

November 2024. Sector Snapshot

# Report on the sustainable water use sector in Catalonia



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**ACCIÓ**  
Government of Catalonia



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### Carried out by

Strategy and Competitive Intelligence Unit of ACCIÓ  
Metyis Business Advisors S.L.

### Collaboration

Catalan Water Partnership  
Business Strategy Unit

Barcelona, November 2024

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The sustainable water use sector

# 1. The water sector



## Definition of the sustainable use of water sector

The sustainable use of water sector includes all those activities and technologies that seek to **manage, distribute and use water resources efficiently and in an environmentally responsible manner**. This includes the **development of technology** for the **treatment, purification and reuse of water, recovery of added value products**, as well as the **improvement of the management of water resources in high-consuming sectors of the resource** such as agriculture, industry and services, among others. It also involves building sustainable infrastructure and implementing solutions to manage stormwater and reduce flood risks.

In addition, the sector focuses on the **generation of alternative water sources** and the **protection and restoration of water ecosystems**, as well as the **creation of regulatory and political frameworks** that ensure long-term water conservation. These initiatives are key to **tackle the effects of climate change**, while promoting sustainable economic and social development.

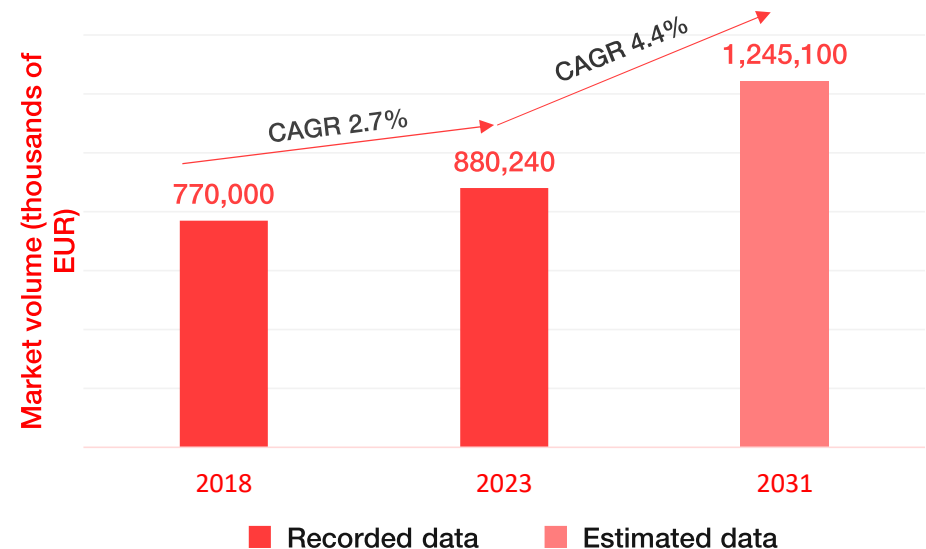


## The water sector on a global scale (I): business volume and sector forecasts

The global water market has experienced significant growth, increasing from **770 billion euros** in **2018** to **880.24 billion euros** in **2023**. The forecast is that this growth will accelerate, reaching **1,245.1 billion euros** by **2031**.

- The growth of the water sector stems mainly from **world population growth** and **intense urbanization**.
- The first factor **will increase demand for water: for consumption, sanitation and hygiene**.
- The second will result in **greater pressure on existing water infrastructures**, so **demand for advanced water treatment solutions, reuse and recycling technologies will accelerate**, as well as in **major investment in these same infrastructures** of the sector.

Global growth forecasts for the water market  
(2018-2031)<sup>1</sup>



Source: GWI & Verified Market Research

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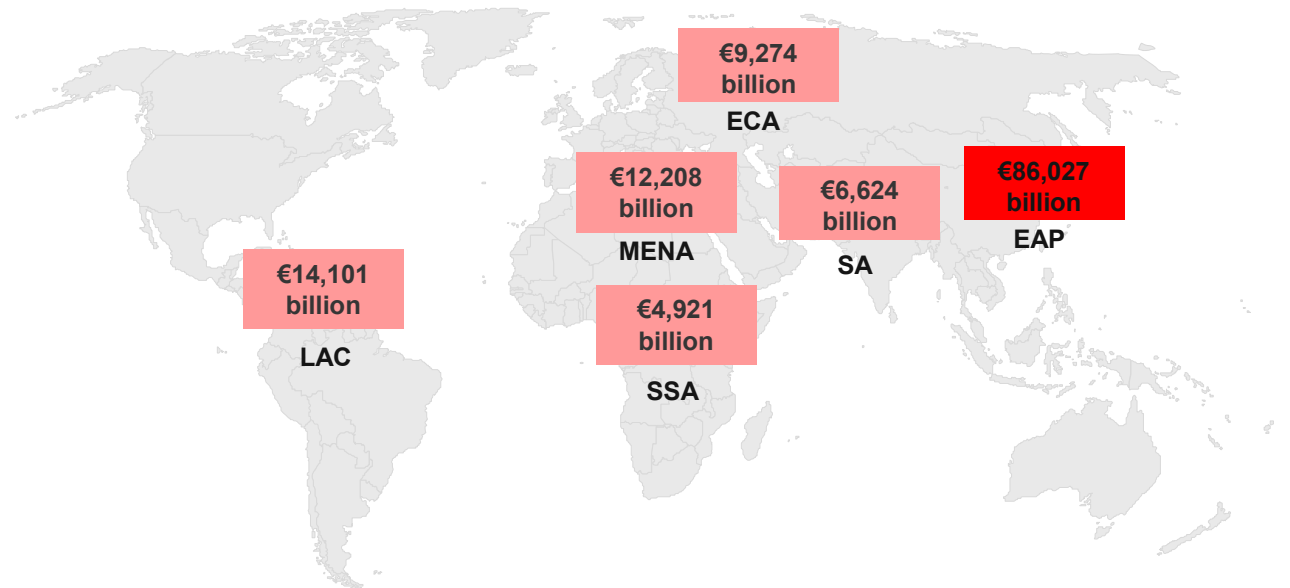
## Water on a global scale (II): Global expenditure in the water sector

Annually they spend close to **155 billion euros** in the water sector. Of this total, **85.5%** comes from the public administration.



Public expenditure in the water sector by region

The Public Administration dominates expenditure in the water sector, specifically, of the total more than **130 billion euros** come from the Public Administration.



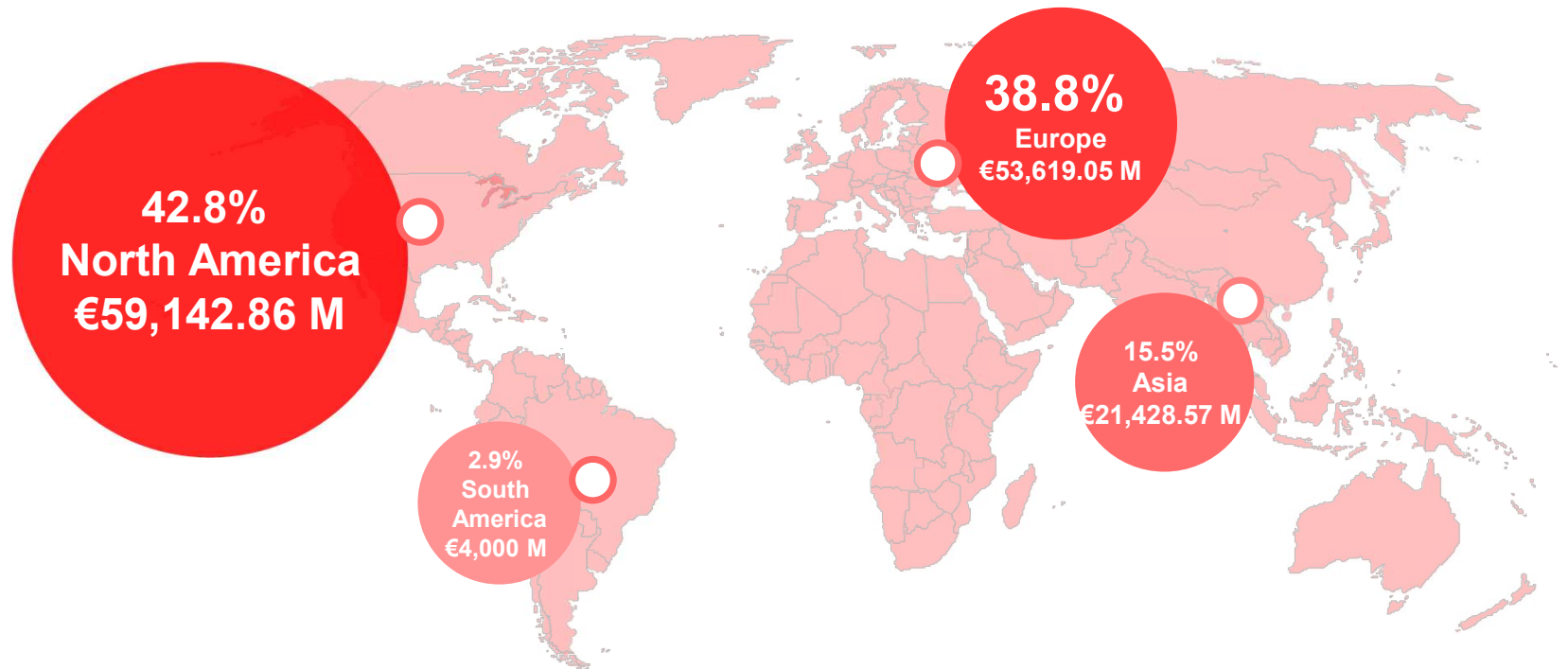
Top 10 companies of the water sector in the world by turnover, 2022



Source: Funding a water-secure future, World Bank Group and GWSP, 2024. Notes: 1. SOE: State-Owned Enterprise. 2. ODA: Official Development Assistance. 3. EAP: East Asia and the Pacific; ECA: Europe and Central Asia; LAC: Latin America and the Caribbean; MENA: Middle East and North Africa; S.A.: South Asia; SSA: Sub-Saharan Africa

## Water on a global scale (II): Geographical distribution of company turnover on a global scale

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Source: *The world's top 50 water businesses, 2024*, Global Water Intelligence



## Denmark is the country that invests the most in water

The volume of R&D in water transport and treatment amounts to €19,867 billion since records began. A total of 413 projects have been executed, creating 30,109 jobs. Spain ranks third in the world in investment (by number of projects executed).

### Global R&D in water, 2019-2023

**413**

projects

(▲24.0% vs. 2014-2018)

**19,867**

€M in investment






(▲17.9% vs. 2014-2018)

**30,109**

jobs created

(▲8.1% vs. 2014-2018)

#### Countries of origin by projects

-  1 Denmark | 51 projects
-  2 Germany | 41 projects
-  3 UAE | 39 projects
-  4 United Kingdom | 32 projects
-  5 United States | 30 projects

#### Destination countries by projects

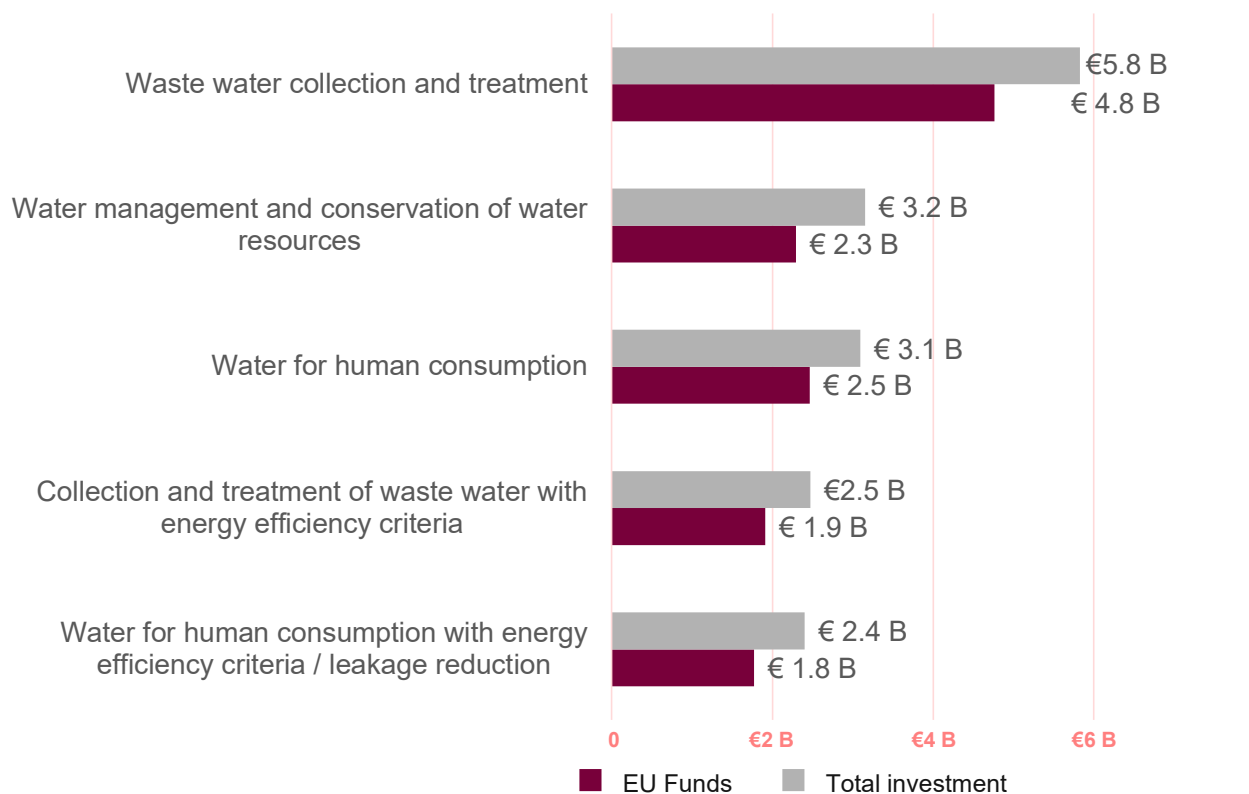
-  1 UAE | 39 projects
-  2 United States | 28 projects
-  3 Germany | 23 projects
-  4 China | 18 projects
-  5 India | 18 projects



**Note:** The projects with the tags “water transportation” and “Water, sewage & other systems” have been included **Source:** ACCIÓ, based on fDi Markets, 2024  
**CataloniaConnects**

## The sustainable use of water sector in Europe: 2021-2027 investment forecast in water management in the Member States

Forecast of investments during the period 2021-2027 in water management in the Member States



As part of the Cohesion Policy programs for the period 2021-2027, an investment of €16.9 billion was planned to support access to water and sustainable water management, of which more than €13.2 billion comes from EU funding.

There are 5 types of investments that focus on access to water and sustainable water management. The largest allocation is for the **collection and treatment of waste water**; and the distribution of the other 4 types is fairly even.

Source: *Water and sustainable water management*, European Commission

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## International benchmarking of global water initiatives

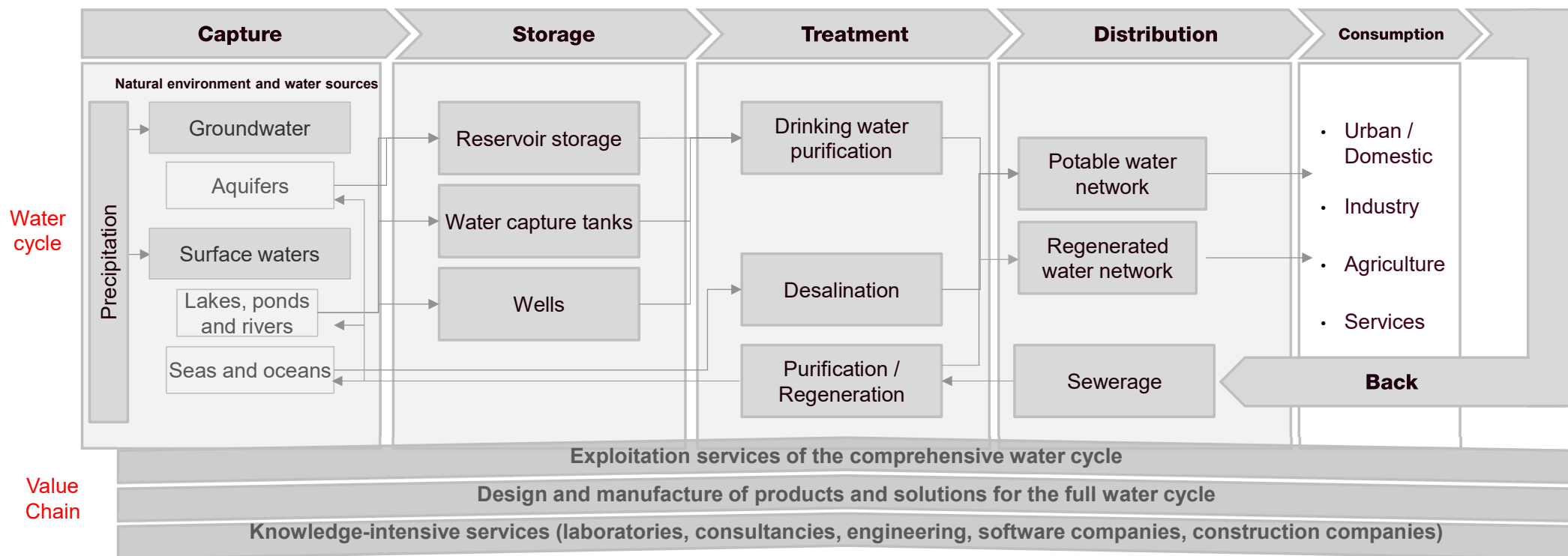


Source: Company websites of the organizations

The sustainable water use sector

## 2. The sustainable water use sector in Catalonia

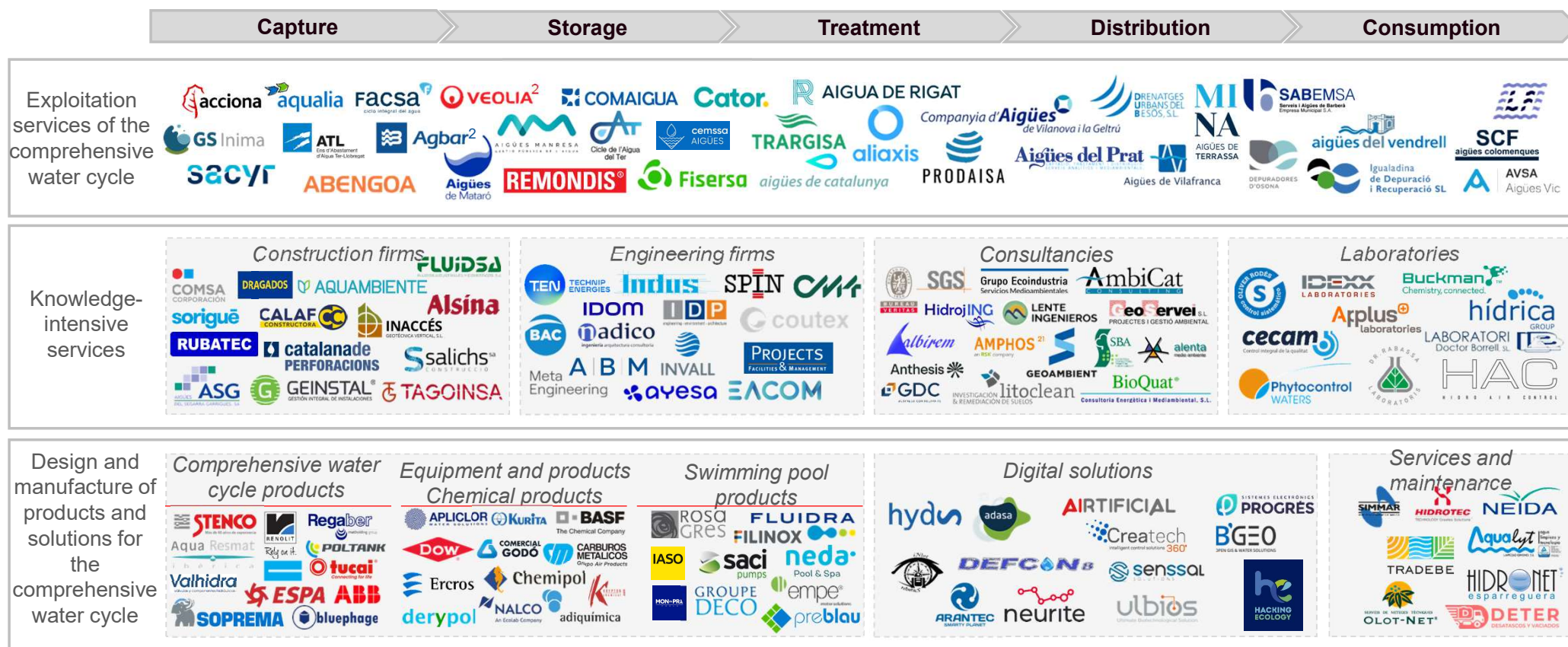
## Definition of the sector in Catalonia (I): The water cycle and the value chain of the sector



## Definition of the sector in Catalonia (II): Mapping scope and segmentation

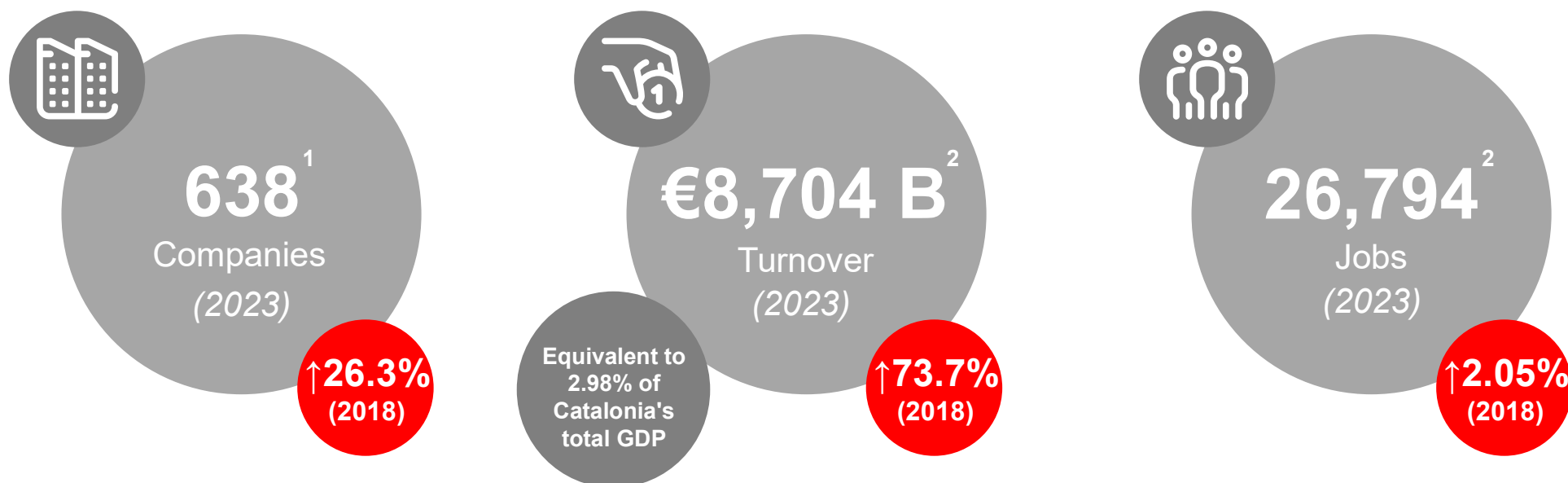
Segment	Sub-segment	Description
<b>Exploitation services of the comprehensive water cycle</b>		<i>Comprehensive water cycle management services (catchment, storage, treatment and distribution).</i>
<b>Knowledge-intensive services</b>	Consultancies	<i>Services in the field of consultancy for the comprehensive management of the water cycle.</i>
	Construction firms	<i>Water cycle infrastructure construction services.</i>
	Engineering firms	<i>Services for the design of water cycle infrastructures and industrial solutions.</i>
	Laboratories	<i>Laboratories for water quality analysis and research.</i>
<b>Design and manufacture of products and solutions for the full water cycle</b>	Equipment and products	<i>Design and/or manufacture of pumps/compressors, pipes and accessories, boilers, separators, treatment systems and industrial machinery directly related to the water cycle.</i>
	Swimming pools	<i>Design and/or manufacture of products and equipment for swimming pools and wellness.</i>
	Chemical products	<i>Manufacture of chemical products for the water cycle (water treatment).</i>
	Digital solutions	<i>Design and/or manufacture of data capture systems, in addition to water control and monitoring systems.</i>
	Services	<i>Services directly associated with the water cycle (maintenance and cleaning).</i>

## Definition of the sector in Catalonia (III): Value chain of the sector in Catalonia



**Notes:** 1. Non-exhaustive list of companies in the water sector in Catalonia. 2. All the companies of the Agbar and Veolia group are included

## Key data of sustainable water in Catalonia



**Source:** SABI, 2024. **Notes:** 1. The mapping has been performed using ACCIÓ's reports and directories, the CNAE linked to the industry and other key sources, including: CWP, AEAS, AQUA Spain, ASAC, ASSOAIGUES, suppliers of the ACA. 2. Data from the annual accounts of the last available year were used, including the years 2022 and 2023 as valid



## Distribution by segments and sub-segments

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Sub-segment	Number of companies	% of the total	Business volume (€M)	% of the total	EBITDA €M	% of the total	Number of jobs	% of the total	CAGR Business volume (18-23)	CAGR EBITDA (18-23)
Exploitation services of the comprehensive water cycle	120	18.8%	1,674	19.2%	51	12.3%	7,291	27.2%	5.9%	-10.5%
Knowledge-intensive services	188	29.5%	1,656	19.0%	94	22.5%	8,130	30.3%	23.2%	29.6%
Laboratories	12	1.9%	50	0.6%	2	0.4%	380	1.4%	-2.0%	-4.6%
Consultancies	36	5.6%	60	0.7%	6	1.5%	667	2.5%	9.4%	17.8%
Engineering firms	98	15.4%	281	3.2%	21	4.9%	2,406	9.0%	3.4%	34.2%
Construction firms	42	6.6%	1,266	14.5%	65	15.7%	4,677	17.5%	38.0%	32.5%
Design/manufacture of equipment, products and solutions	330	51.7%	5,374	61.7%	271	65.2%	11,373	42.4%	11.1%	-10.4%
Equipment and products	185	29.0%	1,977	22.7%	166	39.9%	6,679	24.9%	5.5%	-19.3%
Swimming pools	51	8.0%	2,261	26.0%	16	3.9%	1,919	7.2%	13.6%	180.9 %*
Chemical components	35	5.5%	963	11.1%	85	20.5%	1,563	5.8%	21.6%	15.6%
Digital solutions	25	3.9%	117	1.3%	-2	0.6%	747	2.8%	11.8%	10.8
Services	34	5.3%	57	0.7%	6	1.4%	465	1.7%	10.0%	-168.9 %*
<b>Total</b>	<b>638</b>	<b>100%</b>	<b>8,704</b>	<b>100.0%</b>	<b>€415.3 B</b>	<b>100.0%</b>	<b>26,794</b>	<b>100.0%</b>	<b>11.7%</b>	<b>-7.2%</b>

**Source:** The authors, based on SABI and interview data. For the main companies in terms of business volume and EBITDA where these are not entirely related to the water sector, contribution margin figures obtained from interview data or financial and results reports were used. **Note\*:** In cases where EBITDA goes from positive to negative or vice versa, the evolution in the period 2018 to 2023 is expressed with the absolute growth rate in CAGR accounts

# Main characterization parameters of the sustainable water use sector in Catalonia

## Size of the sustainable water use market

- **638 companies in the sustainable water use sector in Catalonia**, with a **turnover of €20,212 billion** and **71,867 jobs**.
- **€8,704 billion of this business volume (43.1% of the total)** is related exclusively to the water sector. **This accounts for 2.98% of Catalonia's GDP.**

## Distribution by segmentation

- Design and/or manufacture of equipment, products and solutions for the comprehensive water cycle **account for 61.7% of the sector's total volume of business**, exploitation services of the comprehensive water cycle **account for 19.2%** and knowledge-intensive services **account for 19%**.

## Company size

- **90.9%** of the companies that are part of the sector are SMEs and account for **32.2%** of the sector's total business volume. The top 5 companies **account for 42.4% of the sector's total business volume**; the top 20 account for 60.8%.
- **64.2%** of the companies have 10 or more workers.
- **89.4%** of the companies were founded more than 10 years ago.

## The startup ecosystem

- The startup ecosystem in the water sector comprises **16 startups**. **50% of them develop digital solutions.**

## Main characterization parameters of the sustainable water use sector in Catalonia

### Market evolution

#### Market evolution by segment

- Between 2018 and 2023, the sustainable water use sector experienced considerable growth with a **Positive CAGR of 7.15%**. The segments that have gained traction in the sector have been **knowledge-intensive services and the design and manufacture of equipment, products and solutions with a CAGR on sales volume of 23.2% and 11.1%, respectively**. It should be noted that a process of reassignment of companies within the sub-segments of knowledge-intensive services has been carried out since the last report, giving rise to *Non-exhaustive sub-segment CAGRs*.
- The sub-segments that have experienced the greatest growth during this period have been **equipment, products and solutions in the chemical sector with a CAGR of 21.6%, and swimming pools with 13.6%**. In the case of the last-mentioned sub-segment, it is important to highlight the importance of Fluidra's growth in its overall development. **The business group achieved a turnover of €2,051 billion in 2023**, consolidating its position as the leading company in the sector.

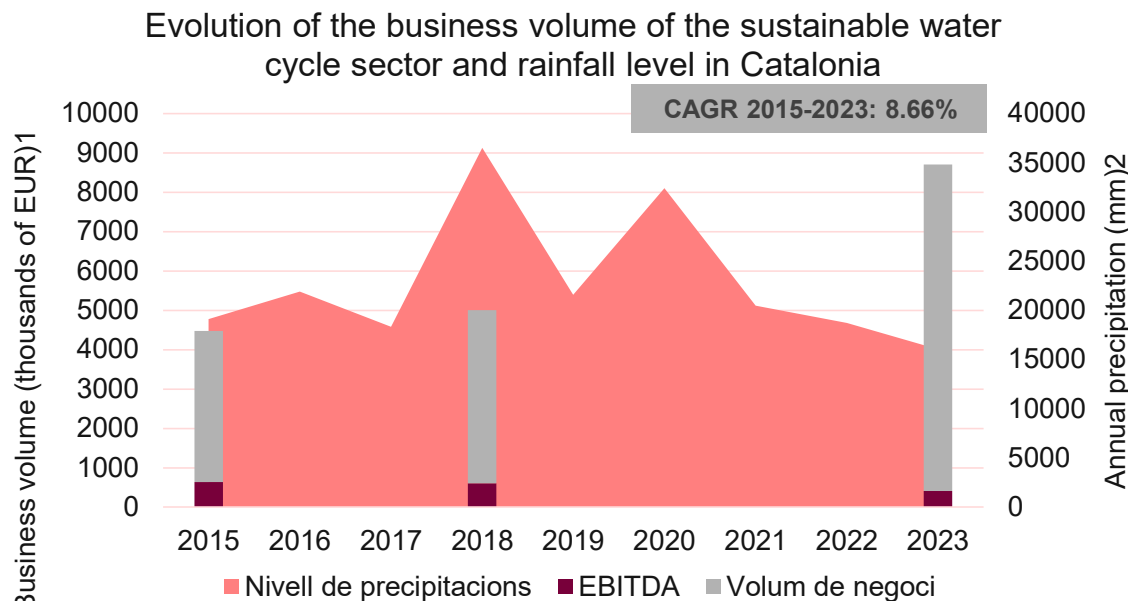
*Source: The authors, based on SABI and interview data*

## Volume of business and EBITDA

In the period 2015-2023, the water sector experienced **positive growth, with a CAGR of 8.66%**. However, it was in the period between 2018 and 2023 that this **growth was most evident with a CAGR of 7.15%**.

This evolution of business volume means an increase in turnover in the sector, and this trend contrasts with a **decrease in the level of precipitation in Catalonia**, but it cannot be claimed that there is any correlation.

On the other hand, **EBITDA has decreased in relation to the 2018 figure**. The decline from €604.7 billion in 2018 to €415.3 billion in 2023 is mainly caused by the design and manufacture of equipment, products and solutions segment which decreased from €468.9 billion to €270.7 billion in the same period.



Source: 1. The authors, based on SABI and interview data. 2. IDESCAT

### Comparison and assessment of the growth of the sustainable water use sector in relation to the growth of Catalan industry

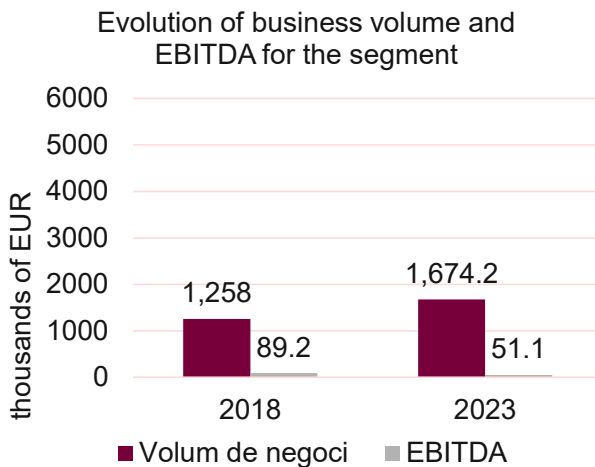
Between 2018 and 2023, the sustainable water use sector experienced a growth of 20% higher **than the total of the Catalan economy** during the same period

	CAGR 2015-2018	CAGR 2018-2023
Water sector	3.80%	7.15%
Total Catalan industry	5%	5.95%

Source: Source: the authors, based on IDESCAT data

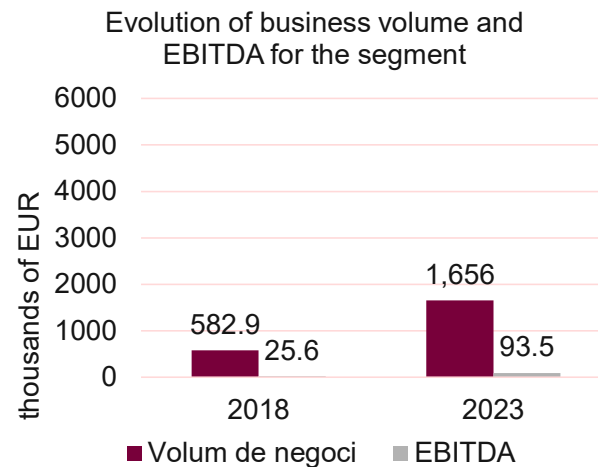
## Business volume and EBITDA by segment

### Operating services segment of the comprehensive water cycle



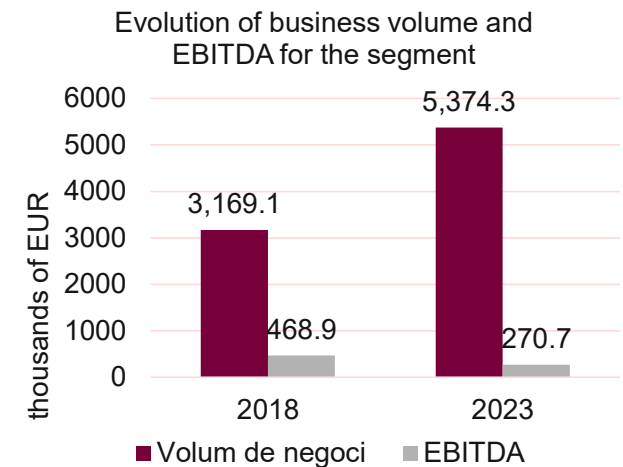
The service companies operating the **comprehensive water cycle** have **increased their business volume** at a **CAGR of 5.9%** between 2018 and 2023, while **EBITDA decreased by a CAGR of -10.5%** in the same period.

### Knowledge-intensive services segment



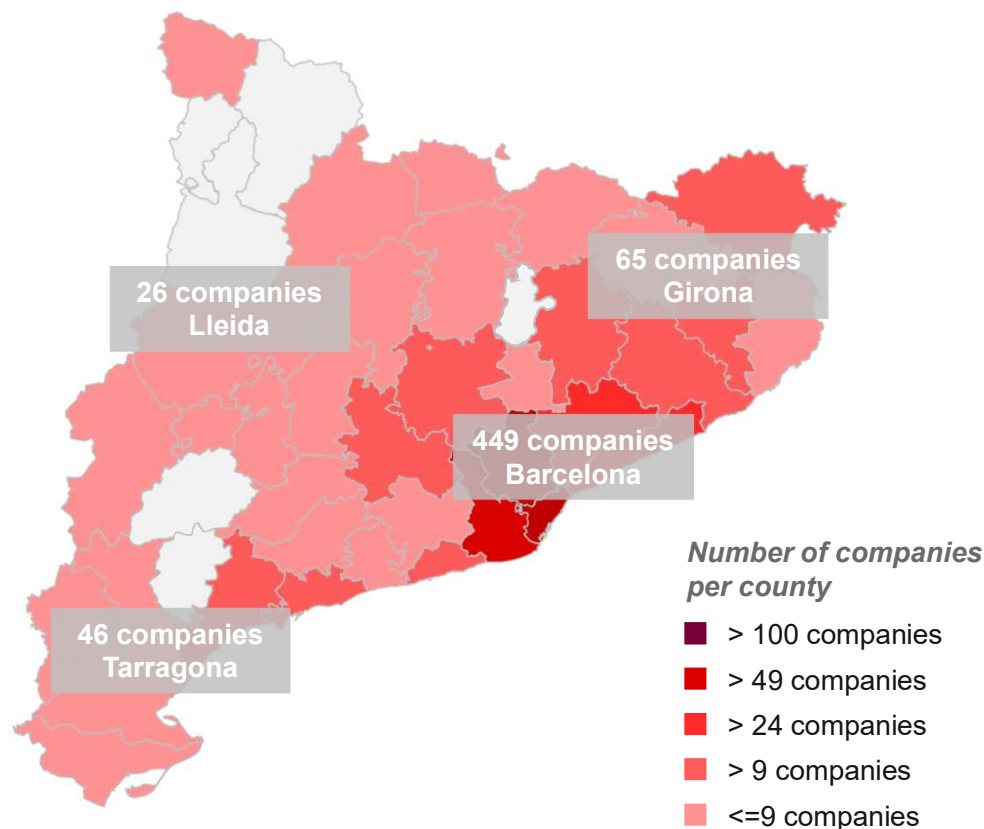
Knowledge-intensive service companies have experienced **even growth, both in business volume and EBITDA**, with a **CAGR between 2018 and 2023 of 23.3% and 29.6%, respectively**.

### Segment design and/or manufacture of equipment, products and solutions



The segment has experienced an **increase in business volume with a CAGR of 11.1%** for the period between 2018 and 2023, while **EBITDA experienced a CAGR of -10.4%** for the same period. The drop in EBITDA reflects the increase in production costs due to the **geopolitical situation** that has generally affected the sub-segment of equipment and products.

## Distribution of companies in the sustainable water use sector by province and region



Of the 638 companies that are involved in the sustainable water use sector in Catalonia, **586 have their corporate headquarters in the territory.**

**Barcelonès is the region with the largest number of companies: 133, and together with Vallès Occidental, Baix Llobregat, Vallès Oriental and Maresme they account for 58% of the total number of companies in the sector.**

County	Number of companies	County	Number of companies
Barcelonès	133	Selva	13
Vallès Occidental	102	Tarragonès	13
Baix Llobregat	61	Alt Empordà	12
Vallès Oriental	44	Garraf	10
Maresme	30	Segrià	9
Osona	23	Baix Penedès	7
Gironès	23	Alt Penedès	6
Anoia	18	Pla de l'Estany	6
Bages	17	Segarra	6
Baix Camp	14	Baix Ebre	5
		Other	34

**Source:** The mapping has been performed using ACCIÓ's reports and directories, the CNAE linked to the industry and other key sources, including: CWP, AEAS, AQUA Spain, ASAC, ASSOAIGUES, suppliers of the ACA

## Support ecosystem and map of actors

Business associations



*Public instruments of the Government of Catalonia for water management*

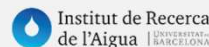


Clusters



*Catalan university centers that provide training related to the water sector*

Fairs



TECNIO technological centers



## With 2,102 startups, Catalonia is the main startup hub in southern Europe

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### Data analysis



**Hacking Ecology** is an open source platform that monitors water quality in real time using sensors to analyze chemical, physical and biological parameters. It promotes sustainability, the protection of aquatic ecosystems, and environmental policies.



**Ulbios Water**: Solution that combines biosensitization and intelligent monitoring of water quality in buildings. It uses sensors to measure parameters such as temperature, pressure, pH and biofilm, facilitating the predictive management of Legionella and disinfection treatments with safety and sustainability.



**AG-ZOOM**: Visualization platform for agriculture that monitors crop water status and climate parameters in real time. It uses AI to calculate pest and disease risk models, delivering personalized data to optimize decision-making.



**DeepSea Numerical**: Platform that uses drones, satellites and sonars to collect data on marine biodiversity. It generates 3D models of the seabed and georeferenced maps that allow the analysis of biodiversity and the identification of degraded areas.

### Reverse osmosis



**Ecomemb**: Company engaged in the regeneration of reverse osmosis membranes used in desalination processes. It extends the useful life of membranes with sustainable technology that reduces the use of chemicals, water and energy, promoting a circular management model.



**Aquamiga**: Direct flow reverse osmosis system that produces water of very low mineralization without a tank. Reduces substances such as microorganisms and heavy metals, with a compact installation and LED alerts to monitor water quality in real time.

### Seawater reuse



**Seawater Irrigation**: Innovative capillary irrigation system using seawater for crops. It creates an artificial water table that allows irrigation with saltwater, encouraging a greater concentration of nutrients and promoting the efficient use of sea water resources.

Source: ACCIÓ based on the companies' websites.



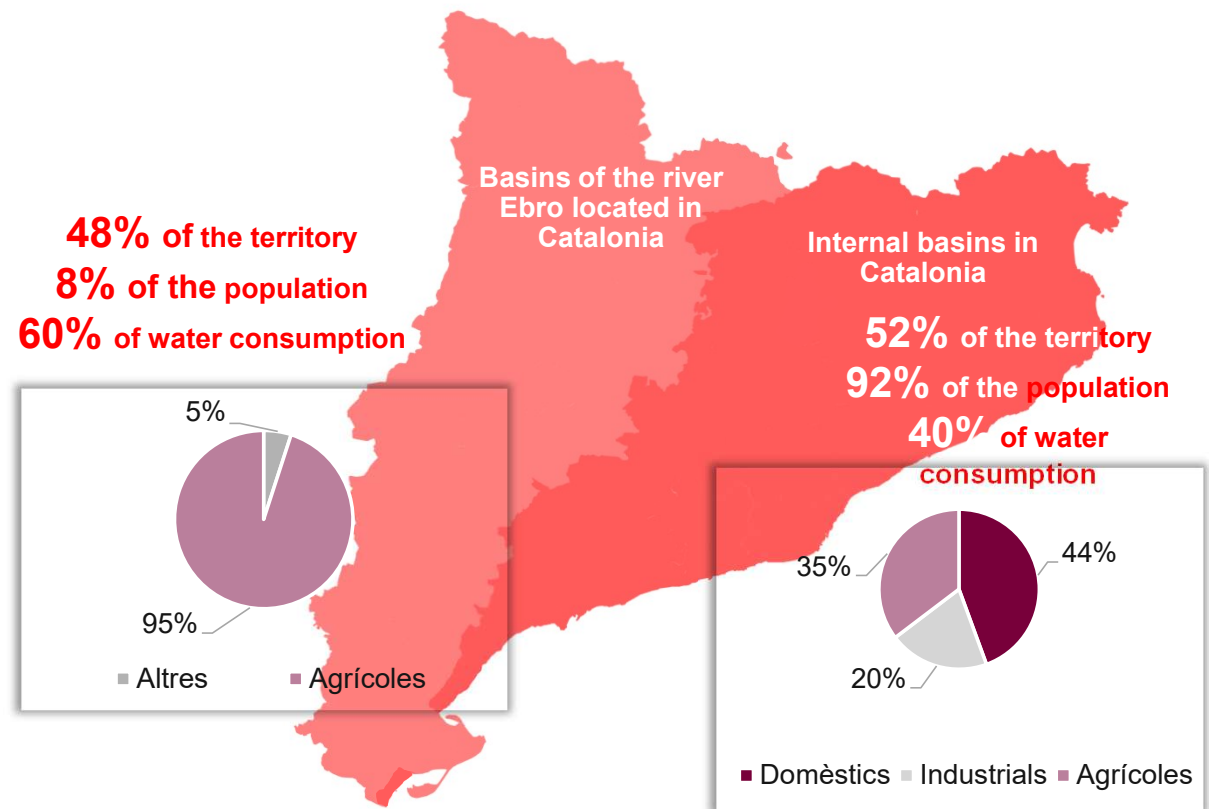
## Sectoral interrelationship

In Catalonia, the sectors that consume the most water are **agriculture, industry and households**. **Agriculture** is the main consumer, using **95% of the water in the Catalan basins of the Ebro**, and **35% of the water in Catalonia's internal basins**. This means an average of approximately **65% of total water**.

**Domestic uses** account for **44% of consumption of internal basins** and **less than 5% in the Ebro basins** (includes domestic supply, municipal services, unmetered uses, under-counting and leaks). This demand is increasing, driven by **population growth, tourism and economic activities**.

**Industry** also accounts for a **significant proportion of water consumption, especially in internal basins** and in industries such as chemicals, paper and textiles, which make intensive use of this resource both in production and in cooling processes.

*Distribution of water consumption in relation to the territory and the population*

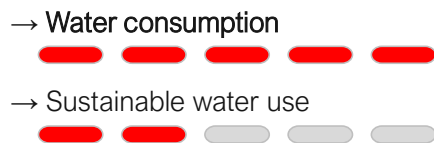


Source: ACA, 2024. Notes: 1. "Other" includes domestic and industrial uses

## Impact of sustainable water use on the water user and consumer sectors

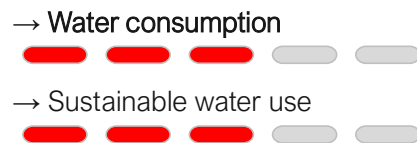
### Agriculture

Implementation of technologies for the efficient use of water in the **agriculture sector** is key to reduce consumption and prevent losing productivity. In this regard, **advanced management technologies and practices** can be implemented that optimize irrigation and reduce water waste: introduction of **efficient irrigation systems** and the use of **sensors to monitor soil moisture, integrate meteorological data, reuse waste water** treated by agricultural irrigation, etc.



### Urban uses

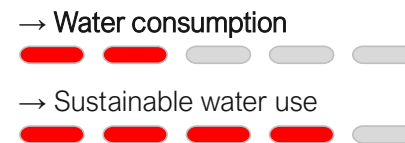
Urban centers require **an efficient water network**. In Catalonia, this entails the **renewal and updating of the water network**, to guarantee the **efficiency of the drinking water supply**, the **treatment** and the **reuse** of waste water for non-potable uses. In addition, smart solutions need to be included to monitor consumption and detect water leaks. Infrastructures to use **rainwater** are solutions that foster efficiency and resilience.



### Industry

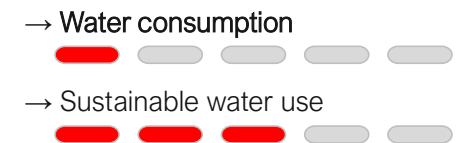
Many **industrial sectors**, such as manufacturing, mining and food, **depend on large volumes of water** for their production, cooling and cleaning processes.

The consumption restrictions imposed in the most recent episode of drought have meant that this sector leads the **technological development of efficient water use**, implementing solutions to **reduce water consumption and to treat and reuse waste water**.



### Services

Activities such as **tourism and recreation**, especially in coastal areas or regions with water scarcity, have a significant impact on water consumption. Due to the drought of recent years, the sector has started to **implement sustainable water management strategies**: the reuse of gray water, rainwater recovery and reuse systems, water treatment of swimming pools to avoid refilling them, etc.



The sustainable water use sector

### 3. Trends, opportunities and challenges in the sustainable use of water sector



# Trends, strategic analysis and changes in business (I)

## Block I: Water management



Regulatory changes in the sector

The new regulatory changes in the EU will require investments in water infrastructure and improvements in the comprehensive water cycle, affecting water treatment, consumption quality and environmental standards.

Reclaimed water for non-potable uses is key, as this saves water from reservoirs used for consumption. It is considered a solution to combat drought, and is produced in regenerating stations with additional treatments.

Regenerated water, a circular and sustainable solution



The double potable-regenerated water network

The use of regenerated water allows cities to optimize water resources sustainably. Double network systems separate potable water from reclaimed water, reducing the demand for potable water and improving water efficiency.

Groundwater is suitable to guarantee municipal uses such as irrigation and cleaning. For this reason, large cities are opting to install groundwater extraction systems, with wells, tanks and pipes that take the water to the points of use.

Use of groundwater



Efficient water network

To ensure efficient water use, a water network with smart management is needed. Telemetry and digital management systems allow flow and quality to be controlled and incidents to be prevented, optimizing consumption in real time.

Cities are adopting natural solutions like permeable pavements to manage water efficiently. These green infrastructures are better adapted to the challenges of climate change, such as droughts and floods.

Integration of green infrastructure



## Block II: Asset management



Integration of renewable energy sources

The sustainability of water infrastructures improves with the integration of renewable energies such as solar, biogas and geothermal. This reduces energy consumption, minimizes costs and makes the installations more self-sufficient.

Water loss is a major challenge, addressed with technologies such as the IoT, Big Data and AI in smart water networks. These solutions improve operational efficiency and reduce waste with predictive maintenance and real-time management.

Strategies and technologies to minimize water losses



## Trends, strategic analysis, and changes in the business (II)

### Block III: Water technologies and innovation



Innovation in materials to improve efficiency

Advanced membrane technologies, water pumps and optimized filtration processes reduce energy consumption in desalination. In addition, research into new materials makes it possible to extend the useful life of equipment and reduce operating costs.

Cybersecurity is crucial to protect digitized water infrastructures from significant risks. European regulations, such as the NIS2 Directive and the Cyber Resilience Act, drive this protection.

Cybersecurity in water infrastructures



### Block IV: Climate change and sustainability



Water Positive – water credits

Being water positive means generating more water than is consumed through efficient management, reuse and recharge of aquifers. Some companies can win Water Positive Credits to implement sustainable practices that balance their impact.

Sludge, a by-product of sewage treatment plants, contains solid materials, bacteria, nutrients and heavy metals, making its treatment complex. Efficient management allows these materials to be used.

Recovery of added value products from water



### Block V: Business model



Changes in water management systems

Sustainable water management can be achieved through public-private collaboration or reinstating town/city council management; each model has its advantages and challenges. The common goal is to guarantee efficiency, social commitment and environmental sustainability.

Spin-offs connect academic research with market demands, driving innovations in the sector. With academic support, networks, funding and technology transfer, these companies can gain prominence and innovate.

Creation of spin-offs from universities



Market concentration

Strategic alliances in the water sector are consolidating the leaders in the market. These concentrations seek to optimize resources, improve efficiency and increase the capacity for innovation and sustainability.

The water sector is integrating services to offer more complete and efficient solutions, improving the quality of projects. Consulting companies expand their activities to execution and assembly, responding to the growing demand for management.

Integration of services



## Technologies applied to the sector (potential and future) and to sustainable water use (I)

<i>Technological scope (treatment)</i>	<b>Enabling</b>	<b>Performance improvement</b>
<b>Desalinisation technology</b>	<ul style="list-style-type: none"> <li>• Reverse Osmosis (RO)</li> <li>• Nanofiltration membranes by PIFAs</li> </ul>	<p>High-pressure pumps, such as split casing and annular section, optimize the process, increasing water quality and operational stability</p> <p>Nanometric and biomimetic membranes reduce energy consumption and improve salt rejection</p>
<b>Sustainable water treatment technologies</b>	<ul style="list-style-type: none"> <li>• Prolonged aeration</li> <li>• NEREDA Technology</li> </ul>	<p>Optimizing oxygen control has reduced energy consumption by up to 50%, improving the aerobic degradation of nutrients, especially nitrogen and phosphorus, with a more efficient and stable process.</p> <p>The use of "aerobic granular sludge", increases sedimentation and compaction, reducing energy and space required by up to 50% and 75%, respectively, thanks to greater nutrient removal efficiency</p>
<b>Water treatment technologies</b>	<ul style="list-style-type: none"> <li>• Ultraviolet (UV) disinfection</li> <li>• Ultrafiltration</li> <li>• UV/H<sub>2</sub>O<sub>2</sub></li> </ul>	<p>The use of low and medium pressure UV lamps, which degrade organic pollutants and disinfect water without generating harmful disinfection byproducts</p> <p>Very fine pore membranes to retain microbiological and organic contaminants, improving the quality of treated water</p> <p>Advanced oxidation processes, through the combination of UV and H<sub>2</sub>O<sub>2</sub>, generate highly reactive hydroxyl (OH) radicals that oxidize and eliminate organic micropollutants resistant to other treatment processes.</p>

**Sources:** *Innovation Frameworks in water desalination technologies*, Saudi Water Authority-Metyis; *El sector de l'aigua a Catalunya*, ACCIÓ; *Application of the UV/H<sub>2</sub>O<sub>2</sub> advanced oxidation process for municipal reuse water; UV Disinfection and advanced oxidation; Aerobic Granular Sludge Technology Improves Wastewater Treatment While Reducing Lifecycle Costs*

## Technologies applied to the sector (potential and future) and to sustainable water use (II)

<i>Digital solutions for the efficient use of water</i>	<b>Type</b>	<b>Solutions applied to cases of success</b>
<b>Sensory technology</b>	<ul style="list-style-type: none"> <li>• Water quality sensors (pH, turbidity and dissolved oxygen)</li> <li>• Leak detection sensors (real-time monitoring)</li> </ul>	<p><u>Spectro::lyser™ d'S::CAN</u>: uses UV-Vis spectrometry for real-time pollutant detection. This technology enables the measurement of multiple parameters, such as dissolved organic carbon (DOC), nitrogen, turbidity and other chemical compounds that may indicate contamination in surface, groundwater, drinking or waste water.</p>
<b>IoT technologies</b>	<ul style="list-style-type: none"> <li>• Smart meters</li> <li>• Water quality sensors</li> <li>• Smart irrigation systems</li> <li>• Supervision of infrastructures</li> </ul>	<p><u>Water quality sensors</u>: These sensors measure various quality parameters such as pH, temperature, conductivity and dissolved oxygen levels. Examples: Libelium's Waspnote (<a href="https://www.libelium.com/">https://www.libelium.com/</a>) and HydroTech Solutions (Water Treatment Evolved - HydroTech Solutions).</p>
<b>AI technologies</b>	<ul style="list-style-type: none"> <li>• AI for equipment failure prediction</li> <li>• Real-time optimization</li> <li>• Digital twins</li> </ul>	<p><u>Digital twins</u>: Virtual models of physical infrastructures that allow simulations and optimization of systems in real time using the data extracted by the sensors. Examples: Siemens' Digital Twin for Water (<a href="https://www.siemens.com/">https://www.siemens.com/</a>) i Bentley Systems WaterGEMS (<a href="https://www.bentley.com/">https://www.bentley.com/</a>).</p>
<b>Automation technologies</b>	<ul style="list-style-type: none"> <li>• SCADA</li> <li>• Advanced process control systems</li> <li>• Chemical product dosing automation</li> </ul>	<p><u>SCADA (Supervisory Control and Data Acquisition)</u>: Systems that monitor and control large-scale operations in water treatment plants. Example: GE's Digital SCADA (<a href="https://opertek.com/">https://opertek.com/</a>).</p>

Source: *Water Resources Management: Top 10 Emerging Technologies-StartUs Insights; Review of sensors to monitor water quality*

## Identification of the main strategic challenges for the sector (I)

### 1 Implementing strategies to adapt to climate change: a future with more drought episodes and extreme phenomena



Define adaptive measures that guarantee the safety and sustainability of natural resources, on the one hand, but that also protect ecosystems and minimize the impact of extreme phenomena, in order to have a healthy environment and deal with the new climate conditions.

### 2 Renovate the Catalan water infrastructure to guarantee an efficient supply



Many Catalan municipalities have an old network that is expensive to repair. This means that approximately 10% of the drinking water that circulates through Catalan pipes is lost. In this context of water leaks and with a damaged network, it becomes difficult to guarantee an efficient use of the resource.

### 3 Digitize the network and apply AI and IoT solutions to monitor assets and achieve data-driven decision-making



Identifying anomalies such as leaks or inefficiencies at an early stage thanks to sensors that monitor flow, pressure and other critical parameters in water infrastructures in real time would allow for proactive management, optimizing system performance and reducing water wastage.

### 4 Work on sustainable and efficient solutions for high water consuming sectors



Promote the design of technologies that reduce water use and improve its reuse in the agricultural sector, domestic uses and the most water-consuming industries (chemical and paper industry, among others), while guaranteeing an environmentally friendly management adapted to the new regulations.

### 5 Have qualified and specialized personnel in the sustainable water use sector



Lack of specialized and up-to-date training for staff currently working in the sector. The preferences of the new generations for work areas with more visibility or more innovative perspectives negatively affect the recruitment of qualified talent in the sector.



## Identification of the main strategic challenges for the sector (II)

### 6 Valorize water to ensure sustainable management of the resource



The general public needs to recognize and become aware of the real value of water, as well as the importance and cost of its management. This situation generates an unequal financial burden on the municipalities in terms of water management and makes implementation difficult due to maintenance and application of improvements to the infrastructure.

### 7 Adaptation of the current treatment infrastructures (potabilization, purification and regeneration) to comply with the new regulations



The latest regulatory changes impose a duty on service providers for the operation of the comprehensive water cycle, as well as manufacturers of equipment, products and solutions for the comprehensive water cycle, to adapt to the new regulatory requirements. This will mean significant investments and changes in the current state of affairs.

### 8 Discover new opportunities for the by-products generated during water treatment and monetize know-how



Wastewater treatment plants generate a large amount of organic waste, which in most plants is not used due to the high costs of this process. Even so, in Catalonia there are already projects to utilize generated resources and generate renewable energy such as biogas.

### 9 Ensure business continuity by mitigating physical and cyber threats and creating contingency plans



In a context in which water infrastructures are increasingly digital, it is necessary to ensure the reliability and security of the system based on industrial cyber security in order not to put the continuity of the service at risk. This is why measures need to be taken and contingency plans need to be drawn up to deal with possible adverse situations.

### 10 Awareness of the sustainable and efficient use of water



Raising awareness among the general public and businesses through educational and informational campaigns with real water consumption data is key to encouraging a change in habits and ensuring responsible use of water at all times, not just when there is a dry spell.

## Business opportunities for Catalan companies (I)

Opportunities	Exploitation services of the comprehensive water cycle	Knowledge-intensive services	Design and/or manufacture of equipment, products and solutions for the comprehensive water cycle
Water availability	Increased use of <b>alternative sources</b> (reclaimed water and groundwater) for <b>uses and for non-potable daily activities</b>		
	Explore <b>other water sources and emerging technologies</b> to exploit them, such as the capture of <b>atmospheric water</b> (taking advantage of environmental humidity to generate drinking water)		
Water treatment	<b>Industrial process water reuse systems</b> for other uses within plants		
	Conduct research into <b>advanced purification technologies</b> : biotechnologies and high efficiency filtration systems		
Management of water resources and efficiency in the use of water	<b>Desalination technologies</b> with a focus on <b>energy efficiency</b>		
	Optimization of <b>the use of water in the agricultural sector</b> with <b>smart irrigation technologies and system</b> , humidity <b>sensors</b> and real time <b>monitoring</b> to improve water use efficiency		
	Solutions to <b>reduce losses in urban networks</b> : leak detection and distribution network management systems that minimize losses.		
Smart water grids: implementation of <b>intelligent water management networks</b> that optimize the distribution, storage and supply of water on a large scale.			

## Business opportunities for Catalan companies (II)

<i>Challenges and opportunities</i>	<b>Exploitation services of the comprehensive water cycle</b>	<b>Knowledge-intensive services</b>	<b>Design and/or manufacture of equipment, products and solutions for the comprehensive water cycle</b>
<b>Water quality</b>		<p>Solutions to detect and eliminate <b>micropollutants</b> (emerging pollutants)</p> <p>Analytics of <b>new unregulated compounds, toxicity analysis, etc.</b></p> <p>Teams <b>to detect contaminants rapidly</b> to be able to make decisions based on real data and make simulations</p>	
<b>Innovation</b>	<p><b>Enable pilot plants</b> to test techniques, equipment and water treatment solutions on an industrial scale</p> <p>Use of <b>existing water infrastructures</b> for <b>validate the technology</b> (Singapore model)</p>		
<b>Enabling</b>	<p><b>Incorporation of electronics and sensing</b> at water management infrastructures to be able to make informed decisions</p>	<p><b>Improve the quality and efficiency of membranes</b></p> <p><b>Digital platforms</b> for to exploitation of the <b>data</b> obtained</p>	<p><b>Make equipment and products "smart"</b> (meters)</p> <p><b>Emphasize equipment and products made in Europe</b>, as a seal of quality and <b>proximity</b></p>

## Business opportunities for Catalan companies (III)


<i>Challenges and opportunities</i>	<b>Exploitation services of the comprehensive water cycle</b>	<b>Knowledge-intensive services</b>	<b>Design and/or manufacture of equipment, products and solutions for the comprehensive water cycle</b>
<b>Infrastructures</b>	<p><b>Development of water management infrastructures, equipment and products</b> of the comprehensive water cycle in <b>emerging countries</b></p> <p>Monetization of Catalan know-how of the <b>water management system</b></p>		
<b>System sustainability</b>	<p><b>Energy efficiency in the water cycle</b> (systems that reduce energy consumption during the water collection, treatment and distribution stages)</p>	<p>Design solutions for the management of phenomena associated with climate change (floods, severe droughts, etc.)</p>	<p><b>Solutions</b> for water management in situations of <b>shortage or drought</b> (rainwater collection and replenishment of aquifers)</p>
<b>Circular economy applied to water</b>	<p>Discover <b>new opportunities</b> for <b>by-products</b> generated during <b>water treatment and monetize know-how</b> (nutrients: phosphorus, nitrogen; microalgae, etc.)</p>		<p><b>Recycled and recyclable products</b></p>
<b>Regulation</b>	<p>Consulting and engineering services for <b>the adaptation of current systems to regulatory updates</b></p>		

# Thank you!

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