



UNIVERSITAT POLITÈCNICA  
DE CATALUNYA  
BARCELONATECH



# [ WATER ]

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## RESEARCH, DEVELOPMENT & INNOVATION AT THE UNIVERSITAT POLITÈCNICA DE CATALUNYA - BARCELONATECH (UPC)

The Universitat Politècnica de Catalunya - BarcelonaTech (UPC) specialises in the fields of engineering, architecture, sciences and technology, including water technologies. In this field, the main focus areas are:

- Treatment, management and distribution of drinking water
- Wastewater treatment, recycling and decontamination
- Conservation and efficient use of water and ecosystems
- Sustainable use of aquatic resources
- Energy generation
- Climate change and adaptation in aquatic environments
- Maritime and inland water transport and logistics

As a result of the UPC's recognised research track record in its areas of specialisation, we can offer a wide range of services:

- R&D technology transfer projects
- Consortia for national and Horizon Europe projects
- Patents
- Technology assessment
- Specialised facilities

The UPC is a leading university in Spain in volume of research and technology transfer to companies, and has become one of the major hubs of knowledge in Southern Europe.

## [ TREATMENT, MANAGEMENT, AND DISTRIBUTION OF DRINKING WATER ]

### INFRASTRUCTURE AND MANAGEMENT OF WATER RESOURCES

- Infrastructure and integrated management of water resources, monitoring, and advanced control of urban drinking water networks.
- Security and efficiency of smart infrastructures: water networks, sewage systems, canals, and rivers.
- Territorial planning for sustainable water management and drought prevention.
- Tools for global management of hydraulic infrastructures: supply and urban drainage.
- Sensors and algorithms for leak detection.
- Treatment and use of bamboo in sanitation and sewage systems.



### DRINKING WATER TREATMENT

- Evaluation of groundwater quality and risks for pathogens and contaminants.
- Improvement of drinking water quality through microalgae and acai biochar.

### DESALINATION

- Renewable energy and advanced membranes for desalination.
- Sustainable recovery of value-added elements from brine.
- Desalination with conductive polymer hydrogels.

## [ WASTEWATER TREATMENT, RECYCLING, AND DECONTAMINATION ]

### TREATMENT

- Production of bioproducts and high-quality regenerated water with microalgae.
- Recovery of ammonia from urban and industrial waste.
- Heat and wastewater recovery with membranes in the industry.
- Removal of emerging contaminants, antibiotics, and hormones.
- Production of bio-stimulants and bio-fertilizers with cyanobacteria.
- Removal of metals and sulfates from wetlands with Acid Rock Drainage (ARD).
- Control of micro and nanoplastics and antibiotic-resistant genes in soils and aquifers.

### EFFLUENT AND DISCHARGE TREATMENT

- Quantification of water and solute flux in submarine discharge.
- Digital twins for early detection of pollution in wastewater treatment plants.
- Processes to improve contaminant degradation and pathogen retention in aquifers.



## [ WASTEWATER TREATMENT, RECYCLING, AND DECONTAMINATION ]

### POLLUTION AND WASTE MANAGEMENT IN AQUATIC ENVIRONMENTS

- Predictive models of microplastic movement in rivers and seas.
- Monitoring and quantification of microplastics with deep learning.
- Treatment of precipitated silica waste with total water recovery and sodium sulfate production.
- Technologies for contaminant degradation and pathogen retention in aquifers.

### INDUSTRIAL WATER REUSE AND RECYCLING

- Electrochemical treatment of textile wastewater with hydrogen production.
- Efficiency in water, energy, and chemical consumption, reduction of microplastics in laundries.

### RAINWATER HARVESTING

- Permeable bituminous mixtures for drainage pavements.
- Hydraulic modeling of drainage grates with computational fluid dynamics.

### POLLUTION REDUCTION

- Microfluidic systems to detect and eliminate microplastics and contaminants from algae.
- Removal of metals and sulfates from water.
- Aquifer recharge to improve water quality and availability.
- Control of seawater intrusion into coastal aquifers.
- Mine Acid Drainage (MAD) treatment with nature-based solutions.
- Diagnosis of river pollution with low-cost instrumentation.
- Impact of climate change on groundwater quality.

## [ CONSERVATION AND EFFICIENT USE OF WATER AND ECOSYSTEMS ]

### EFFICIENT IRRIGATION IN AGRICULTURE

- Regenerative and precision agriculture for sustainable production.
- Digital twins for irrigation and water and nutrient recirculation systems in hydroponic crops.
- Production of alternative proteins with microalgae.

### WATER-SAVING TECHNOLOGIES IN URBAN ENVIRONMENTS.

- Strategies for sustainable water use and drought management.
- Sustainability evaluation between bottled and tap water.
- Natural solutions for water management in peri-urban areas.
- Reuse of wastewater in urban green spaces.



## [ SUSTAINABLE USE OF AQUATIC RESOURCES ]

### AQUACULTURE AND MARICULTURE

- Feasibility studies for aquaculture operations.
- Marine reserve networks for the recovery of fishery interest species.
- Acoustic tags for marine species tracking.
- AI for automatic calibration of fishery operations.

### MARINE BIOTECHNOLOGY

- Circular biomaterials for marine ecosystem regeneration.

## [ CLIMATE CHANGE AND ADAPTATION IN AQUATIC ENVIRONMENTS ]

### BLUE ECONOMY

- Study of natural and human impacts on the sea.
- Development of ocean observation systems.
- Climate risk management and early warning systems.
- 3D printing of marine biotopes using recycled steel slag.

### ENVIRONMENTAL MONITORING AND MANAGEMENT

- Oceanic and river observation networks.
- Participatory monitoring platforms for coastal environments.
- Analysis of physical and biological processes in coastal bays.
- Impact of human activity on river sediments and flood risks.

### EXPLORATION TECHNOLOGIES

- Mitigation of acoustic pollution on aquatic species.
- Autonomous underwater vehicles for marine observation.
- Cost-effective solutions for water challenges and aquatic ecosystem restoration

## [ ENERGY GENERATION ]

### OCEAN ENERGY

- Evaluation of the energy resource from waves and optimization of capture devices.
- Fluid-structure interaction analysis for buoys and floating wind turbines.
- Optimization of moorings for offshore wind turbines.

### HYDRAULIC ENERGY (WAVES AND TIDES)

- Generation of undulating and tidal energy.
- Predictive diagnosis and maintenance of machinery.
- Numerical simulation of turbulent flows and hydrodynamic characterization for tidal energy.
- Optimization of turbines in micro-hydro power plants.



## [ MARITIME AND INLAND WATER TRANSPORT AND LOGISTICS ]

- Ship traffic studies and air quality with AIS data.
- Technologies to reduce emissions and use of sustainable fuels.
- Energy management optimization and pollution reduction in shipyards.

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