

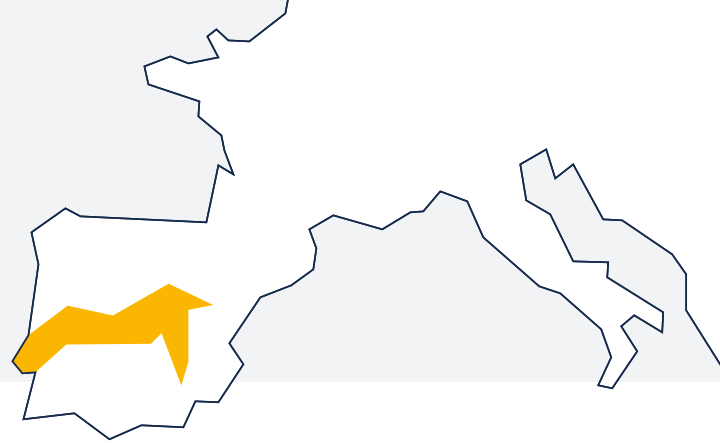
# Tagus-Segura River Basins

## SPAIN & PORTUGAL

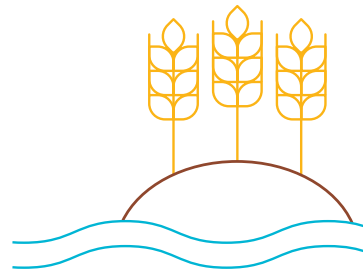


## BRIEF OVERVIEW

The Tagus-Segura system consists of **two river basins connected by an aqueduct**, which allows water to be transferred from the Tagus Basin to the Segura Basin.



**The Tagus River Basin** has a Mediterranean climate with continental features. It is the most populated river basin in Spain, with **nearly 8 million residents**, and includes Madrid. Aquifers are generally regarded as a strategic water source, particularly for severe droughts or to meet specific local water demands.



**In the Segura River Basin**, the combination of fertile soils, a semi-arid climate, and available water resources—both surface and groundwater—has supported the development of **one of Europe's most productive irrigated agricultural systems**.

However, some aquifers in this region are overexploited.

# IDENTIFIED WEFE CHALLENGES & PROSPECTED SOLUTIONS

## Water scarcity

- > **Monitoring water resources** and adapting production models based on availability.
- > Improving **purification methods for water reuse**.

## Agri-food sustainability

- > Providing training and technical support to producers for **diversifying crops** that align with local and seasonal demands.
- > Adopting modern and technology-driven production systems.

## Energy transition

- > Prioritising the implementation of **renewable energies and self-consumption practices** to reduce carbon emissions and promote sustainability while ensuring profitability.

## Environmental sustainability

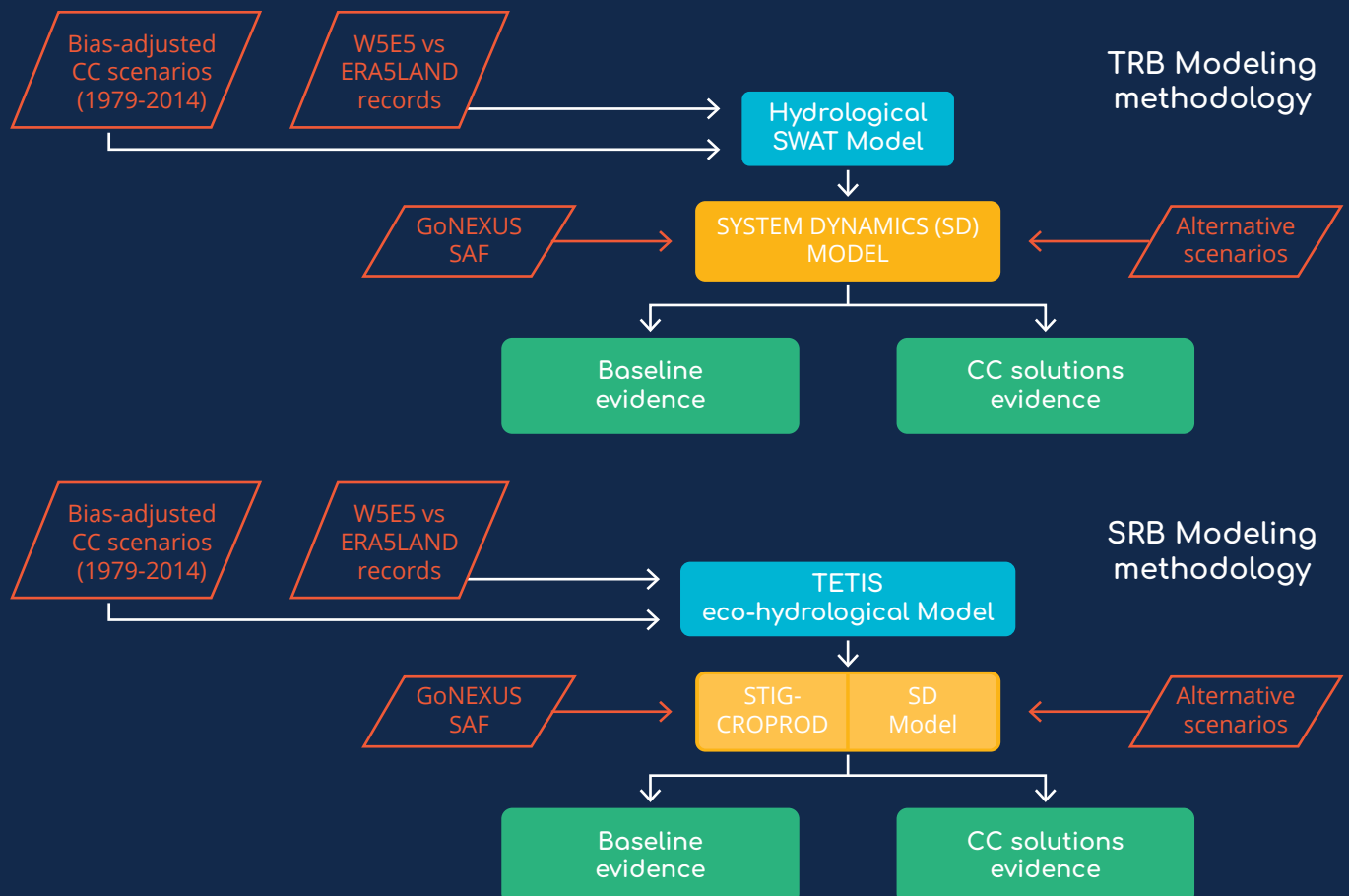
- > Prioritising the **implementation of ecological flows**.
- > Exercising **greater control over resource use** and pollution hotspots.
- > **Aligning economic activities with ecological health** to protect ecosystems.

## MODELLING TOOLS

The modelling framework centres on **two main models**. For the Segura River Basin, it includes **the TETIS eco-hydrological model**, the Water-Energy-Food-Ecosystems (WEFE) system dynamics model, and **the STIG-CROPROD hydroeconomic IWRM model**.

For the Tagus River Basin, it uses **the SWAT model** along with a WEFE system dynamics model.

Together, these models enable a detailed analysis of how **climate and socioeconomic changes impact the hydrology** of each basin over time and across different areas. Additionally, this framework allows for the calculation of WEFE indicators, providing valuable insights through **the GoNexus Sustainability Assessment Framework (SAF)**.



# SCENARIOS

During the second GoNexus Dialogue, stakeholders discussed two potential future scenarios for 2050 through **fictional newspaper articles**, which effectively led to establishing distinct scenarios for the Segura and Tagus Basins.

## SEGURA BASIN

### Scenario 1 - Sustainable energy transformation

In this scenario, the Segura Basin is highly developed with a focus on **renewable energy** and advanced, digitised **agricultural irrigation**. Alternative water sources are also considered to support sustainable agriculture.

### Scenario 2 - Ecological transformation

This scenario considers climate change projections where current agricultural practices may no longer be viable. As a result, **sustainable economic alternatives are explored** to support the basin's future

## TAGUS BASIN

### Scenario 1

Over the past two decades, prioritising the Tagus River has led to **significant changes**. Halting water transfers to the Segura Basin allowed the Tagus to meet its local needs, foster regional development, and address some climate change impacts. The upper Tagus saw **increased tourism and a revival of rural areas**, along with the growth of new agricultural industries. However, concerns over aquifer overuse arose. Ecosystems in the central Tagus were restored, and the focus on the middle and lower Tagus since 2030 supported Portugal's needs but **reduced hydroelectric production**. By 2050, reduced water flows raised questions about the Albufeira Treaty, straining Spain-Portugal relations and raising potential treaty revisions.

### Scenario 2

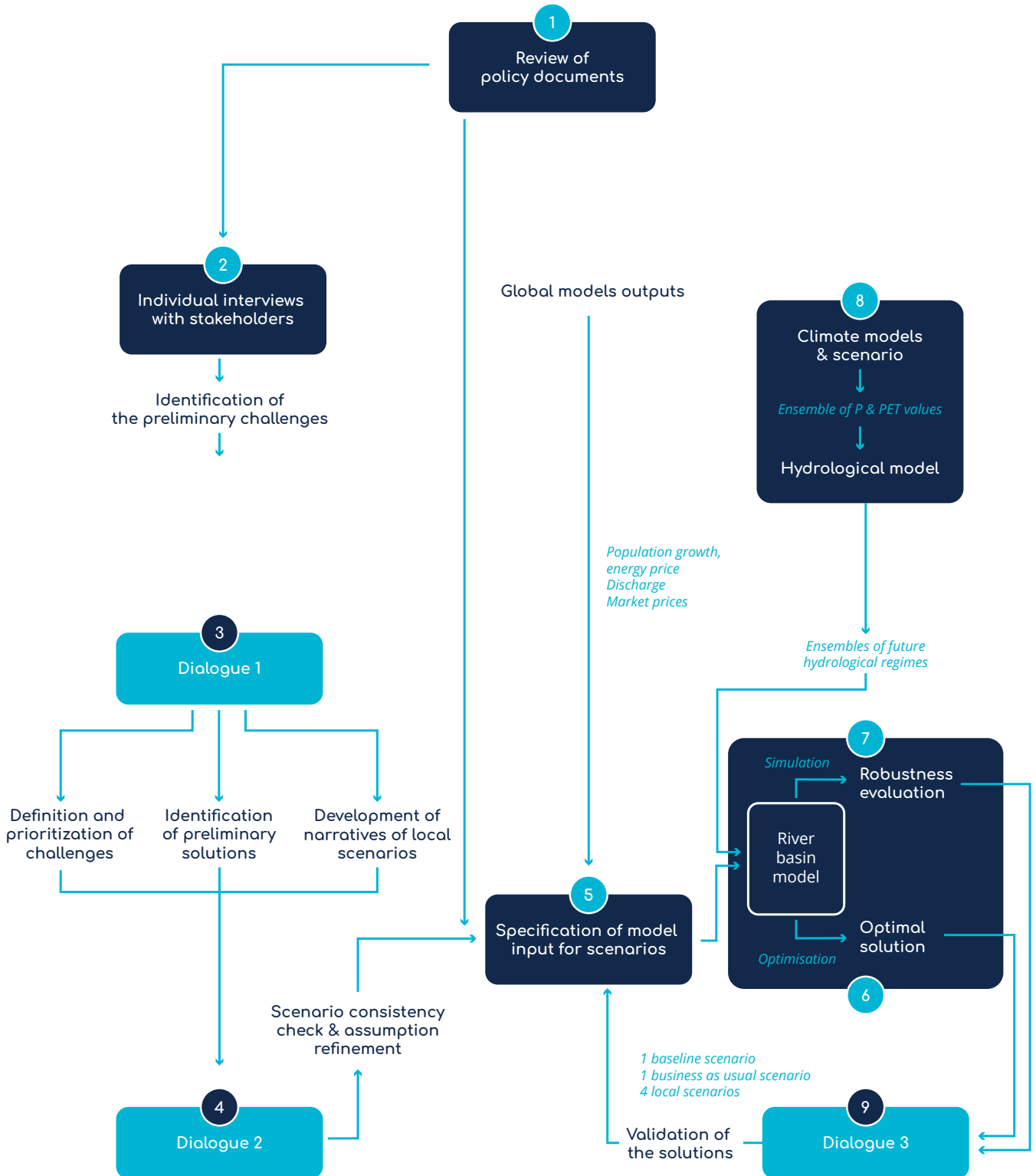
Spain and Portugal's relationship is strained **over water resource tensions** in shared river basins. The conflict centres on Spain's alleged breach of **the Albufeira Treaty** concerning water flow to Portugal. The Tagus faces significant pressures from ongoing transfers to the Segura Basin, groundwater overuse, and **increased irrigation pumping** amidst declining rainfall. While Madrid attempts to boost water efficiency, this falls short for the Tagus Basin, and **ecological concerns rise** in the middle and lower Tagus due to hydroelectric production. Portugal demands consistent water flows, while Spain seeks a **climate-responsive revision** of the treaty's flow limits.



# DIALOGUES

The GoNexus dialogues are based on a **participatory approach**, involving several key activities:

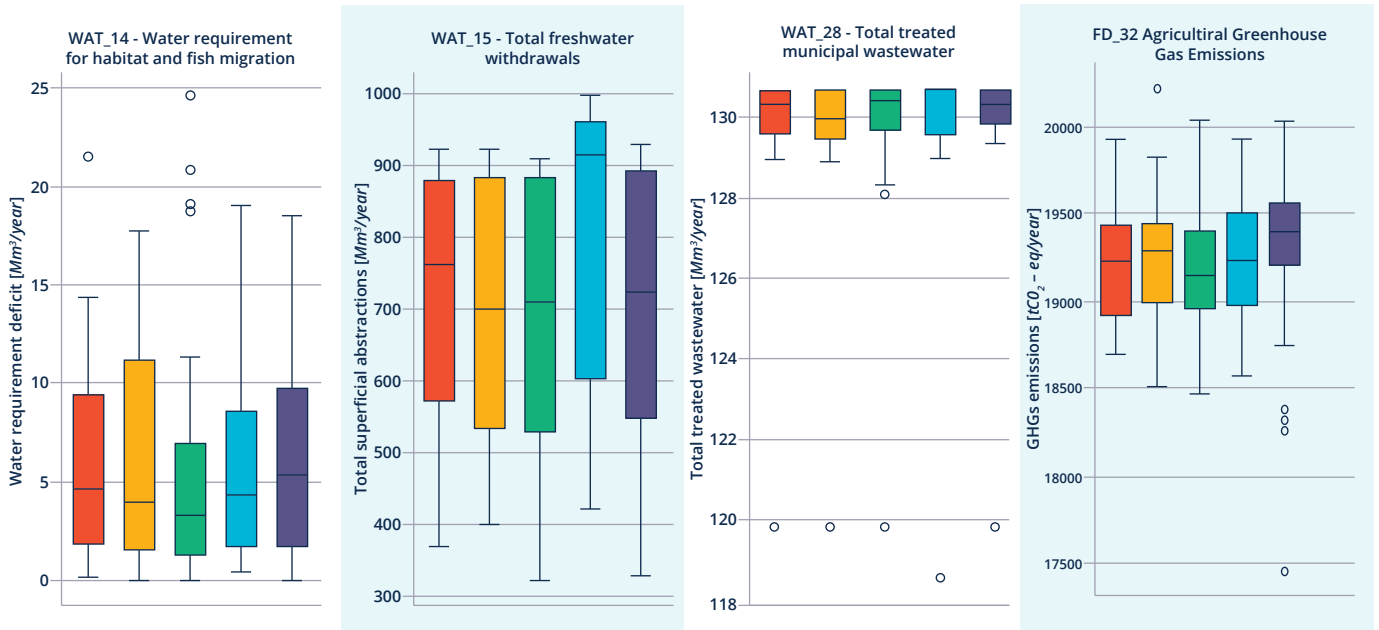
- **Reviewing documents and scientific data** from external studies and global models.
- **Engaging a range of WEFE nexus stakeholders** through interviews and workshops.
- Using various **simulation and optimisation models** to analyse the basin.



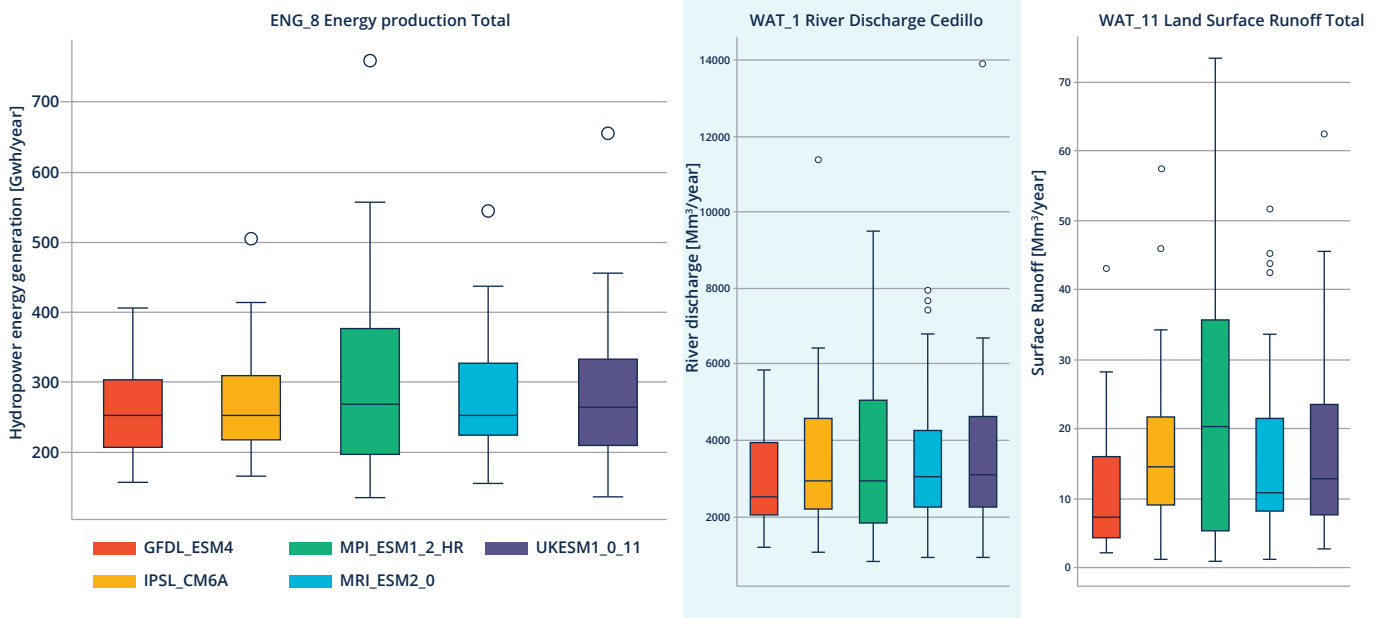
# EVIDENCE

The analysis of evidence from the reference period in the Tagus-Segura system highlights **the importance of the water transfer link between the two basins**. Fluctuations in transferred volumes create trade-offs affecting both basins' resources. When transfer volumes decrease, the Tagus Basin retains more resources, improving its ability to **address water scarcity and meet ecological flow requirements**. However, this reduction also leads to **higher energy demands** and resource deficit in agricultural production in the Segura basin.

SRB



TRB



## Contact us

- ✉ [info@gonexus.eu](mailto:info@gonexus.eu)
- 🌐 [www.gonexus.eu](http://www.gonexus.eu)
- ✂ [@GoNexusProject](https://twitter.com/GoNexusProject)

## Funding



The GoNexus project is funded by the European Union Horizon Programme call H2020-LC-CLA-2018-2019-2020 - Grant Agreement Number 101003722.