

RESEARCH PORTFOLIO

Water Digitalization

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Name of scientists in charge

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Technology description

Application of artificial intelligence, modelling and digitalization techniques for a sustainable management of the urban water cycle (drinking water and distribution network systems, sewer systems, wastewater treatment, reclaimed water systems, recovery systems and receiving media).



Research expertise

- > Development of multi-criteria Environmental Decision Support Systems (EDSS) integrating knowledge management, artificial intelligence, and conventional modelling to improve the management of complex water-related systems.
- > Knowledge-based modelling and EDSS for drinking water treatment, supporting operation strategies, mitigation of influent impacts, and evaluation of organic matter fractioning.
- > Planning, design, operation and maintenance of small and decentralized, including natural systems, medium and large wastewater treatment systems.
- > Multi-criteria (technical and socio-economical) and life cycle analysis (LCA) of urban water systems.
- > Integrated control of the urban water cycle (sewer system, wastewater treatment plant and receiving media) to improve ecological status of water bodies.
- > Agent-based modelling for a user-centered urban water management.
- > Digital twins for the optimization of water treatments.
- > Modelling of water treatment processes with computational fluid dynamics (CFD).

Projects

- > [i3Waters](#) -intelligent, innovative, integrative Water Systems. European Commission. Call: HORIZON-MSCA-2024-DN-01. GA 101227354. 2026-2029.
- > [MORIARTY](#) - Bridging the Water Gap: A Step Forward in Multifaceted Risk Evaluation in Supply Scenarios with Regenerated Water. Spanish National Research Agency. Call: Proyectos de Generación de Conocimiento. Ref: PID2024-155733OB-I00.2025-2028.
- > [WaterCLUE](#) - Online Sensing and Digitalization of Drinking Water Supply Systems for Timely Mitigation of Chemical and Microbial Risks. Spanish National Research Agency. Call: Consolidación Investigadora. Ref: CNS2023-143664. 2024-2026.
- > [D-PATTERN](#) - Interdisciplinary approach to evaluate decentralisation in urban water management: two case studies in Spain. Spanish National Research Agency. Call: Proyectos de Generación del Conocimiento. Ref: PID2023-150071OB-I00. 2024-2027.
- > [HADES](#) - Decision Support System based on Digital Twins for WWTP optimization. Ref: CPP2021-009097. Spanish National Research Agency. Proyectos de Colaboración Público-Privada.

Publications

- Abert-Fernández, D., Aguilera, E., Emiliano, P., Valero, F., Monclús, H. **Beyond point predictions: Quantifying uncertainty in E. coli ML-based monitoring.** *Journal of Water Process Engineering* (2025), 78, 108734
- Garrido-Baserba, M., Sedlak, D.L., Molinos-Senante, M., Barnosell, I., Schraa, O., Rosso, D., Verdaguer, M., Poch, M., **Using water and wastewater decentralization to enhance the resilience and sustainability of cities,** *Nature Water* (2024), 2 (10), 100180, 953-974.
- Vidal-Lamolla, P., Molinos-Senante, M. and Poch, M., **Understanding the Residential Water Demand Response to Price Changes: Measuring Price Elasticity with Social Simulations,** *Water (Switzerland)* (2024), 16, 17, 2501.
- Suquet J., Godo-Pla L., Valentí M., Ferràndez L., Verdaguer M., Poch M., Martín M.J., Monclús H., **Assessing the effect of catchment characteristics to enhanced coagulation in drinking water treatment: RSM models and sensitivity analysis,** *Science of the Total Environment* (2021), 79910, 149398.
- Palma-Heredia D., Verdaguer M., Molinos-Senante M., Poch M., Cugueró-Escofet M.À., **Optimised blending for anaerobic co-digestion using ant colony approach: Besòs river basin case study,** *Renewable Energy* (2021), 168, 141-150.
- Galizia, A., Mamo, J., Blandin, G., Verdaguer, M., Comas, J., Rodríguez-Roda, I., Monclús, H., **Advanced control system for reverse osmosis optimization in water reuse systems,** *Desalination* (2021), 518, 115284.
- Godo-Pla L., Emiliano P., Poch M., Valero F., Monclús H., **Benchmarking empirical models for THMs formation in drinking water systems: An application for decision support in Barcelona, Spain,** *Science of the Total Environment* (2021), 7631, 144197.
- Poch M., Garrido-Baserba M., Corominas L., Perelló-Moragues A., Monclús H., Cermerón-Romero M., Melitas N., Jiang S.C., Rosso D., **When the fourth water and digital revolution encountered COVID-19,** *Science of the Total Environment* (2020), 74420, 140980.

Software

DrinkIA – Digital Twin® technology is a decision support system to optimise drinking water treatment plants' operation from an integrated approach and to address the main demographic, climate and health challenges of their management.