

The Problem

In sunny Mediterranean regions there are thriving intensive greenhouse agriculture and tourism industries, hardly sustainable due to water scarcity.



<https://science.nasa.gov/earth/earth-observatory/almerias-sea-of-greenhouses-150070/>

Example: Almería (Eastern Andalucía): 33,000 Ha of greenhouse horticulture (export value 500 M€), 6 municipalities with > 400,000 inhabitants, 3 marinas, 3 golf courses, beach resorts and > 30 hotels.

The Solution: A Living Lab

General objective: to improve the water-energy-food nexus in semi-arid regions by

- implementing sustainable desalination technologies
- promoting strategic management of resources, for transitioning to sustainable water for agriculture and tourism industries.

Specific objectives:

- Decarbonise desalination
- Implement circular economy practices through brine valorisation.

The Living Lab

CIEMAT and CIESOL combine expertise in solar desalination and material recovery from seawater, Central Board of Users of the Aquifers and Provincial Council of Almería incorporate farmers and municipalities for real world application, and the Visitor Centre of Plataforma Solar de Almería brings citizens.

Diverse and dynamic Community of Practice

Researchers and technology providers for: desalination; solar energy; agriculture; and brine valorisation.

Companies related to water, energy, food and salt production.

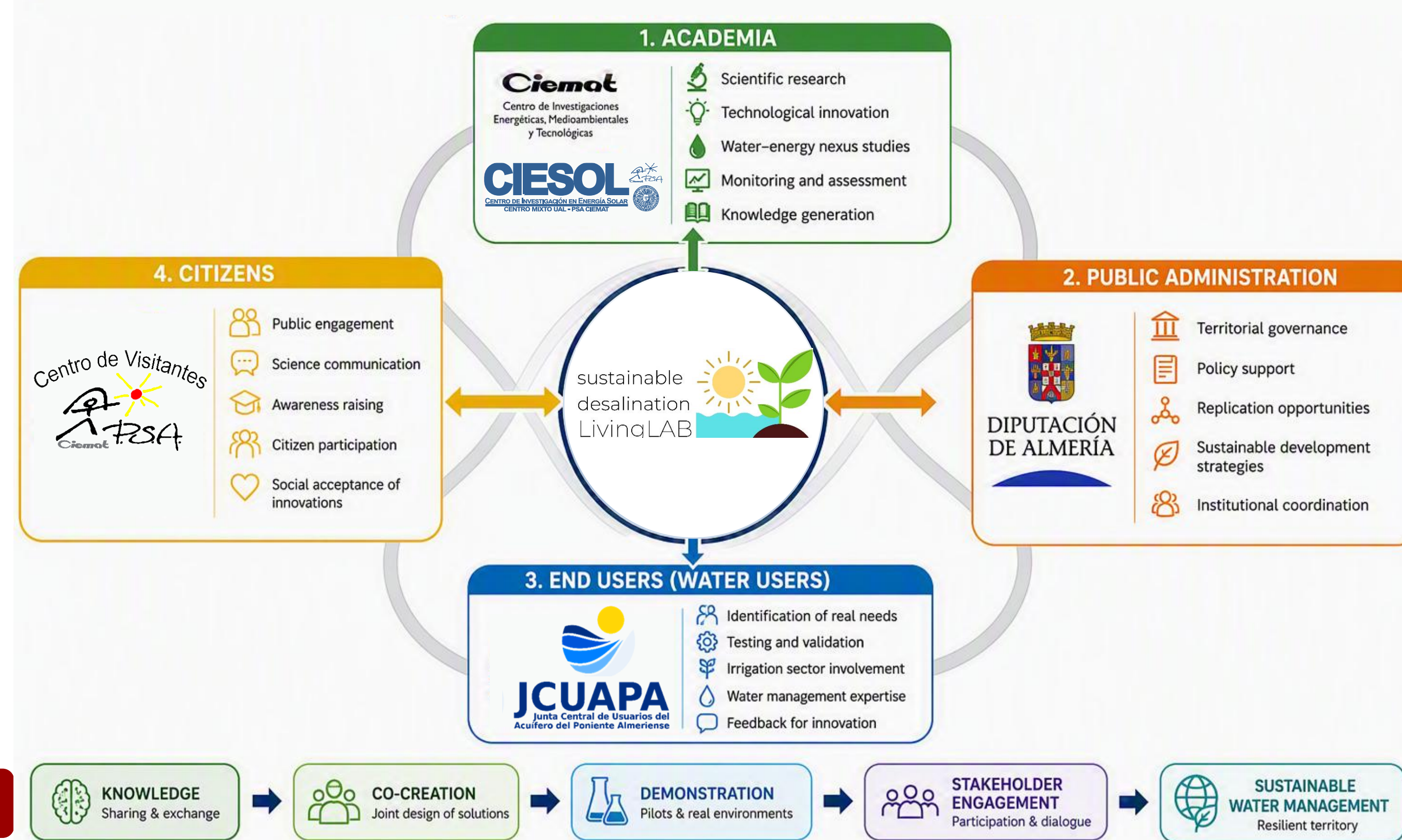
Regulatory bodies on water and energy; management entities of water resources; energy policy makers.

Water users: including irrigation communities, municipalities, farmers, golf courses and water-intensive industries.

Citizens: environmental groups, associations, press.



Sustainable Desalination Living Lab



Activities

- Training, capacity building, piloting and demonstrating technologies.
- Implementing sustainable water resource management strategies, like promoting the certification of using sustainable water sources as an added value for agriculture and tourism sectors.
- Sharing our region's model and fostering international cooperation with similar regions and Water Oriented Living Labs.

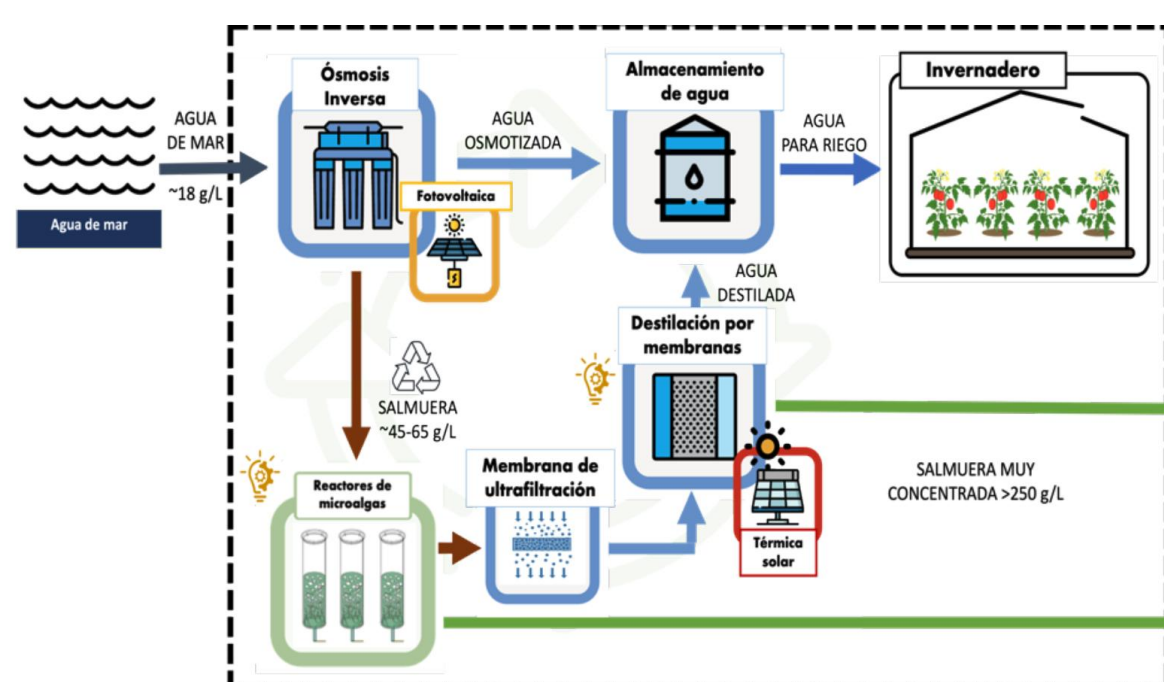
Co-creation activities performed during 2026



- **Policy brief for water reuse** in collaboration with the EU project REWAISE.
- **How to Engage All Stakeholders in R&D&I Projects?** – activity performed within the workshop “Water-Energy-Food: An Unavoidable Nexus” at CIES international congress.
- Strategic stakeholder mapping to foster transnational synergies and future alliances in sustainable agricultural desalination – activity performed within the international course on “The current status and prospects of solar desalination and desalinated water for irrigation”

Projects

Solar desalination for greenhouse irrigation

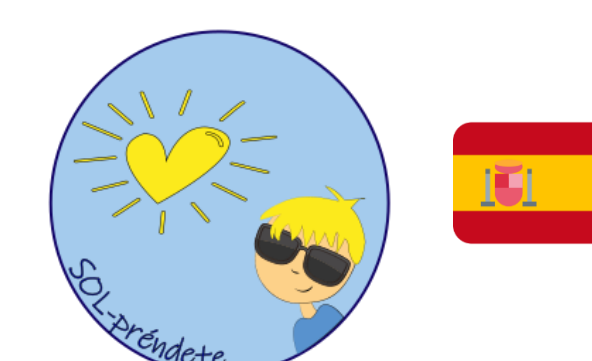


Digitalization and Optimization of Sustainable Desalination Systems for the Generation of Non-Conventional Water Resources in Agriculture: Water–Energy–Environment Nexus



Sustainable membrane distillation for industrial water reuse and decentralized desalination approaching zero waste

Educational and outreach activities



SOL-préndete: Hands-on learning and science outreach activities to increase scientific knowledge and inspire future generations, with a particular focus on the water–energy nexus

Thermal desalination for brine concentration towards valorisation



Sustainable drinking and irrigation water production from saline alternative water resources



Solar membrane distillation for the valorization of residual brines

Concentrated Solar Power with PV for decarbonizing desalination

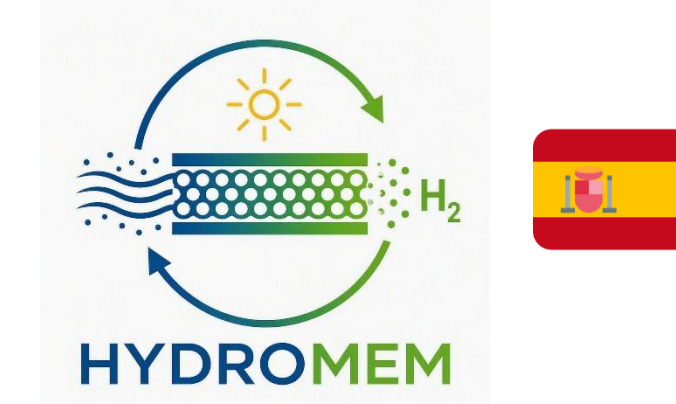
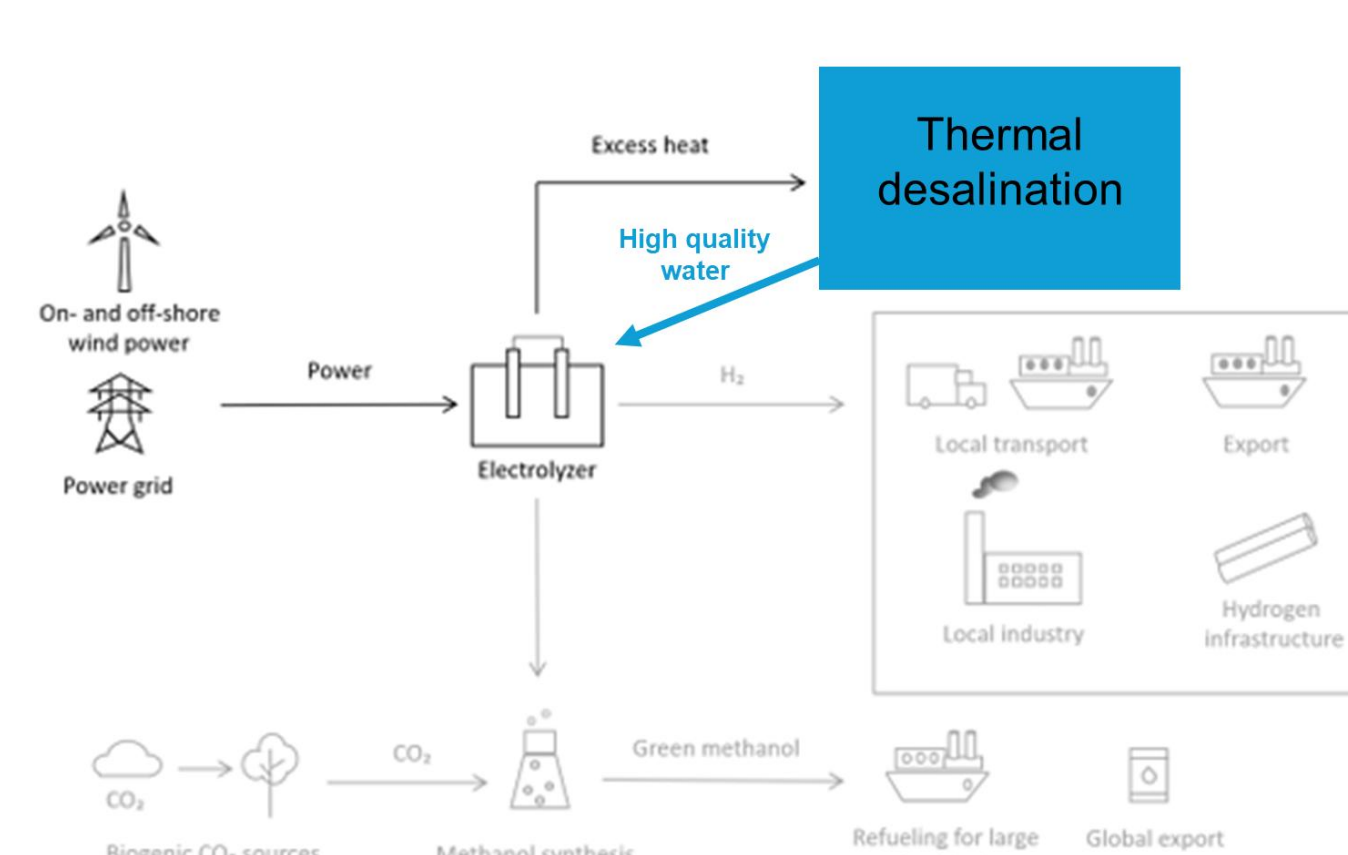


Air-based Solar Thermal Electricity for Efficient Renewable Energy Integration & Compressed Air Energy Storage



Integration of desalination systems in central tower solar power plants and brine reuse for macroalgae production

Coupling thermal desalination with green hydrogen production



Integration of membrane distillation into green hydrogen production to enhance its overall sustainability and efficiency

