

2025 Annual Activity Report

Aqualia Innovation





1. Innovation for caring for the planet

At Aqualia, we are committed to innovation: our main lines of work in efficiency, circularity and carbon neutrality show how applied research drives solutions to the challenges of climate change and water resource management.

The water sector is facing stricter legal requirements with Directive (EU) 2024/3019 concerning urban wastewater treatment, Regulation (EU) 2020/741 on minimum requirements for water reuse and its transposition through Royal Decree 1085/2024, and Directive (EU) 2020/2184 on the quality of water intended for human consumption.

In this demanding regulatory context, innovation is essential for ensuring the sustainability of facilities and services across the end-to-end water cycle. To meet the new requirements and respond to climate, technological, digital and social challenges, Aqualia's open innovation is a key element that involves all company staff and external stakeholders.

At Aqualia, we have long embraced, and embedded across the organisation, the importance of innovation in tackling the main challenges of our time. Our Innovation and Technology department works—in collaboration with people both in and outside of

the company—to identify opportunities, develop innovative solutions, and implement and transfer knowledge.

The transfer of knowledge from Aqualia's innovation to production is also an essential part of our Aqualia Strategic Sustainability Plan 2024–2026. To this end, the Innovation and Technology department works together with the production and engineering teams to adapt plants and implement alternative solutions for water abstraction, as well as for eco-efficiency and the smart management of the water resource across the entire cycle.

We are also one of the first companies in the sector to become certified to the new international standard ISO 56001:2024, which replaces the Spanish standard UNE 166002:2021, for our **Innovation Management System**.

- [Further information on Aqualia's Strategic Sustainability Plan 2024-2026 here.](#)

Key achievements in 2025

€5,864,847
invested in innovation

3
new innovation projects launched in 2025, including the development of innovative solutions for caring for the planet¹

7
new implementations of applied innovation processes at facilities managed by the company²

20
ongoing projects developed by the Innovation and Technology department

42
universities and
23
research centres we collaborate with

24
patents in force³

¹ The new innovation projects launched in 2025, which include the development of innovative solutions to tackle climate change, are LIFE SMALLWAT (France and Spain), HE WATERSENS (Spain) and AVI-PURAGUA (Spain).
² The new implementations of applied innovation processes at facilities managed by the company in 2025 are as follows: Fe+Mn filter media, MBMBR Moving Bed Membrane Bio-Reactor, NF hollow-fibre membranes, reverse osmosis remineralisation, Microbial Desalination Cell (MDC), AquaGranular, chlorine dioxide THMs (trihalomethanes).
³ Includes only national (ES), European (EP) and international PCT (MX, USA, CO) patents currently in force. Does not include trademark registrations.



2. Our strategy: innovation and development across the end-to-end water cycle

Our **Innovation Strategy** focuses on identifying opportunities and developing and implementing novel solutions to respond to the environmental, social, technological and legislative challenges of end-to-end water management. Internal and external collaboration is key to knowledge transfer, which

drives innovation at Aqualia and its contribution to sustainable development. This vision is structured around two pillars that are deployed across the entire end-to-end water cycle: eco-efficiency and sustainability.



ECO-EFFICIENCY

Follow circular economy principles through efficient management of natural resources and the recovery of raw materials.

Objectives:

- » Develop advanced technologies that optimise the use of renewable resources.
- » Avoid waste generation in the company's processes and services.
- » Seek solutions that enable growth in all water markets in line with eco-efficiency requirements.



SUSTAINABILITY

Minimise energy consumption, prevent pollution in an equitable social environment, and protect the climate and nature.

Objectives:

- » Develop cutting-edge technologies that foster the company's sustainability, protecting the environment and biodiversity.
- » Improve energy efficiency in the company's solutions and services.
- » Recovery of by-products from the end-to-end water cycle.



Aqualia's innovation workstreams support the **United Nations Sustainable Development Goals (SDGs)**, for which affordable, high-quality water supply and sanitation services (SDG 6), an optimised

energy balance (SDG 7), and responsible production and consumption (SDG 12) without affecting the climate (SDG 13) are particularly relevant.

Workstreams and noteworthy actions in 2025

Following European policies as a roadmap, we work on and develop solutions across six areas of action with multiple projects.



SUSTAINABLE WASTEWATER TREATMENT

H2020 NICE, from concrete jungles to urban oases (Spain): Integrating the use of Nature-based Solutions (NbS) into urban water cycle management.



ALTERNATIVE RESOURCES: REUSE, DRINKING WATER TREATMENT AND DESALINATION

Inauguration of the WAVE Centre (Spain): This centre is a European leader in research on new desalination methods and brine recovery.



SUSTAINABILITY AND ENERGY EFFICIENCY

Misiones ECLOSION and Misiones ZEPPELIN, a commitment to green hydrogen (Spain): Developing technological solutions for green hydrogen production and storage within wastewater treatment plants.



CIRCULAR ECONOMY, ECOFACTORIES AND BIOFACTORIES

Improving sewage sludge quality and resolving operational issues in sludge treatment (Czech Republic) through advanced systems that address operational challenges and enhance quality.



INDUSTRIAL WATER

Regeneration of industrial water for reuse as process water (Spain), specifically for cooling towers.



DIGITAL DEVELOPMENTS

LIFE RESEAU, digitalisation of Moaña's sewerage system (Spain) through an intelligent infiltration and inflow (I&I) management system for network monitoring and quantification.

3. Workstreams

3.1 Sustainable wastewater treatment

The revision of EU Directive 2024/3019 on urban wastewater treatment extends the obligation for wastewater treatment to agglomerations of more than 1,000 inhabitants and requires integrated stormwater management. It also lowers discharge limits, increases nutrient recovery and seeks a neutral energy balance by 2040. At the same time, it requires sludge to meet higher standards of quality for its subsequent reuse, addressing the removal of micropollutants and microplastics.

Conventional solutions do not meet these expectations, and in small plants, conventional technologies such as extended aeration require costly investment and maintenance. On the other hand, nature-based solutions (essentially lagooning systems and peat filters) are low-cost options with very good performance. In larger plants also, solutions

are based on aerobic technologies, which consume energy and produce sludge of no value, when there are alternatives that reduce the footprint, improve efficiency and avoid energy consumption and waste generation under the approach of extended producer responsibility (EPR).

In this area, Aqualia is working on adapting wastewater treatment technologies to the size of the plants in order to minimise energy consumption and waste generation. In this way, we are improving aerobic and anaerobic treatments, and reducing sludge production through nutrient recovery, to obtain valuable resources such as fertilisers.



Noteworthy action 2025

H2020 NICE: FROM CONCRETE JUNGLES TO URBAN OASES (SPAIN)

Challenge: nature-based solutions for a sustainable urban water cycle.

The NICE project aims to integrate the use of Nature-Based Solutions (NBS) into urban water cycle management. It addresses all facets of the urban water cycle, demonstrating the feasibility of using natural systems, such as green walls and roofs, rain gardens, constructed wetlands, and sustainable drainage in cities, to obtain reusable water for different purposes. In doing so, as well as mitigating pollution and runoff, the project also seeks to make the NBS an attractive and integral part of the urban landscape.

A fundamental aspect of the NICE project is the construction and evaluation of NBS at a pilot scale in different European cities. In 2025, we carried out actions in the Spanish cities of Talavera de la Reina, Algeciras, Benalmádena and Madrid. We also began working to build a sludge wetland at the New Cairo Wastewater Treatment Plant in Egypt.

In Algeciras, we commissioned a constructed wetland to treat and reuse stormwater and greywater. Rainwater is physically filtered through sand and gravel, and then wetland vegetation removes any remaining contaminants by means of biological processes. The result is water suitable for irrigating gardens or cleaning streets. In addition, this wetland treats greywater from the Instituto Torre Almirante secondary school.

The constructed wetland counteracts the urban heat island effect that occurs in cities. This effect consists of a build-up of temperature due to the obstruction of air movement caused by buildings, and reduced evapotranspiration due to less vegetation and increased impermeable paving. These parks become a sustainable green alternative for citizens to enjoy for leisure, as well as a space for local fauna and flora to settle.

At the HUB INTEXT in Talavera de la Reina, we commissioned single-stage, vertical-flow wetlands specially designed for treating urban wastewater. This system has been patented under the name WETFAN, a technology that combines both a forced ventilation and an internal water recirculation system to enhance the removal of nitrogen present in wastewater by transforming it into nitrogen gas. This type of wetland requires less area per inhabitant than other wetlands and also has very low energy consumption.

On the façade of the offices of Benalmádena's municipal water company, we installed a vertical garden built with innovative, lightweight and absorbent materials that allow the treatment of the building's greywater and remove dissolved solids. As well as enhancing the building's aesthetics, this new vegetation layer strengthens the thermal insulation of the structure and reduces the energy consumption of the air-conditioning system, especially during periods of higher temperatures and sunshine.

In addition, in 2025 we commissioned a recovery, regeneration and reuse plant for greywater at our corporate headquarters in Madrid. After installing a separate network, the greywater flows into an initial tank located in the basement. From there it is pumped to a hybrid constructed wetland combining vertical and horizontal phases, where emerging contaminants are removed and pathogens are reduced. After this simultaneous treatment process, the treated water is again stored, chlorinated, and ready to be used for irrigating the building's gardens and washing down common areas. The main objective of this initiative is to make our corporate headquarters a national and European benchmark in water resource management.

• [More information here.](#)



3.2 Alternative resources: reuse, drinking water treatment and desalination

In the current context of water stress, making use of non-conventional water sources is key. EU Regulation 2020/741 on minimum requirements for water reuse ensures that reclaimed water meets the same levels of quality and risk control in all EU countries. For its part, Royal Decree 1085/2024 on water reuse establishes a new legal regime for the use of this reclaimed water. For drinking water, EU Directive 2020/2184 on the quality of water intended for human consumption and Royal Decree 3/2023 establish the technical and sanitary criteria for drinking water quality, its control and supply, with a growing concern for health and emerging contaminants, and they require the modernisation of much of Europe's drinking water treatment processes to address the new limits on endocrine disruptors, pharmaceuticals and microplastics.

This set of requirements drives the development of innovative solutions for drinking water treatment and wastewater reclamation. For each objective, we set tailored solutions so that we can achieve sustainability in all its dimensions: technical, economic, environmental and social.

The new standards require, in addition to measuring and removing emerging contaminants and microplastics, the development of risk control strategies and diagnostic tools. These tools make it possible to select the optimal combination of technologies for each situation, also assessing the feasibility of modernising existing plants to comply with the new requirements.

Alongside reuse, desalination also contributes to securing the water resource. More than 1,700 plants are already operating in Europe, with a nominal capacity of 3,400 Mm³/year, and estimated global annual growth of around 7% since 2010. A key factor is undoubtedly the optimisation of these processes, thanks to the introduction of new materials and membranes, which increase performance and reduce energy consumption.

Noteworthy action 2025

INAUGURATION OF THE WAVE CENTRE (SPAIN)

Challenge: develop new desalination systems, brine valorisation and use of renewable energy.

In June, the WAVE innovation centre was inaugurated at the La Caleta desalination plant (Adeje), an Aqualia-Entemanser initiative supported by the Adeje City Council. This centre is a European benchmark in research into new forms of desalination, brine valorisation to recover resources such as critical raw materials and the use of renewable energy as a step towards a

sustainable desalination that makes it possible to extract the true value of seawater.

WAVE is a centre open to all stakeholders, where research initiatives on desalination, brine valorisation and the use of renewable energy are jointly developed. The centre has both the material and human resources required to transform the scientific knowledge generated into innovative solutions and apply them directly to the water cycle. In fact, WAVE has already developed solutions that are implemented at full scale both in Tenerife and on the Spanish mainland: tertiary treatment at the La Orotava wastewater treatment

plant and various drinking water treatment systems for Cantabria, Castilla-La Mancha and Andalusia.

With a surface area of more than 3,000 m², the centre's layout provides a flexible and versatile platform, ideal for addressing new challenges and developing future solutions in seawater desalination. The various facilities and highly qualified staff provide a unique infrastructure for initiatives that include the innovation, evaluation, demonstration, training and transfer of desalination technologies.

This centre has offices, workshops, laboratories and a demonstration area that comprises three areas where demonstrative activities in the following workstreams are carried out: seawater desalination, brine valorisation, and coupling with renewable energy. The demonstration area is divided into electrically and hydraulically powered workstations, supplied with seawater, separated into drinking water and brine using seawater reverse osmosis (SWRO), thus making the centre very versatile.

Work is currently underway on the following technologies:

Desalination: spiral-wound nanofiltration membranes; hollow-fibre nanofiltration membranes; membrane distillation; high-recovery reverse osmosis; microbial desalination cell and remineralisation with micronised calcite.

Brine valorisation: production of gourmet salt in Alma de Mar® evaporation ponds; production of

disinfectant agents through electrochlorination; recovery of calcium and magnesium through selective precipitation and critical raw materials recovery unit.

Renewable energy: solar collector field, harnessing solar thermal energy and pressure-retarded osmosis to generate electricity by converting salinity gradients.

The solar evaporation area occupies a surface area of more than 400 m² and consists of 12 evaporation ponds in which, using only wind and sun, compounds such as calcium, magnesium and Alma de Mar® gourmet salts are recovered from brine. One of the world's first initiatives to harness the true value of brine.

The solar collector area occupies a surface area of more than 600 m² to generate solar thermal energy used in the membrane distillation demonstration plant to increase production of desalinated water at the seawater desalination plant.

The permanent staff based at the WAVE centre comprises four researchers and a floating workforce of a further seven employees. In addition to attracting local and international talent thanks to the creation of highly qualified direct employment, the centre has created indirect opportunities for suppliers of materials and services.

• [More information here.](#)



3.3 Sustainability and energy efficiency

The revision of EU Directive 2024/3019 on urban wastewater treatment sets the objective of energy neutrality for wastewater treatment plants with capacities above 10,000 p.e. (population equivalent), and proposes increasing the contribution of renewable sources to 100% by 2040. In the end-to-end water cycle, the electricity consumption associated with pumping for abstraction, supply and distribution of urban water is currently at 0.5 kWh/m³. This is very similar to the average specific consumption of wastewater treatment plants of 0.5 kWh/m³, and together they represent 2% of Spain's annual consumption.

In innovation work, wastewater is viewed as an energy source capable of powering the treatment

process itself and still generating an energy surplus. At Aqualia, we are moving forward with the development of technological alternatives, such as anaerobic treatments, and maximising the conversion of organic matter into bioenergy (biomethane and/or hydrogen). In parallel, we are also optimising the equipment and operational control of the plants using digital tools. To maximise the production and use of energy at the wastewater treatment plants, we are incorporating renewable energy, such as solar and wind, into the process. At the same time, we are also working to recover energy from water drops within the end-to-end water cycle and through active pressure control.

(including urban biowaste, agri-food waste, wastewater and wastewater treatment sludge). The developed solutions have also been validated at the Salamanca wastewater treatment plant and the Lleida wastewater treatment plant.

In Salamanca, a demonstration-scale plant has been operated for the anaerobic digestion of sludge, together with a biogas cleaning and upgrading system, to obtain high-quality biomethane. In Lleida, in turn, we are advancing in the development of technologies for valorising the CO₂ present in biogas and producing biomethane. From this location, we operate the advanced anaerobic digestion laboratory that supports our wastewater treatment plants in the study and full-scale implementation of co-digestion projects.

In June, we inaugurated the green hydrogen plant we built at the Isla Verde wastewater treatment plant in Algeciras (Spain) as part of the Misiones ZEPPELIN project. The project has investigated a flexible set of green hydrogen production and storage technologies based on the use of waste and by-products. This initiative has improved the costs and efficiency of producing this energy vector.

The project addressed technological challenges linked to biogas and bioethanol reforming, dark fermentation (DF), microbial electrolysis (ME), gasification and hydrogen storage. In turn, new

models for green hydrogen production were established to complement the electrolysis with renewable energy; these are integrated into a decarbonised energy system under the principles of the circular economy and digitalisation.

During the development of the ZEPPELIN project in Algeciras, green hydrogen has been produced from biogas by catalytic reforming, as well as from waste activated sludge and dewatered sludge, using three innovative microorganism-based technologies:

- Dark fermentation with low solids concentration
- Dark fermentation with ultra-high solids concentration
- Microbial electrolysis

These technologies make it possible to valorise different by-products of wastewater treatment, by generating renewable hydrogen and helping to decarbonise the process. The combination of thermochemical and biological processes positions the Algeciras wastewater treatment plant as a benchmark in the sustainable production of energy vectors from waste.

• [More information here.](#)

Noteworthy action 2025

ECLOSION MISSIONS AND ZEPPELIN MISSIONS: NEW MODELS FOR PRODUCING GREEN HYDROGEN (SPAIN)

Challenge: development of new models for producing green hydrogen.

Hydrogen as an energy vector has emerged as one of the most promising routes for climate change mitigation and adaptation, as it can produce electrical, mechanical and thermal energy without generating direct CO₂ emissions.

Currently, 96% of the hydrogen produced on our planet comes from fossil sources and only 1% from renewable sources. This reality clashes with the Spanish roadmap, which sets the 2030 objective that 2% of the hydrogen consumed by industry should be renewable. Aware of this, at Aqualia we lead innovative initiatives such as the Misiones ECLOSION and Misiones ZEPPELIN projects, through which we contribute to the development of highly innovative technological solutions for the production and storage of green hydrogen in the environment of wastewater

treatment plants. These projects were completed during 2025.

In May, Spain's first demonstration plant for generating green hydrogen from reclaimed water was inaugurated at the Guadalete wastewater treatment plant in Jerez. This pioneering initiative, driven by the ECLOSION project, not only uses reclaimed water, but also generates energy to run the treatment plant itself, marking a milestone in self-sufficiency and in meeting ambitious European decarbonisation targets.

The plant is powered by photovoltaic energy and treated water, integrating advanced technologies for water conditioning, next-generation electrolyzers, (hydrogen and electricity) energy storage systems, and conversion into electricity. It also incorporates state-of-the-art tools to optimise its operation and integration within the wastewater treatment plant.

The ECLOSION project develops new materials, technologies and processes for the generation, storage, transport and use of renewable hydrogen and biomethane obtained from biowaste



3.4 Circular economy, ecofactories and biofactories

The Circular Economy Action Plan (CEAP), part of the European Green Deal, promotes the efficiency of industrial processes and use of resources to prevent waste. Regulation (EU) 2024/1252 (Critical Raw Materials Act, CRMA) focuses on ensuring a secure, resilient and sustainable supply of critical raw materials; sets targets for extraction, processing and recycling within the EU; and promotes strategic projects to improve risk monitoring and strengthen the supply chain.

According to the National Sewage Sludge Register (Registro Nacional de Lodos), in Spain around five million tonnes of wastewater treatment sludge are produced annually (assuming 20% dry solids), mainly for agricultural use (around 80%), with the remainder ending up in landfill or being incinerated (around 4%). EU Directive 2024/3019 on urban wastewater treatment establishes that sludge must be treated, recycled and valorised in accordance with the hierarchy defined in the Waste Framework Directive.

The EU sets a minimum phosphorus recovery rate and recommends nutrient reuse—such as the valorisation of biosolids and their agronomic-value compounds (organic matter, nitrogen, phosphorus, potassium, calcium, magnesium and other micronutrients)—in agriculture. Since 2014, Aqualia has been working with the University of Santiago de Compostela to precipitate the phosphorus present in the centrate from dewatering centrifuges and recover

struvite stones. This led to us obtaining [European Patent EP3112320A1](#) (Method and system for the crystallisation of struvite for recovering phosphates in wastewater) in 2024.

The first industrial-scale struvite reactor was implemented at the wastewater treatment plant in the Spanish town of Guillarei, and in recent years another plant has been put into operation at the Guadalete wastewater treatment plant— also in Spain—to supply a fertiliser, Aquavite®, to Fertiberia's factories.

Many innovation projects develop alternative solutions to conventional wastewater treatment plants to transform them into biofactories or ecofactories, thereby minimising their consumption of energy and reagents and avoiding waste generation. This is also a way of creating opportunities to generate bioproducts through resource recovery: biofertilisers, biostimulants, biopesticides, biochars, charcoal, ectoine or single-cell protein, among others. Likewise, in the management of sludge at wastewater treatment plants, sanitation and stabilisation treatments are addressed, as well as material and energy recovery, biomethanisation and co-digestion.



Noteworthy action 2025

IMPROVING THE QUALITY OF WASTEWATER TREATMENT SLUDGE AND RESOLVING OPERATIONAL ISSUES ASSOCIATED WITH ITS TREATMENT (CZECH REPUBLIC)

Challenge: improve the quality of wastewater treatment sludge and resolve operational issues associated with its treatment.

In 2025, we completed the implementation of advanced sludge treatment systems in the Czech Republic, with the aim of resolving operational issues and improving their quality. Actions were carried out at the Havířov and Opava wastewater treatment plants, where similar operational needs were identified. The latter plant receives wastewater from a nearby biscuit-manufacturing plant that will increase its production in the short term, with the consequent rise of organic load in the effluent reaching the facilities.

To improve traditional mesophilic digestion (carried out between 30–38 °C), thermophilic stabilisation (between 50–57 °C) is introduced, which does not require sludge liming (eliminating the calcination process), provides high sanitation efficiency, significantly reduces odours, and optimises space and investment costs.

This improvement relieved the overload of the original system of three mesophilic digesters, which did not sufficiently reduce the organic content in the sludge dry matter. What's more, it suffered frequent heating and mixing failures, combined with a tendency to foam formation. The new approach delivers greater operational and economic efficiency, as it uses existing tanks while ensuring the intensification required for sludge management.

Sludge pasteurisation at the Bohumin wastewater treatment plant

As a result of research into sludge pasteurisation carried out over the last 12 years, a full-scale 1:1 solution has been implemented which, after several successful tests, is an integral part of the sludge management system at the Bohumin wastewater treatment plant.

The mixed sludge (primary and secondary, thickened, 10–20 °C) is pumped from the separator to a storage tank. It passes through a recovery heat exchanger to a preheated intermediate tank (25–31 °C). The sludge then enters the

pasteurisation heat exchanger, reaching ~70 °C. It remains in a disinfection chamber for about 30 minutes, and finally, the sludge circulates back through the recovery exchanger (cooling to ~35 °C) before entering the digestion station.

Solar drying demonstration at the Bohumin wastewater treatment plant

A pilot experience of solar sludge drying has also been successfully implemented at the Bohumin wastewater treatment plant. The aim was to check whether this technology works well in the Czech climate, to reduce the costs of sludge management and facilitate its handling at the plant. It also sought to open up new possibilities for reusing sludge as biosolids in agriculture and industry.

The dryer uses solar energy to accelerate the drying process, and during the colder months, an underfloor heating option was also tested. The demonstration was carried out in three phases between May 2024 and June 2025. In just seven days of solar drying, the sludge weight was reduced up to threefold. Initially, the sludge had between 75% and 80% moisture and was sticky and foul-smelling. However, from the second day onwards it began to turn into dry granules that were soft and easy to handle. From the seventh day onwards, the evaporation process slowed down and the dry matter content stabilised.

Impact and future outlook

The trials confirmed the reduction of costs in sludge management and demonstrated the production of high-quality biosolids. The integration with renewable energy sources (e.g., solar-heated floors) improves energy self-sufficiency and supports the decarbonisation objectives. Based on these results, opportunities are being explored for its large-scale implementation within SmVaK's operating area in the Czech Republic.



3.5 Industrial water

Water plays a key role in industry, and at Aqualia we work to ensure that our industrial customers meet their sustainability and innovation objectives, and also improve their processes for conditioning process water and treating industrial effluents. To this end, we are developing solutions to optimise the treatment of industrial wastewater in the agri-food, mining and chemical industry sectors, with the aim of achieving its reuse, and reducing the water footprint.

In this area, we have worked on different technologies, such as:

- Anaerobic membrane bioreactors (AnMBRs), tested since 2014 at Ecoparc Barcelona, at the Citroën plant in Vigo, and currently to treat liquid manure in Xinzo de Limia (Spain).

- An advanced upflow reactor, such as the patented PUSH®.
- The ELAN® reactor, with several references in the industrial sector, notably the full-scale implementation at the Heineken plant in Seville (Spain).

A particular stream generated in many industries is brine, which is also abundant in seawater desalination. These effluents resulting from the separation of minerals must be properly managed and, for this reason, work is being carried out to harness them as a source of critical and strategic raw materials, and to separate out critical minerals such as magnesium.



Noteworthy action 2025

REGENERATION OF INDUSTRIAL WATER FOR REUSE AS PROCESS WATER (SPAIN)

Challenge: reduce industry's water footprint and make effluent treatment more efficient.

For two years, Aqualia Industrial teams and the Catalonia delegation have worked on developing trials focused on regenerating highly complex industrial wastewater for reuse as process water, especially in cooling towers. These actions have been carried out at the Tarragona industrial wastewater treatment plant, designed and built by Aqualia and owned by AITASA (the Tarragona Industrial Association for Water Treatment).

During this period, pilot ultrafiltration (UF) plants and double-pass reverse osmosis (RO) plants have been acquired, requiring adaptation works, commissioning and optimisation of operating points. Throughout this process, Aqualia has provided support and technical assistance and we have resolved various incidents.

Noteworthy is the creation of specific chemical cleaning protocols for the ultrafiltration equipment and the reverse osmosis skid. These units operate with high-load effluents from the petrochemical industry, which add an extra level of difficulty to their treatment. Throughout the pilot phase, different scenarios were monitored in order to be able to respond to all of them.

The above circumstances also required a complete redesign of process automation, combining different pretreatments with ultrafiltration and reverse osmosis until the optimal outlet effluent for reuse was obtained.

With Aqualia Industrial, an operational non-conventional UF membrane model has been created and successfully implemented. This model delivered excellent results, far above the levels of performance in traditional procedures, paving the way for a new line of research managed by Aqualia Industrial with support from the Innovation and Technology department.

During 2025, we completed the piloting of the membrane treatment train at the Villapérez wastewater treatment plant (Asturias, Spain) to obtain bespoke reclaimed water and its subsequent reuse in different industrial applications. The treatment train consists of an ultrafiltration unit followed by a reverse osmosis stage and an electrodeionisation (EDI) stage.

Bespoke water was obtained that meets the technical and regulatory requirements of the various proposed industrial applications. Innovative membranes with limited market penetration were also validated, notably biomimetic membranes with lower energy consumption.

Finally, at the COGERSA waste treatment centre in Asturias, piloting began of the technology train proposed in the LIFE INFUSION project for treating complex streams—such as landfill leachate and the liquid fraction from anaerobic digestion—at these centres.

Current treatment of these streams consumes a great deal of energy and resources, and is usually carried out at the actual waste treatment plants. The proposed treatment train is based on a more sustainable solution in which these streams are transformed into resources: biofertilisers, reclaimed water, and energy in the form of biomethane.

To this end, three technologies developed by Aqualia are used:

- **AnMBR + ELAN.** With this combination of anaerobic technologies, it is possible to reduce the organic and nitrogenous matter of the treated streams with low energy consumption, obtaining biogas and a high-quality effluent that, after a post-treatment, makes it possible to obtain reclaimed water that meets the requirements for its reuse.
- **ABAD-CARB.** Technology for purifying biogas streams with a low water consumption to obtain biomethane of a quality suitable for grid injection.



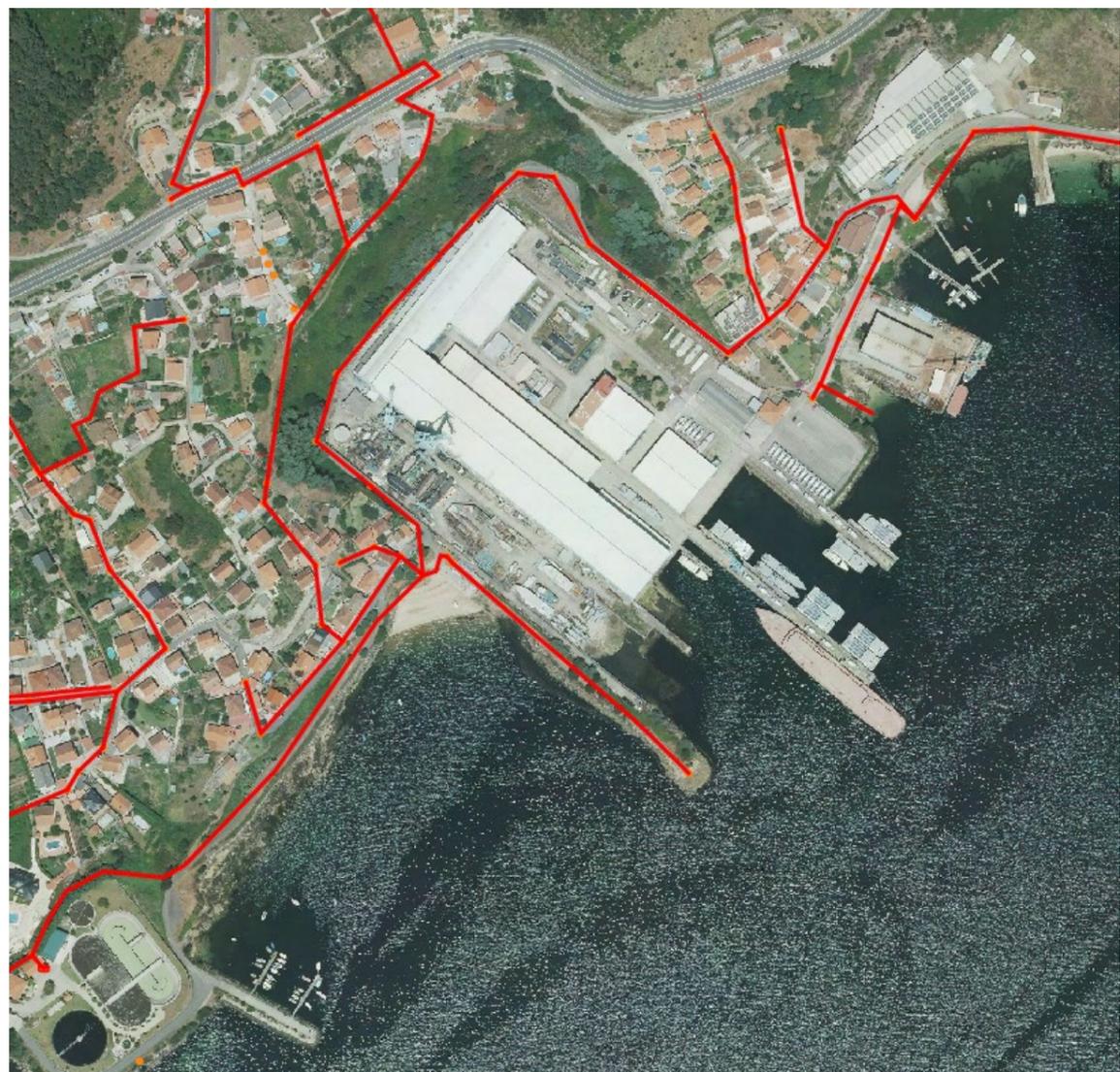
3.6 Digital developments

Advanced tools have revolutionised management of the water cycle and energy consumption by optimising processes with technologies such as the Internet of Things (IoT), which connects multiple sensors. Data analysis and artificial intelligence, on the other hand, monitor water and energy systems in real time for the early detection of problems, and they enable a fast and efficient response.

Decision support systems (DSS) are fundamental in this context, as they integrate data from various sources and use advanced algorithms to propose accurate recommendations. In water management, these systems can forecast future demand, optimise distribution and ensure resources are used efficiently. In terms of energy consumption, DSS can identify usage patterns, suggest savings measures, and manage loads more effectively, reducing consumption and associated costs.

At Aqualia, we design our own systems based on the knowledge of thousands of professionals, adding value, our brand, and differentiating ourselves from the competition as an added value to the management we carry out in all the municipalities where we operate.

In addition, we carry out digital developments in abstraction to prevent algal blooms, and in drinking water treatments, for the removal of trihalomethanes (THM) or the dosing of reagents. In desalination, we use algorithms to optimise the electricity consumption of the desalination plants in national and international facilities. Furthermore, we apply numerical optimisation and mathematical modelling methods to minimise the energy consumption of the sewerage system or the aeration processes in wastewater treatment.



Noteworthy action 2025

LIFE RESEAU: DIGITALISATION OF MOAÑA'S SEWERAGE SYSTEM (SPAIN)

Challenge: better understand the dynamics of the sewerage system and anticipate how it will respond under different scenarios, especially heavy rainfall.

The LIFE RESEAU project started in 2021 and involves Aqualia, the Instituto Tecnológico de Galicia (ITG) and the Danish water supply company VandCenter. Its actions include implementing a Smart Infiltration/Inflow Management System (SiiMS) in Moaña (Pontevedra, Spain) to monitor and control the network by quantifying infiltration and inflow. This makes it possible to optimise the operation and maintenance tasks, as well as to assess the influence of different climate change scenarios on the wastewater treatment plant and the combined sewerage system.

During 2025, this project progressed in developing models that enable a better understanding of how the sewerage system operates. These models are constantly being validated and calibrated thanks to data collected by sensors installed in the system.

One of the major achievements was improving the simulation of system behaviour during rainfall events. For this, hybrid models that combine traditional tools (such as stormwater management models, SWMM) with artificial intelligence are used, as well as specific models to analyse infiltration and flow decomposition at specific points in the network. All of this is integrated into the SiiMS web platform, facilitating access to and interpretation of the information.

The LIFE RESEAU project helps us to better understand the dynamics of the sewerage system and anticipate how it will respond under different scenarios. Some of the most noteworthy advances:

- Detection of infiltration in the system, both due to improper connections to stormwater networks and due to saline water ingress.
- Prediction of overflows at pumping stations, making it possible to understand the system's response capacity and act before overflows occur.
- Continuous monitoring of key variables, adjusting the frequency of measurements to obtain more accurate data.
- Data quality control, ensuring that the models learn with reliable information.

- Comparison with real events to adjust model sensitivity and improve its accuracy.

The development of these models—together with the actions mentioned above—provides valuable information that makes it possible to increase the knowledge of sewerage system operation, propose actions for operational improvements, safeguard the integrity of sewerage infrastructure and determine its resilience capacity.

In addition, the network is periodically updated in GIS (Geographic Information Systems) that capture, store, analyse and visualise geospatial data to reflect changes in its structure. And one fundamental element: the knowledge and experience of the operators are incorporated, because, to achieve the best results, technology and practice must go hand in hand. In short, all this work not only improves the understanding of the system, but also provides key information for making faster and more effective decisions, reducing risks and optimising sewerage management.



4. Projects implemented in 2025



1. Innovation for caring for the planet

2. Our strategy: innovation and development across the end-to-end water cycle

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WORKSTREAMS

Ent. on	Acronym	Project name	Start	End	Location	Sustainable wastewater treatment	Alternative resources: reuse, drinking water treatment and desalination	Sustainability and energy efficiency	Circular economy, ecofactories and biofactories	Industrial water	Digital developments
20 06	LIFE ZERO WASTE WATER	Positive energy wastewater treatment plant for combined treatment of waste water and biowaste in small populations	2020	2025	Almería	•		•			
20 07	LIFE INFUSION	Intensive treatment of waste effluents and conversion into useful sustainable outputs: biogas, nutrients and water	2020	2025	Gijón	•				•	
21 03	MISIONES ECLOSION	New materials, technologies, and processes for the generation, storage, transport, and integration of renewable hydrogen and biomethane from biowaste	2021	2025	Salamanca (End-to-end Water Cycle Innovation Centre)			•	•		
21 04	MISIONES ZEPPELIN	Research into Innovative and Efficient Green Hydrogen Production and Storage Technologies based on the Circular Economy	2021	2025	Algeciras			•	•		
20 04	H2020 REWAISE	Resilient Water Innovation for Smart Economy	2020	2025	Moaña / Almería (Hub REUSA) / Denia (Desalination Innovation Centre) / Adeje (WAVE Centre) / Oviedo / Salamanca		•		•		•
20 05	LIFE PHOENIX	Innovative cost-effective multibarrier treatments for reusing water for agricultural irrigation	2020	2025	Almería (Hub REUSA)	•	•				
21 01	H2020 NICE	Innovative and enhanced nature-based solutions for sustainable urban water cycle	2021	2025	Talavera de la Reina (Hub INTEXT) / Madrid	•	•				
21 02	LIFE RESEAU	Resilience enhancement in the urban water sector	2021	2025	Moaña	•					•
22 02	HE D4RUNOFF	Smart implementation of adaptive hybrid solutions in sewage networks for preventing and managing diffuse pollution from urban water runoff	2022	2026	Santander	•					•
22 03	HE CHEERS	Producing novel non-plant biomass feedstocks and bio-based products through upcycling and the cascading use of brewery side-streams	2022	2026	Lleida				•	•	
22 05	HE NINFA	Taking action to prevent and mitigate pollution of groundwater bodies	2022	2026	Los Alcázares		•				•
23 01	HE RESURGENCE	Industrial water circularity: reuse, resource recovery and energy efficiency for greener digitized processes	2023	2027	Algeciras				•	•	
24 01	LIFE SALTEAU	Sustainable drinking and irrigation water production from saline alternative water resources	2024	2028	Denia (Desalination Innovation Centre) / Adeje (WAVE Centre)		•				
24 02	INTERREG GESTEAUR	Sustainable and Digitalized Water Management in Rural Environments of the SUDOE area	2024	2027	Tiñosillos / Fontiveros				•		•
24 03	HE CIRSEAU	Building a water smart economy and society	2024	2026	Madrid						•
24 04	UNITED CIRCLES	Interconnected efforts from feasibility to finance for industrial-urban symbiosis driven by circularity hubs	2024	2028	Salamanca (End-to-end Water Cycle Innovation Centre)		•		•		
24 05	INTERREG IDIWATER	DESAL + LIVING LAB MAC	2024	2026	Adeje (WAVE Centre)		•				
25 01	LIFE SMALLWAT	Advanced BIOlogical and ELECTROchemicAI processes for a sustainable wastewater treatment in small and medium agglomerations.	2025	2029	Almería, Talavera, Brittany (France) and La Gomera	•					
25 02	HE WATERSENS	Decentralizing WATER Services by Developing Water SENSitive Cities combining innovative Blue-Green-Grey Infrastructures with Smart Integrated Water Management Systems	2025	2029	Badajoz, Cantabria y Aragón (Spain); Franschhoek (South Africa); Lisbon (Portugal), Thessaloniki (Greece)	•	•		•		
25 04	AVI-PURAGUA	Treatment and Elimination of Emerging Contaminants and Effluent Regulation for Water Transformation	2025	2028	Denia and Lliria		•		•		•

5. New implementations of applied innovation processes

In 2025, seven solutions developed by the Innovation and Technology department were applied at facilities managed by Aqualia.

Project	Implementations
Fe+Mn Filtration Media	<ul style="list-style-type: none"> Arcos/Frontera Drinking Water Treatment Plant Fe and Mn Removal (2025) Valverde Drinking Water Treatment Plant. Mn Removal (2024) Els Poblets Brackish Water Desalination Plant (EDAS). Osmosis Pretreatment (2023) Mar de Alborán Seawater Desalination Plant (EDAM). Reverse Osmosis (RO) Pretreatment (2023) Mostaganem Seawater desalination plant (EDAM). Osmosis Pretreatment (2023) Cap d'Jinet Seawater Desalination Plant (EDAM) Osmosis Pretreatment (2023) Guaymas Seawater Desalination Plant (EDAM) Osmosis Pretreatment (2022) Racons Brackish Water Desalination Plant (EDAS). Reverse Osmosis Pretreatment (2022)
Moving Bed Membrane Bio-Reactor (MBMBR)	<ul style="list-style-type: none"> Villabona Wastewater Treatment Plant (EDAR) (Asturias). Ongoing implementations: Existing Membrane Bioreactor (MBR) (1,450 population equivalent (p.e.), average permeate flow 270 m³/day). Dosing of Commercial Powdered Activated Carbon (2025) Grado Wastewater Treatment Plant (EDAR) (Asturias). Pilot with Flat-Sheet Membrane Bioreactor (MBR) (1 m³/h). Dosing of Biochar Produced from Wastewater Treatment Sludge (2020)
Nanofiltration (NF) Hollow-Fibre Membranes	<ul style="list-style-type: none"> Mancomunidad Nogales (2025) Icod de los Vinos (2022–2024) Laboratory scale: 14 locations tested
Reverse Osmosis Remineralisation	<ul style="list-style-type: none"> La Caleta Seawater Desalination Plant (EDAM) (14,000 m³/d) (2025) Fonsalia Seawater Desalination Plant (EDAM) (21,000 m³/d) (2024) Guaymas Seawater Desalination Plant (EDAM) (17,280 m³/d) (2023) Al-Alamein Seawater Desalination Plant (150,000 m³/d) (2023)
Microbial Desalination Cell (MDC)	<ul style="list-style-type: none"> New version launched with X-Prize (2025) La Caleta Seawater Desalination Plant (EDAM) (Tenerife) (2020) Racons Brackish Water Desalination Plant (EDAS) (Denia) (2018)
AquaGranular	<ul style="list-style-type: none"> El Bobar Wastewater Treatment Plant (EDAR). 27 m³ pilot (2025) Moaña wastewater Treatment Plant (EDAR) (Pontevedra). Treatment of up to 40% of the influent flow to the wastewater treatment plant, using two 450 m³ reactors (2024)
Chlorine Dioxide Trihalomethanes (THMs)	<ul style="list-style-type: none"> Nogales Drinking Water Treatment Plant (ETAP). Trihalomethane (THM) reduction, drinking water treatment plant capacity 400 m³/h. (2024) Torreueva-Castellar Drinking Water Treatment Plant (1,800 m³/d) (2020) Racons Brackish Water Desalination Plant (EDAS) (Denia). Brackish water desalination plant capacity 700 m³/h) (2019) Ampuriabrava distribution (2018)

ETAP: Drinking water treatment plant
 EDAS: Brackish water desalination plant
 EDAM: Seawater desalination plant



6. Patents

In 2025, patent families and trademarks continued to grow for another year.

	Type of protection	Short name	Granted on	Patent no.
1	National OEPM patent	Anaerobic batch water purification system	06/05/2009	ES2300164*
2	National OPEM patent	Anammox ELAN Process	10/09/2014	ES2466090
	European patent EPO	Anammox ELAN Process	17/12/2014	EP2740713
	Trademark registration	ELAN®	08/06/2013	11265559
	UK Trademark registration	ELAN® UK	15/09/2022	UK00911265559
	European patent	ELAN® in water line	30/08/2023	EP3255016
3	European patent EPO	MFC fluidised bed (ELSAR)	22/04/2020	EP2927196
	Trademark registration	ELSAR®	02/06/2021	18398327
4	European patent EPO	Influent distribution and Mixing Device for UASB Reactors PUSH	5/10/2016	EP3090408
	European patent EPO	PUSH Improvement	15/11/2023	EP4166514
5	European patent EPO	Biogas upgrading	29/03/2017	EP3061515
	International PCT patent	Biogas upgrading USA	27/02/2018	US9,901,864 B2
	International PCT patent	Biogas upgrading MEXICO	02/12/2021	MX388417
	Trademark registration	ABADBioenergy®	22/05/2017	016146151
	Trademark registration	ABAD GRID®	02/08/2025	19166861
6	European patent EPO	MDC (Microbial Desalination Cells MIDES)	26/08/2020	EP3336064
	International PCT patent	MDC USA	23/03/2021	US10,954,145
	International PCT patent	MDC MÉXICO	02/12/2024	MX/a/2019/007194
7	European patent EPO	SAnMBR	20/05/2020	EP3225596
	International PCT patent	SAnMBR USA	03/03/2020	US10,577,266 B2
	International PCT patent	SAnMBR MEXICO	21/06/2022	MX393297
8	European patent EPO	ADVANSIST	10/07/2020	EP3454652
	Trademark registration	ANPHORA®	02/06/2021	1389329
	International PCT patent	ADVANSIST/ANPHORA® COLOMBIA	31/07/2023	CO41631
	International PCT patent	ADVANSIST/ANPHORA® MÉXICO	19/07/2024	MX415126
	International PCT patent	ADVANSIST/ANPHORA® USA	03/09/2024	US12,077,737
9	European patent EPO	DARE	19/05/2021	EP3527538
10	European patent EPO	CRISTALIZACIÓN DE ESTRUVITA	17/04/2024	EP3112320
		AQUAVITE®	02/06/2021	18323060
11	European patent EPO	Purasand High Recovery	31/07/2024	EP4344761
12	European patent EPO	WETFAN	27/11/2024	EP4375242
13	Trademark registration	DAHLIA®	01/06/2023	18828624
14	Trademark registration	CAMELLIA®	19/06/2024	1898624
15	Trademark registration	ALMA DE MAR®	14/08/2024	1823060

* This patent expired on September 5, 2025.

In 2025, three new European patents were filed: ABAD Carb, ABAD Biochem and Solventes Verdes; an application to extend protection via the Patent Cooperation Treaty (PCT) for DOFAST's European patent application; and a trademark registration for an ABAD Grid® process with the new brand identity created for the processes resulting from Aqualia's innovation.

Patent applications submitted in previous years are still under evaluation, in the pending patents table.

	Type of protection	Short name	Application date	Result
1	European patent EPO	Pressure reactor	19/10/2017	Under assessment
2	European patent EPO	Ectoine production	03/03/2023	Under assessment
3	International PCT patent	PUSH COLOMBIA & MEXICO Improvement	13/10/2022	Under assessment
4	European patent EPO	Solar patent technology FRESNEL	23/09/2024	Under assessment
5	European patent EPO	DOFAST Dissolved Ozone Flotation	14/10/2024	Under assessment
6	European patent EPO	ABAD CARB	23/01/2025	Under assessment
7	European patent EPO	ABAD BIOCHEM	11/08/2025	Under assessment
8	International PCT patent	DOFAST Dissolved Ozone Flotation	14/10/2025	Under assessment
9	European patent EPO	SOLVENTES VERDES	13/12/2025	Under assessment

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Our commitment to sustainability, cooperation and the generation of applied knowledge drives us to set up different types of public-private partnerships, consolidating our presence in the countries where we operate as benchmarks in water innovation.

Recognition at the 14th AEDyR International Congress 2025

We participated prominently at the 14th AEDyR International Congress 2025, held in Santa Cruz de Tenerife, where we were recognised with three awards at the **2nd AEDyR Awards**, consolidating our leadership in sustainability, innovation and excellence in the water cycle:

- **Sustainability.** The MARadentro Managed Aquifer Recharge project won an award in the Sustainability category for its focus on Managed Aquifer Recharge with reclaimed water, improving the quality and availability of groundwater.
- **Excellence.** In the Excellence category, Aqualia's wastewater regeneration solutions, capable of adapting water quality to different uses: urban, agricultural, industrial or environmental.
- **Young Presentation.** José Luis Marín, Aqualia project technician, received the Young Presentation award for his presentation on the operation of the Guaymas Seawater Desalination Plant (EDAM) outfall, recognised for its positive environmental impact.



Sustainability Actions 2025 award for the WAVE centre

The municipality of Adeje was distinguished with the Sustainability Actions 2025 award, in the Public Authorities category, for the development of the WAVE centre (Water Added Value European Centre). The event, organised by Custommedia through its *Equipos&Talento* and *Compromiso RSE* media outlets, brought together more than 800 professionals in a day dedicated to sharing sustainability initiatives and best practices, and recognised more than 60 outstanding initiatives.

21st San Alberto Magno Award for Scientific Merit 2025

We were awarded this prize from the Official Association of Chemists of Asturias and León and the Association of Chemists of the Principality of Asturias for our contribution to progress in the field of water. This recognition highlights our exceptional contribution to scientific and technical progress in the water sector, our impact on sustainability and quality of life, as well as our ability to achieve—through R&D+i—tangible solutions for eco-efficient water management.

- [More information here.](#)

Recognition at the 15th IWA Latin American Anaerobic Digestion Congress for the technology developed at the Salamanca Innovation Centre

The work *In situ pressurised upgrading of biogas for sustainable biomethane production*, developed at the End-to-End Water Cycle Innovation Centre in Salamanca in collaboration with the University of Valladolid and Aqualia, within the ECLOSION project, was recognised by the International Water Association (IWA) as one of the best presentations at the 15th Latin American Anaerobic Digestion Congress, held in Brazil.

- [More information here.](#)

Pre-qualification of the MIDES project for the XPRIZE Water Scarcity competition

MIDES, our pioneering microbial cell for low-energy seawater desalination, was pre-qualified in the prestigious XPRIZE Water Scarcity Competition, a global challenge to revolutionise seawater desalination and ensure sustainable access to drinking water. This recognition places us among the world's leading innovators in water technology.

- [More information here.](#)

AQUALIA, THE ONLY PRIVATE OPERATOR AMONG THE FOUNDERS OF EIT WATER, EUROPE'S LARGEST WATER KNOWLEDGE AND INNOVATION COMMUNITY

The European Union, through the European Institute of Innovation and Technology (EIT), awarded the creation of EIT Water to the consortium to which Aqualia belongs. EIT Water is the new knowledge and innovation community dedicated to water and marine and maritime ecosystems. In this way, **we are joining as one of the 50 founding partners and the only private end-to-end water cycle operator within this European alliance.**

EIT Water is the tenth Knowledge and Innovation Community (KIC) of the European Institute of Innovation and Technology, and its mission will be to address Europe's most urgent water challenges, focusing on water scarcity, droughts and floods, degradation of marine and freshwater ecosystems, and promoting a circular and sustainable blue economy. To this end, it will be based on three mechanisms: training and skills development, promoting innovation projects (including near-to-market projects), and driving the creation and financing of companies through Europe's largest innovation network.



- [More information here.](#)



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