engineers

Climate Change Impact on Water

Evidence and climatic projections suggest that water resources in Spain will be seriously affected and the frequency of droughts will increase.



<http://edge.climate.copernicus.eu/>



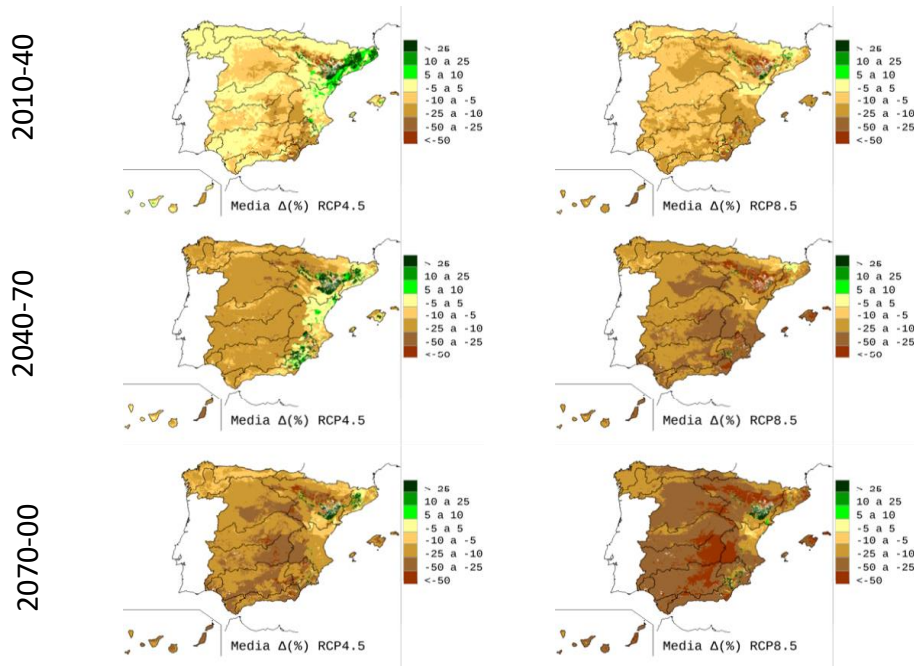
Measured streamflows at the Spanish gauging stations with the longest records

The Spanish Plan of Adaptation to CC

- Focused on the study of climate change effects on:
 - The water resources in a natural regime
 - The water demands (irrigation, urban supply and industry)
 - The available water resources in the water resources systems.
 - The ecological status of water bodies.
- The Centre for Hydrographical Studies of CEDEX has carried out these studies for the Directorate General for Water and the Spanish Office of Climate Change.

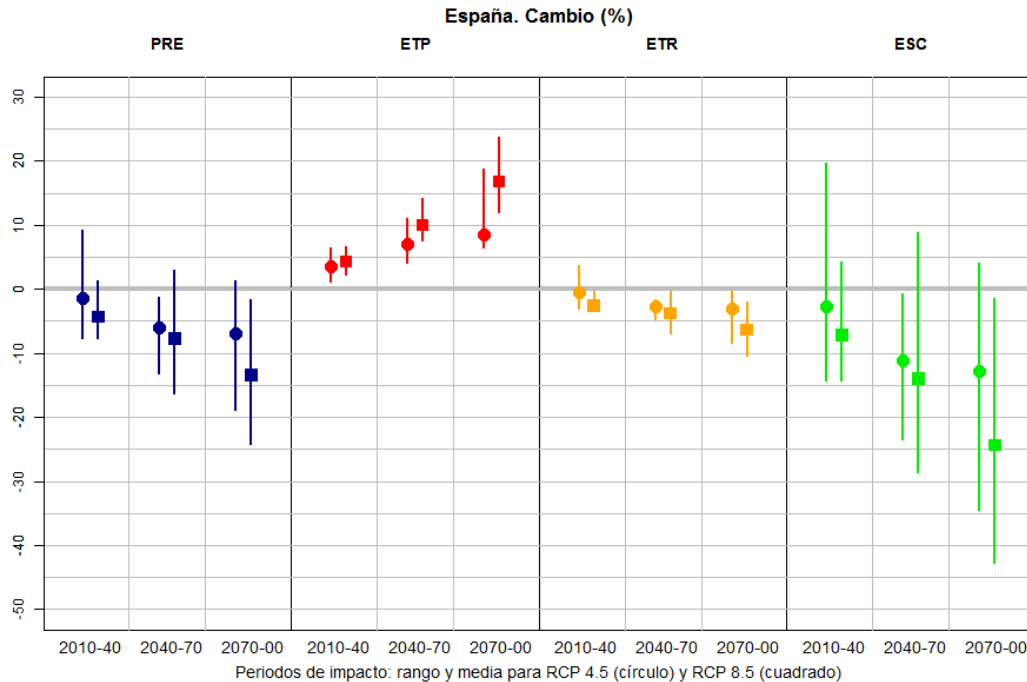
Impacts of climate change on water resources

Distributed hydrological model used to assess the impact on natural water resources



- Inputs: Climatic projections of Spanish Meteorological Agency.
- Outputs: hydro-meteorological maps on monthly scale (evapotranspiration, soil moisture, surface runoff, aquifer recharge,...).

Impacts of climate change on water resources



- Reduction in rainfall.
- Increase in PET.
- Reductions in runoff (between 15% - 40%).
- Increase the frequency of droughts.

Source: CEDEX (2017). Evaluación del Impacto del Cambio Climático en los Recursos Hídricos y Sequías en España

Climate change in water planning

- CC studies were regulated in the Royal Decree 907/2007 and in the Water Planning Instruction (OM ARM/2656/2008): water balances for several CC scenarios must be carried out in the River Basin Management Plans (RBMPs).
- Studies of impact on water resources systems and measures for adaptation have been developed in RBMPs in Spain. Results show that the current water uses will be difficult to maintain in some river basins in the long run.

Future Adaptation actions

- Develop specific river basin adaptation plans in the framework of the river basin management plans.
- Improve the consistency of programmes of measures of River Basin Management Plans with the impacts of climate change.

Main adaptation measures

- Incorporate the effects of climate change in water planning adapting water resources systems to less availability and greater irregularity.
- Develop river restoration projects based on achieving good ecological status, searching for compatibility between river restoration and flood risk protection.
- Improve efficiency in water supply and irrigation.



River and wetlands restoration projects



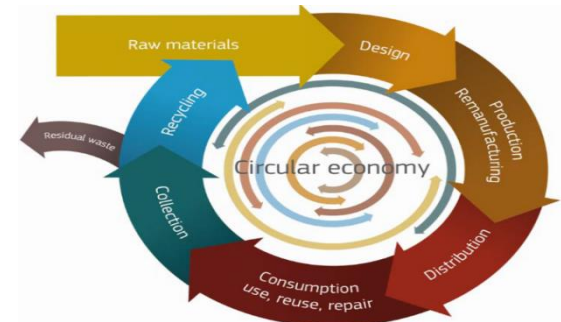
Improving efficiency irrigation in the Acequia Real del Júcar

Main adaptation measures

- Design integrated water resources systems: surface water, groundwater, reuse and desalinated water, applying the circular economy principles.
- Develop Real-Time Information Systems and Decision Support Systems.



Use of non-conventional resources:
desalination plants



Reuse in the framework of circular economy

Thank you very much for your
attention