

City Overview

Barcelona:
The new water cycles

BARCELONA



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OVERVIEW

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→ Topographic map of Barcelona

Introduction

90 % of natural disasters are related, directly or indirectly, to water. Either scarce or overwhelming nowadays, changes in hydrological patterns are happening on a global scale.

“Water-related risks are systemic. Even among OECD countries, none is really spared from water-related issues.” (Oriana Romano, Head of Department of Water Governance, Blue economy and circular economy, OECD).

Yet the total amount of water on Earth remains constant. What changes is its availability, potability, quality, and capacity to be stored, distributed, and returned to the natural environment... all while seeking to consume large amounts at the same time and in the same place.

For centuries, Barcelona regularly faced water shortages. In 1953, rainfall that was half the normal amount led to water outages as early as May. In 2008, Catalonia went through several severe droughts. **And the years 2021 through 2024 rank among the driest on record.** On July 8th this year, the Fabra Observatory of meteorology, built at the end of the 19th century on Mount Tibidabo, recorded the hottest temperature ever in Barcelona since 1914: 40°C (104°F).

Faced with both water and demographic pressures – which are common challenges faced by Mediterranean cities – Barcelona must therefore balance different water uses and several supply strategies. The city is undoubtedly an emblematic case study of the contemporary issue of water management. From the historical legacy of domestic cisterns and bioclimatic patios to modern seawater desalination infrastructure and transformative projects, **the city exemplifies a deep commitment to constantly adapting to its territory’s physical and hydrographic limitations.**

2026 is a particularly important year for Barcelona, as it honors the memory of Antoni Gaudí (1852-1926), a figurehead in Barcelona’s architectural history– and Ildefons Cerdà, the father of modern urbanism and urban planning in Barcelona. From June 28 to July 2, 2026, the World Architecture Congress was held there under the theme *“Becoming. Architecture for a Planet in Transition”*¹. In a city shaped by its relationship with water, this international event highlights the city's ability to reinvent itself and bring together nearly 10,000 architects, urban planners, and researchers from around the world.



To watch the various lectures from the urban expedition

¹ World Congress of Architects. Barcelona. UIA 2026. <https://uia2026bcn.org/fr/>

Overview

Barcelona's long history of mitigating climate's impact on water uses

Since its construction around the 10th century, the Rec Comtal irrigation canal, which is nearly 13 km long, has followed the ancient Roman aqueduct, drawing surface water from the River Besòs and discharging it into the sea. Following the drought of 1778, an underground tunnel over 2 km long was dug to draw groundwater from the river, power mills, irrigate crops, supply the local population and Barcelona's artisans, before supplying, in the 19th and 20th centuries, the textile industry.

Until the end of the 18th century, Barcelona's water supply relied on this system, before it was overwhelmed by population growth and urban expansion. The Llobregat river then took over, as technological advances now made it possible to collect and treat its water, whilst the Besòs was subsequently restricted to industrial use.

Iconic sites from this era still stand in Barcelona today, such as the Casa de les Aigües de Montcada I Reixac, which was responsible for the collective management of water and ceased its operations in 1989.

Situated on either side of Avinguda Meridiana, the Trinitat Vella and Trinitat Nova facilities formed the heart of Barcelona's former municipal water service. Built between 1915 and 1919, the complex remained in operation until 1989. At Trinitat Vella, water was supplied from wells and the Montcada mine. At Trinitat Nova, the pumped water was collected in a vast reservoir and then, after settling and chlorination, flowed into the drinking water network. Today, the site is used by the Trinijove Foundation², which runs social programmes.



→ Casa del Aigua Trinitat-Vella, Barcelona History Museum
Source: *Barcelona City Hall*

² Fundació Privada Trinijove. (s. d.). Casa de l'Aigua de la Trinitat Vella archivos - Fundació Privada Trinijove. <https://trinijove.org/tag/casa-de-laigua-de-la-trinitat-vella/>

Throughout Barcelona's history, water has regularly become scarce; during such periods, inhabitants would turn to faith in the hope that rain would return: **"Appealing to the divine was society's response to climatic fluctuations"**, according to the historian Manel Martin.

In the 21st century, water supply requires a production model that takes into account climate change and periods of scarcity. Nonetheless, according to Manel Martin, practices from the Roman era reveal that *"we have simply improved upon what the Romans were already doing very well"* such as underground cisterns. For the historian, whilst we long believed that technology and industrialization had solved the problem of climatic

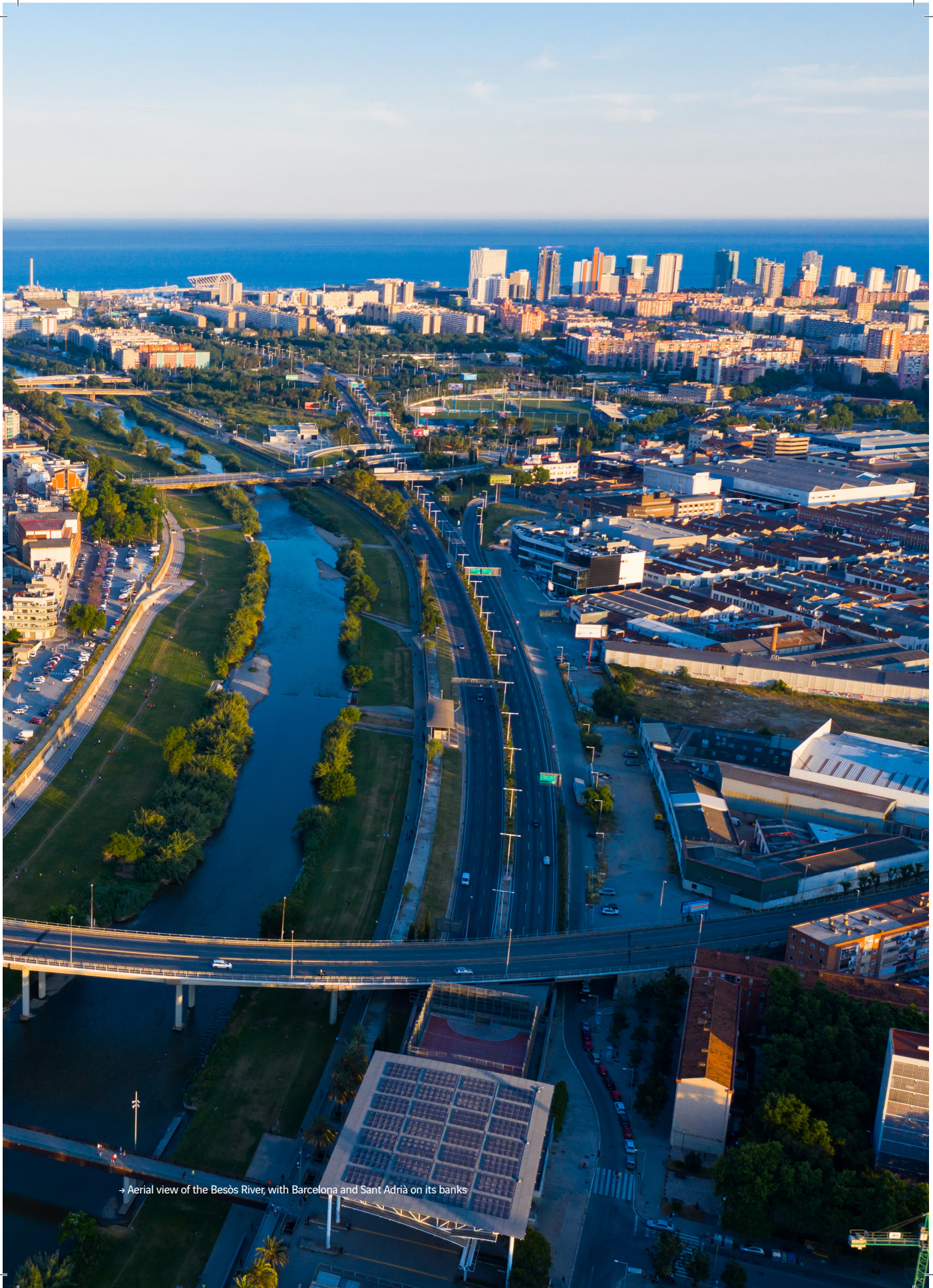
fluctuations, it is only recently that we have realized that **the climate has its own dynamics**.

Today, the system supplying the Barcelona metropolitan area relies both on historic natural resources – the Ter, Llobregat and Besòs catchment areas – and on innovative technologies: desalination and water reclamation plants.

→ Drinking water supply network of the Ter-Llobregat system (Conca, in english catchment area).
Source: Barcelona City's Council,
https://coneixement-eu.bcn.cat/widget/atles-resiliencia/es_index_cicleaigua.html







→ Aerial view of the Besòs River, with Barcelona and Sant Adrià on its banks

Innovating for water resilience: balancing between resource security and sustainability

The ATL (Aigües Ter-Llobregat) desalination plant, which came into operation in 2009 at the Llobregat estuary south of Barcelona, draws seawater 2 km from the shore to produce drinking water to supplement the reservoirs that supply 70% of the Greater Barcelona area's needs (5.5 million inhabitants). **Originally intended as a backup facility, it operated at full capacity (200 000 m³/day) during the recent drought which lasted until 2025.** The process follows four standard stages for this type of facility: first, pre-treatment of the collected seawater to ensure its quality; then, desalination by reverse osmosis and remineralization to make the water fit for consumption. Finally, the water undergoes a final disinfection process, to ensure compliance with European standards. **The desalination efficiency rate is approximately 45% (45 L of freshwater per 100 L of seawater).** The site's energy requirements are about 3 kWh per cubic meter³; equivalent to leaving a LED light bulb on for 12 days.

What makes this site unique is its connection to the Baix Llobregat wastewater treatment plant (WWTP): the brine produced by desalination is diluted in the treated wastewater from the WWTP before being discharged into the sea via the outfall, thereby limiting the impact on marine ecosystems.

In addition to desalination, some of the treated water is reclaimed (not suitable for drinking but compliant for industrial and agricultural uses) and reinjected into the Llobregat upstream of the Sant Joan Despí water treatment plant, creating a loop between the river, the WWTP and the water treatment plant.

This whole system (desalinated and reclaimed water) helped to meet up to 25-30% of the Barcelona metropolitan area's drinking water needs during the last drought. The target of Catalan authorities is to achieve around 70% from non-conventional sources by 2030⁴.

“At present, 70% of our water supply comes from rainwater, and 30 % from desalinated and reclaimed water. We want to reverse this ratio.”

— **Josep Lluís Armenter,**
director of the Catalan Water Agency (ACA)



→ Llobregat Desalination and Regeneration Plant

³ Dessalinitzadora del Llobregat. Generalitat de Catalunya. (s. d.). https://www.gencat.cat/especial/prat/cat/consum.htm#bloc_esquerra_petit

⁴ Agència Catalana De L'Aigua. "Transició Hídrica," n.d. <https://aca.gencat.cat/ca/laca/transicio-hidrica/index.html>

KEY POINTS

- **“Alternative solutions help to guarantee access to water in situations of water stress”**, said Josep Lluís Armenter, director of the Catalan Water Agency (ACA). Indeed, unconventional water resources (desalination and water reclamation) enabled Barcelona to cope with the 2022–2025 drought and secure its water supply during the 2024 blackout⁵.
- Innovation has a role to play in the quest for more productive water use, to be able to **“extract the maximum value from every drop”** (Esther Crauser-Delbourg, WaterWiser) particularly through recycling and reuse. Technology can enable better monitoring of water reserves: the company Sixense⁶ combines spatial data and ground-based sensors to monitor ground movements with millimeter precision, a highly relevant tool for the management of water infrastructure like dams.

SUSTAINABILITY ISSUES THAT REMAIN

- **Sovereignty issue:** Reverse osmosis membranes, which generally have a lifespan of 5 to 8 years (up to 10 years under optimal conditions) are currently produced mainly in Japan, the United States and China. Their periodic replacement therefore raises concerns about industrial dependence as to this day, no plant producing them exists yet in Europe.
- **Environmental challenge: the desalination process requires a great deal of energy and impacts marine biodiversity** – to a degree still poorly understood. The Barcelona plant appears to have identified a promising approach through synergy with the wastewater treatment plant to limit the concentration of discharged brine, but the process still has a significant environmental impact, and this synergy cannot be replicated everywhere.
- **Resource efficiency challenge:** in Barcelona, the use of non-conventional waters completes an ambitious water restriction policy during periods of drought, making it a city with a comprehensive strategy. However, on a broader scale, according to the economist Esther Crauser-Delbourg, **desalination should remain a last-resort solution as it can perpetuate the idea of an “infinite” resource and give a “false sense of security”**. Indeed, cities such as Riyadh and Dubai have relied almost exclusively on seawater desalination for several years and have a per capita consumption four to five times higher than that of Europeans...



⁵ Today, access to drinking water is inseparable from electricity, which powers water abstraction, treatment, and distribution. A power outage can therefore quickly deprive a population of water, even when the resource itself is available.

⁶ Sixense. “Sixense - Sécuriser Et Pérenniser Vos Sites Et Infrastructures,” October 5, 2026. <https://www.sixense-group.com/>

Water in urban planning: building resilient communities

(Re)designing the urban water cycle

The issue of water resources is also – and perhaps above all – a matter of land-use planning and the integration of water, its requirements and its cycle, into urban projects. In this regard, many towns and cities have recently been trialing Nature-based Solutions (NbS) in order to restore the wider water cycle. Through the restoration of watercourses and controlled groundwater recharge (an experiment currently underway near Toulouse on the Garonne River, involving the storage of water in underground aquifers during periods of abundance for later use during droughts), it is possible to manage water resources more effectively during periods of both surplus and shortage.

However, to manage water more effectively, particularly in urban areas, **we must also take care of our soil**. As the bioclimatic urban planner Clément Gaillard points out, “*from*

a hydrological point of view, a city is a desert”: water finds it difficult to infiltrate there. Conversely, when it falls in large quantities, it can cause flooding. The floods experienced by Valencia in 2024 are one tragic illustration and can be explained by the gradual loss of 9,000 hectares of orchards that served as natural buffer zones between the canals and the city. Increasing urbanization has heightened vulnerability to flooding; it is therefore becoming urgent to reduce surface sealing, because when it rains in the city, “*any water that does not seep away is lost*” (Clément Gaillard). And so, it goes for the associated cooling potential.



- 1 Evaporation 2 Runoff 3 Surface infiltration 4 Infiltration into the groundwater

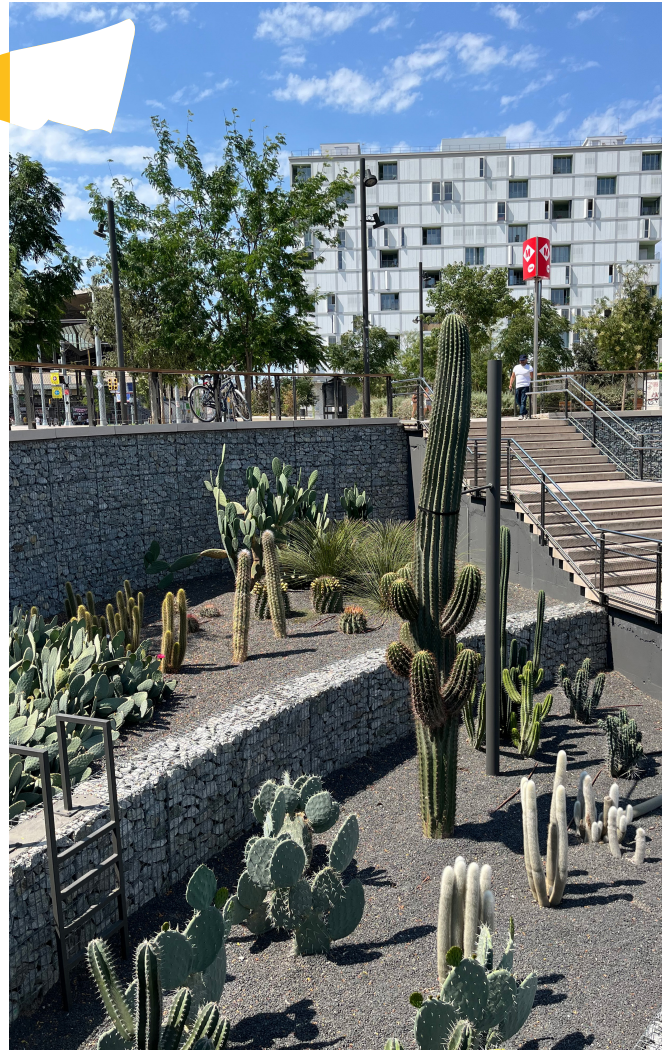
→ Diagram of La Fabrique de la Cité based on data from the Guide for the Implementation of SYMASOL's Alternative Techniques (June 2016)
<https://fr.scribd.com/document/575815701/brochure-symasol-isbn-web>



On the other hand, we are increasingly faced with water shortages during periods of drought and extreme heat. In Europe, droughts are no longer confined to the Mediterranean area: in July 2026, the European Drought Observatory reported critical conditions across much of Europe, with alarming levels in France, southern Germany, Switzerland, northern Italy and United-Kingdom⁷. Conditions also deteriorated in Belgium, the Netherlands, Ireland and other regions which were until now considered less at risk.

Whilst it is worthwhile **to restore natural habitats and reduce the imperviousness of urban spaces to limit flooding, droughts and urban heat islands**, the latter are probably the most difficult to address. According to Clément Gaillard, to combat the urban heat island effect in Paris or Barcelona, half the city would have to be demolished and trees planted. Thus, it is more often a question of *“negotiating with the heat island”*, which means trying to work on thermal comfort.

In practice, another challenge stands in the way of urban greening: we want trees that are highly drought-tolerant – meaning they can regulate their sweating – but which also perspires as much as possible to keep us cool. **The cactus is a perfect illustration of this challenge: it is very well adapted to heat and drought; however, it provides neither shade nor transpiration.**



→ An immersive garden in 2050, Square of the Glories, Barcelona
Source: ©Louise Fel

⁷ European Commission - DEFIS. “Severe Drought Affects France | EU Space Support Office.” EU Space Policy, August 27, 2026. <https://eu-space.europa.eu/components/earth-observation-copernicus/image-of-the-day/severe-drought-affects-france>

TWO TREES SPECIES WHICH ARE WORTH REVALUING, ACCORDING TO CLÉMENT GAILLARD

■ **The Belombra** (or *Phytolacca dioica*) is a remarkable tree. Native of the South America pampas, it was imported and planted in Spain, and can be found in Barcelona, notably in the Ciutadella Park. Its large root system (known as the 'Codex' in botanical terms) allows it to store an important amount of water, but it also limits its use in urban areas. Nevertheless, it deserves to be given greater recognition in the context of global warming, as it is extremely resilient to scarcity of water.

■ **The Provence hackberry**⁸ (or *Celtis Australis*) also offers numerous benefits for improving the resilience of cities. Its dense foliage provides substantial shade; on the other side, this tree can remediate certain soils contaminated with mercury, lead or even cadmium.



→ In Belombra, in the Park of the Ciutadella, Barcelona
Source: @Louise Fel

⁸ Romeo. "Micocoulier De Provence : Un Arbre Méditerranéen." L'Autoroute de la pluie (blog), December 15, 2025. <https://www.autoroutedelapluie.org/2025/12/15/micocoulier-provence/>

Barcelona: two key transformative projects

1) *Plaça de les Glòries: from a road hub to an urban park*

The “**Canòpia Urbana**” project, initiated by the Barcelona City Council and led by Olivier Philippe and Ana Coello, architects and urban planners from Agence Ter, supported by a team of multidisciplinary experts, arose from an approach aimed at integrating water, soil and vegetation as active elements of the urban landscape.

Taking a cross-cutting approach, Plaça de les Glòries now offers a public space that citizens can make their own, one that restores the interactions between plants, soils and water and creates ecological continuity. It reconnects soil and plants without isolating the hydric issue.

Once the trees have grown, **the square park will provide coolness and shade thanks to a diverse range of vegetation and partially permeable ground** that will allow water to flow through the various spaces.

In terms of transportation, cars and public transport (trams, buses) are restricted to the area surrounding the square, whilst bikes and scooters can pass through it freely. Above all, it is now possible to cross this square on foot, which offers a completely different experience of the neighborhood.

The square exemplifies **the benefits of cross-functional collaboration**. The environmental benefits of urban projects are indeed often hampered by a silo-based approach to work: water and sanitation, green spaces, roads and transport are the responsibility of separate departments, sometimes even spread across different local authorities and urban areas – a fragmentation that also affects certain areas of expertise.

→ Source: *The Glories building site*
<https://www.barcelonavelo.com/the-blog/barcelone/le-chantier-de-glories/>
(Plaça de les Glòries in 1992, top). ©Maxime Granata (Plaça de les Glòries in July 2026, middle), ©Louise Fel (bottom)





→ Source : Excerpt from the 1975 opening brochure (CHPO – top), excerpt from the 1999 opening brochure (Barcelona Regional – bottom), provided by Juan Pedro Martín Vide

2) Besòs area: from an industrial and peripheric river to an ecological metropolitan resilience axis

Originally, the Besòs area was a plain that was gradually swallowed up by massive urban development and became highly prone to flooding. The river, deprived of its natural course, then became Barcelona's open sewer. In 1962, nature brutally asserted its rights: a flood of unprecedented magnitude struck the area – 2,000 cubic meters of water per second – and caused hundreds of deaths.

Yet urbanization continues. Between 1956 and 2000, the Besòs area experienced a substantial demographic boom. Following another major flood in 1994, things began to change: in 1996, the local council launched a project to restore the site to its natural state and create a riverside park.

But it was not until 2011 that the neighborhood finally bid farewell to its industrial era, with the closure of the iconic Tres Ximeneas thermal power station. The building has been preserved thanks to the determination of the residents, deeply attached to this industrial legacy that has shaped the neighborhood's identity. In 2016, the site was even designated a cultural asset of local interest, thereby officially becoming part of Spain's industrial heritage.

The metropolitan project launched by the Barcelona Metropolitan Area was officially presented in September 2025, two years after public consultations began. Their conclusions confirm the desire to retain the chimneys whilst transforming them into a site of significant economic, ecological, and social value.

With a total investment of 17.7 million euros (of which 7 come from European funds), the **ReviuBesòs⁹** project aims to renature the river delta, reorganize pedestrian and cycle routes, and revitalize the area as a whole through a mixed-use development: green areas, housing, a research center dedicated to audiovisual art, leisure facilities, etc. Thus, the Tres Ximeneas neighborhood is undergoing a substantial transformation to become part of a blue-green infrastructure project¹⁰.

⁹ Fundación Biodiversidad. "REVIUBESÓS. Renaturation of the Mouth of the Besòs River to Improve Metropolitan Resilience. - Fundación Biodiversidad," May 28, 2026. https://fundacion-biodiversidad.es/en/proyecto_feder/renaturation-of-the-mouth-of-the-besos-river-to-improve-metropolitan-resilience-reviubesos/%20

¹⁰ Tresximeneies. "Transformation - Tres Ximeneies Del Besòs." Tres Ximeneies Del Besòs, June 22, 2026. <https://tresximeneiesdelbesos.cat/en/transformacion/>

¹¹ Consorci del Besòs. (s.d.) Consorci Del Besòs. <https://consorciibesos.cat/>

¹² Ibid.

The challenges associated with this ambitious project are manifold. Firstly, it is a heavily industrialized area and therefore polluted, both at ground level and in river water. Jesús Arcos, a landscape architect, nevertheless believes that **this site which is “extremely degraded and environmentally ruined”** has great potential: it could become an important venue for leisure and swimming for a vulnerable local population, whose access to the beach has long been restricted, and even closed off, due to water pollution.

The regeneration project required reaching **a consensus amongst various landowners, both public (20%) and private (80%)**, in order to align their interests. Land reallocation enabled the redistribution of plots. 80% of the funding comes from private sources and 20% from the public sector. The challenge laid in convincing the landowners that the associated costs

of decontamination and soil remediation could, in the long run, contribute to the economic value of their land.

The site could also become a climate refuge and provide greater resilience in the face of increasingly frequent natural hazards such as storms and floods, thanks to its partial de-sealing. Through its new relationship with water – both fresh and salt – **the project promises a twofold reconnection of the site 1) with its community and 2) with the sea, through the creation of a delta typical of Mediterranean landscape.**

In 2034, when the project will be complete and the 32 hectares decontaminated, “we will move from a lifeless, flood-prone area to a resilient space teeming with life”, says Ferran Falcó, director of the Besòs Consortium¹¹ and former member of the Catalan Government. This is the challenge the Besòs region is currently undertaking.



→ Visual showing the planned developments in the Tres Chimeneas neighborhood. Source: Besòs Consortium¹²



→ Source: UTE aldayjover arquitectura y paisaje + LANDLAB Laboratorio de paisajes + Aquática ingeniería, SBDA infographics

RISK AS A CATALYST FOR CHANGE

What these two projects have in common is that not only do they enable a better response to crises, but they also help to prevent some of them or mitigate their severity.

For landscape architect Jesús Arcos, the strength of the ReviuBesòs project lies in its vision of **“risk as an opportunity”** to move towards greater resilience, inclusion and diversity. Belen Gutierrez, chemical engineer at the Polytechnic University of Madrid and President of the Spanish Association for Desalination and Water Reuse (AEDyR¹³), and Xavier Amores, Director of Catalan Water Partnership (CWP¹⁴) – a cluster of stakeholders in the water sector that promotes innovation, cooperation and internationalization – share the same vision: risk can act as a lever for a paradigm shift and for shaping the future. The water crisis can act as a catalyst for innovation, an area in which they recommend continuing and strengthening investment and collaboration, such as through public-private partnerships.

Whether it concerns innovation projects such as desalination, water reclamation, or the renaturation of urban spaces, conclusions are the same: **water-related risks require the adoption of a shared, forward-looking approach.**

To achieve this, according to Oriol Clos, chief architect of Barcelona from 2006 to 2011 and director of the 22@ project¹⁵ aiming to transform the Poblenou district, **the influence of elected representatives can bring about a breakthrough and ensure that the project takes precedence over sectoral thinking**, which acts as a hindrance in both France and Spain. What matters, in fact, is that the project empowers the area to gain economic, ecological, and social value.

These new sources of unconventional water and land-use planning projects form part of the emergence of **‘new water cycles’**. They involve transforming the conventional

approach to the water cycle into a circular system, in which the resource can be abstracted, treated, used, and then reused, to reduce groundwater abstraction and dependence on rainfall. Their implementation, however, goes beyond the purely technical dimension: it involves **rethinking economic models and forms of governance.**

In this context, how can we adapt water governance to new water cycles?

Innovation in managing water: scale of action and water pricing

Towards a new price of water?

The transformation of water management raises the question of its value. Long perceived as an abundant and accessible resource, **water remains relatively undervalued in light of its social, environmental and economic importance**: its price, as allocated to those involved in land-use planning, does not reflect the benefits it can bring in terms of urban and social resilience, when it is available in sufficient quantity and quality. Nor does it adequately reflect its scarcity, or the rising costs involved in its production and management. This may help to perpetuate the notion of a cheap resource, even as droughts make its availability increasingly uncertain and **‘the lack of water is starting to take a heavy toll’** (Esther Crauser-Delbourg, WaterWiser). Indeed, during droughts, agricultural yields plummet and food prices soar. One thing is certain: today, the price of water does not consider its availability at a specific place and time, nor its level of pollution or future risks – and therefore future costs – associated with it. Thereupon, a consensus is emerging: **that of collectively considering a new price for water.**

¹³ Association Espagnole de Dessalement et Réutilisation (AEDyR): <https://aedyr.com/en/>

¹⁴ CWP – Catalan Water Partnership. (s.d.) CWP – Catalan Water Partnership. <https://cwp.cat/en/home/>

¹⁵ Eco-quartiers.fr : le 1^{er} espace de débat en ligne sur les éco-quartiers et la ville durable. (s. d.) <https://www.eco-quartiers.fr/#/fr/espace-infos/etudes-de-cas/22-8/>

In Barcelona, the price of water for all users has risen significantly in recent years (+11.5% in 2024, +5.95% in 2025 and +2.9% in 2026), but it remains lower than the price in France: €2.9 per m³ in Barcelona compared with €4.69 in Paris, an average which, however, masks a wide variation in prices depending on the user:

BREAKDOWN OF WATER PRICES BY USAGE¹⁶

	France	Spain
Agriculture ¹⁷	€0.10 to €0.20/m ³	€0.10 to €0.30/m ³
Industries ¹⁸	Between €1 and €3/m ³	Between €1.25 and €2.50/m ³
Households ¹⁹	€4.69/m ³ (2024)	Progressive, from €0.82 to €4.27/m ³

Is the price of water for public and private sector stakeholders too 'low'? Should the 'polluter pays' principle be applied? Should the agricultural sector bear the cost of water scarcity? How can we encourage water conservation whilst considering issues of accessibility?

Esther Crauser-Delbourg: ***"We know how to price a resource according to its scarcity – we do it with energy. We need to do the same with water, in a responsible way that is appropriate to the specific nature of this resource, without moving towards market-based solutions. Water must be considered a matter of sovereignty, just as energy is, in order to foster affordable innovative solutions."***

"We know how to price a resource according to its scarcity – we do it with energy. We need to do the same with water."

— **Esther Crauser-Delbourg**,
President and CEO, Water Wiser

THE EXAMPLE OF ENERGY

Indeed, when the energy offer becomes insufficient, its price rises, creating **an economic signal that can boost sobriety, innovation, and alternative development**. However, price-signal effects are neither automatic nor uniform and depend on regulatory, technical, economic, and social factors. Once developed at a large scale, solutions benefit from scale economies and technological progress that help reduce their costs, as the recent fall in solar panels' prices illustrates.

¹⁶ ¿Cuánto Cuesta El Agua En España? Guía Completa 2024," n.d. <https://www.immoabroad.com/es/spain/cuanto-cuesta-el-agua-en-espana-guia-completa-2024>

¹⁷ Favre, Marine, Julien Hardelin, and CGDD. "Le Prix De L'eau : État Des Lieux Et Perspectives Pour Une Gestion Durable De La Ressource." Interview by Guillaume Gruère, Marielle Montginoul, and Thierry Rieu, Document de travail. Edited by Pierre Clauquin, Amélie Coantic, Audrey Coreau, Boris Le Hir, Vincent Marcus, David Meunier, Olivier Simon, et al. CGDD, 2025. https://www.ecologie.gouv.fr/sites/default/files/publications/document_travail_73_prix_eau_aout20258.pdf

¹⁸ "Syndicat Mixte Du SI Zone Industrielle Artois Flandres - Service Eau Potable (2025) | Observatoire Sispea," n.d. <https://www.services.eaufrance.fr/service/203850/2025>

¹⁹ Eaufrance. "Prix Moyen Global De L'eau Au 1^{er} Janvier 2025 | Eaufrance," n.d. <https://www.eaufrance.fr/chiffres-cles/prix-moyen-global-de-leau-au-1er-janvier-2025> / <https://www.immoabroad.com/es/spain/cuanto-cuesta-el-agua-en-espana-guia-completa-2024>

ACTION ON USES: IS WATER SOBRIETY POSSIBLE FOR EVERYONE?

Adaptation and resilience also rely on changing behaviors. In Spain, recurring extreme droughts and the rise of water price seem to have created a “water culture”. **In the last 20 years, the Spanish average water consumption has decreased, going from 171 L per day per citizen in 2004 to less than 100 L in 2024²⁰.** As a matter of comparison, in France, average consumption is about 145 L per day per citizen in 2023²¹ (-5 L since 2009), and about 120 L in Europe²².

Sobriety must also be addressed in the tourism sector, since the Costa Brava’s littoral is the most touristic coast of Spain and the most water deficient... **In Catalonia, a 4-5-stars-hotel tourist consumes 3 to 5 times more than a Barcelona citizen**, mainly because he’s not submitted to the same rules... For instance, during the 2021-2024 drought, some domestic and leisure uses were highly restricted for inhabitants of Barcelona, while the touristic sector was not affected: private pools filling was forbidden, unlike the ones of hotels.

The former mayor of the city, Ana Colau, was particularly attached and invested in this subject and founded the European movement to reduce Airbnb locations in city centers. Barcelona has an objective, in the long run, to reduce tourist water use at 220 L on average, which would still be twice the one of residents.

This approach to managing shortage thus raises the topic of fairness amongst users, which reflects the difficulty of striking a balance between the needs of residents and the economic interests of a key sector for Barcelona.

Towards new management approaches

RETHINKING GOVERNANCE AND FUNDING

Adopting a forward-looking, preventative approach and moving beyond sectoral thinking requires new forms of cooperation, **public-private partnerships**, and funding that

is more focused on risk prevention. Oriana Romano (OECD) for example, advocates for a **“purpose-based” funding** that can be directed in a more targeted manner according to specific projects and their associated benefits in terms of resilience. From her point of view, “water risk is systemic”, and even the most technologically advanced countries are not immune to water stress. Consequently, **the issue revolves around trust in institutions and their ability to anticipate, prevent, and manage crises.**

PLANNING ON SEVERAL LEVELS

This line of thinking leads us to consider governance on two levels. First, at a global level, as water is globalized through the goods we trade (textiles, food, furniture, etc.); second **at the hydrographic level, within river basins, where supply and demand intersect.** Esther Crauser-Delbourg calls for a global mapping of water uses and needs, accompanied by a genuine European policy, emphasizing that **water is now “an operational constraint that raises questions about the viability of projects”** whether they be in the property, industrial or environmental sectors...

In Spain, the “State Pact on the Climate Emergency”, published by the government in December 2025²³ following extensive consultation with the public, calls for the **development of “sponge landscapes” and greater integration of the water cycle into spatial planning** (river basin-based water planning, removing paving stones, nature-based solutions), while also committing to shared and participatory water governance.

²⁰ Uso y consumo. (s. d.). Urbanismo, Acción Climática, Movilidad, Pla de Barris Y Servicios Urbanos. Mairie de Barcelone. <https://ajuntament.barcelona.cat/urbanisme-accio-climatica-mobilitat-pla-barris-serveis-urbans/es/agua/uso-y-consumo>

²¹ Eaufrance. “Volume D’eau Potable Consommé Par Habitant Par Jour En 2023 | Eaufrance,” n.d. <https://www.eaufrance.fr/chiffres-cles/volume-deau-potable-consomme-par-habitant-par-jour-en-2023>

²² Thèmes | Parlement Européen. “Eau Potable Dans L’UE : Meilleure Qualité Et Meilleur Accès | Thèmes | Parlement Européen,” n.d. <https://www.europarl.europa.eu/topics/fr/article/20181011STO15887/eau-potable-dans-l-ue-meilleure-qualite-et-meilleur-acces>

²³ European Economic Review, Agencia Europea de Medio Ambiente, Comisión Europea, and European Investment Bank. “España Frente a La Emergencia Climática,” 2025. <https://www.miteco.gob.es/content/dam/miteco/es/prensa/Propuesta%20Pacto%20de%20Estado%202025%20diciembre.pdf>

Conclusion

Water falls from the sky and finds its way into the soil, through the roots of trees, into lakes and wetlands. In cities, it seeks a path between our streets, travels through our underground networks before irrigating fields, and flows from our taps.

When water is scarce, soils crack, grasslands and forests dry out and become dangerously vulnerable to the smallest spark²⁴. Yet, when it does fall, the way we have sealed our land prevents water from soaking into the soil. Trees, themselves weakened by extreme heat, can no longer sweat effectively and therefore lose much of their ability to cool the air... Simply put, whether it falls or not, we end up facing the same consequences: droughts and floods, sometimes following one another within a matter of weeks.

It is therefore urgent to put water back at the heart of our planning, so that we can work with its natural cycle rather than disrupt it. This also means moving beyond our predominantly linear approach to water: it does not simply fall and run off, until we capture it, distribute it, and eventually discharge it. **Water does not behave in straight lines.** It circulates, infiltrates, evaporates, and transforms itself, repeatedly. We need to bring circularity back into the way we design and develop our territories.

Ubiquitous, water is embedded in the clothes we wear, the technologies we use, and the food we eat. Managing it relies on complex infrastructures and networks, making water a matter not only of sovereignty and security, but also of public trust and confidence in public institutions. **Thinking in terms of water loops would mean creating more opportunities to retain water, let it soak into the**

ground, store it and put it back into circulation.

Protecting the natural water cycle means, among other things, keeping soils alive, reducing the risk of floods and wildfires, sustaining agricultural production, protecting public health, and mitigating the effects of climate change. Integrating this cycle into urban planning is no longer optional, it is essential. **Capturing water where and when it falls is a crucial first step. But we also need to think about what happens next, and about the loops that water can feed, from soil to vegetation, from neighborhood to watersheds, and from individual plots to entire territories.**

Ultimately, the success of this transformation will also depend on strong political leadership, common sense, and creativity. We will have to rethink our squares, our streets and our cities, drawing inspiration from approaches developed elsewhere.

Barcelona's approach to water management is particularly instructive in this respect, for three reasons: 1) anticipating crisis through infrastructure; 2) incorporating the needs of the wider water cycle into urban planning; and 3) bringing all water uses (local authorities, industries, farmers and citizens) into the governance process, helping to build broad acceptance of the measures being implemented.

Perhaps it is by building on these three principles that we will move beyond the limitations of our current approach to managing water and finally **create the conditions for every drop to live several lives.**

²⁴ Salvado, Nico. "La Catalogne Défigurée Par Les Incendies." Equinox, July 16, 2026.
<https://www.equinoxmagazine.fr/2026/07/16/la-catalogne-defiguree-par-les-incendies/>

Key figures

DEMOGRAPHICS

Spain population ²⁵ (2025)	9,077,984 inhab.
Catalonia population (2025)	8,113,490 inhab.
Barcelona population ²⁶ (2023)	1,701,891 inhab.
Total surface area of Spain	505,990 km ²
Total surface area of Catalonia	32,108 km ²
Total surface area of Barcelona	101,4 km ²
Spain population density	96 hab / km ²
Catalonia population density ²⁷ (2025)	256 hab / km ²
Barcelona population density	16,783 hab / km ²

TOURISM

Estimated number of tourists in Barcelona per year (2019)	14 millions ²⁸
Estimated number of tourists in Catalonia per year (2024)	19,9 millions ²⁹
Number of tourist accommodations in Barcelona ³⁰	11 592
Share of tourism in Catalonia's GDP ³¹	14%
Share of tourist accommodations in Barcelona's water consumption ³²	~8-12%

²⁵ Generalitat de Catalunya and Institut d'Estadística de Catalunya. "La Catalogne En Chiffres." Statistical report, 2025. <https://www.idescat.cat/serveis/biblioteca/docs/cat/xifresct/xifres2025fr.pdf>

²⁶ Routard.com. "Barcelone - Carte D'identité," n.d. <https://www.routard.com/fr/guide/a/carte-d-identite/europe/espagne/catalogne/barcelone>

²⁷ countryeconomy.com. "Catalogne 2026," n.d. <https://fr.countryeconomy.com/pays/espagne-communautes-autonomes/catalogne>

²⁸ Climate Chance. "Destination Zéro Émission À Barcelone," n.d. <https://www.climate-chance.org/bonne-pratique/destination-zero-emission-barcelone/>

²⁹ "La Catalogne En Chiffres." Statistical report, 2025. <https://www.idescat.cat/serveis/biblioteca/docs/cat/xifresct/xifres2025fr.pdf>

³⁰ Le Petit Journal. "Voici les zones où l'on trouve le plus de logements touristiques à Barcelone," June 4, 2024. <https://lepetitjournal.com/barcelone/logement/voici-zones-barcelone-logements-touristiques-386759>

³¹ Micard, Romain. "Crise De L'Eau À Barcelone : Le Tourisme En Péril, 32 Milliards D'Euros Menacés." Le Journal Catalan, February 12, 2025. <https://www.le-journal-catalan.com/crise-de-leau-a-barcelone-le-tourisme-en-peril-32-milliards-deuros-menaces/124243/>

³² Chamerois, Aurélie. "À Barcelone, Les Restrictions D'Eau Relancent Le Débat Sur Le Tourisme." Equinox, March 31, 2023. <https://www.equinoxmagazine.fr/2023/03/31/barcelone-restrictions-eau-tourisme/#:-text=Depuis%20le%20d%C3%A9but%20du%20mois,moyenne%20106%20litres%20par%20jour>

ECONOMY

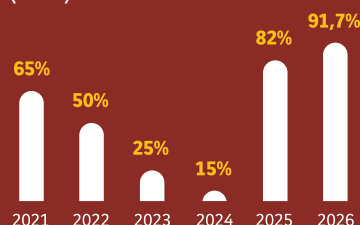
Spain's GDP per capita ³³ (2023)	€25,210 / inhab.
Catalonia's GDP per capita ³⁴ (2024)	€37,477 / inhab.
Barcelona's GDP per capita ³⁵ (2018)	€46,600 / inhab.

Spain's median wage ³⁶ (2024)	€2,385 per month
Catalonia's median wage (2024)	€2,530 per month
Barcelona's median wage ³⁷ (2023)	€2,528 per month

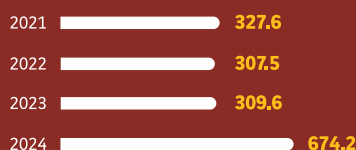
Average purchase price of a home in Spain ³⁸ (2025)	€2,642 / m ²
Average purchase price of a home in Barcelona ³⁹ (2026)	€5,176 / m ²

ENVIRONMENT AND INDUSTRY

Water levels in Catalonia's reservoirs (2026)⁴⁰



Average annual rainfall in Barcelona (in mm):



Percentage of water consumption made possible by desalination⁴¹

24% of water consumption in Barcelona metropolitan area

Average annual domestic water consumption in 2024⁴²

96,7 L per person per day (~35m³ per year)
down 8% since 2007

In France⁴³: 148 L per person per day

European average⁴⁴: 100 L per person per day

³³ "Catalogne - Carte D'identité," n.d. <https://www.routard.com/fr/guide/a/carte-d-identite/europe/espagne/catalogne/barcelone>

³⁴ countryeconomy.com. "Catalogne 2026," n.d. <https://fr.countryeconomy.com/pays/espagne-communautes-autonomes/catalogne>

³⁵ "Idescat. Producto Interior Bruto Territorial. PIB, PIB per Habitant. Barcelona," n.d. <https://www.idescat.cat/pub/?id=pihc&n=8276&geo=mun%3A080193&lang=es>

³⁶ "En Espagne, La Vertigineuse Différence De Salaires Entre Les Régions," Equinox, November 30, 2025. <https://www.equinoxmagazine.fr/2025/11/26/en-espagne-la-vertigineuse-difference-de-salaires-entre-les-regions/>

³⁷ VIA Empresa. "¿Cuál Es El Salario Medio De Los Barceloneses?" February 3, 2025. https://www.viaempresa.cat/es/economia/cual-es-salario-medio-barceloneses_2209170_102.html

³⁸ Delattres, Etienne. "Espagne : Salaire Moyen Et Coût De La Vie." L'Essentiel De L'Éco, December 14, 2025. <https://lessentieldeleco.fr/4805-espagne-salaire-moyen-et-cout-de-la-vie/>

³⁹ Idealista. "Évolution du prix des propriétés à vendre à Barcelone," September 2026. <https://www.idealista.com/fr/espacio-presse/rapports-prix-logement/vente/cataluna/barcelona-province/barcelona/>

⁴⁰ embalseshoy.es. "embalseshoy.es — Estado De Los Embalses De España," n.d. <https://embalseshoy.es/>

⁴¹ The Metropolitan Area AMB. "Dessalinitzadora del Prat de Llobregat," 2026. <https://www.amb.cat/en/web/medi-ambient/aigua/instalacions-i-equipaments/detall/-/equipament/dessalinitzadora-del-prat-de-llobregat/348901/11818>

⁴² Urbanismo, Acción Climática, Movilidad, Pla De Barris Y Servicios Urbanos. "Uso Y Consumo," n.d. <https://ajuntament.barcelona.cat/urbanisme-accio-climatica-mobilitat-pla-barris-serveis-urbans/es/agua/uso-y-consumo>

⁴³ Centre d'information sur l'eau. "Consommation D'eau Moyenne Par Foyer En France | Centre D'information Sur L'eau." Centre D'information Sur L'eau | Le Centre D'information Sur L'eau Constitue Un Lieu D'échanges Et D'information Désormais Reconnu Par Le Grand Public, June 4, 2026. <https://www.cieau.com/le-metier-de-leau/ressource-en-eau-eau-potable-eaux-usees/quels-sont-les-usages-domestiques-de-leau/>

⁴⁴ Eau potable dans l'UE : meilleure qualité et meilleur accès." Parlement Européen, n.d. https://www.europarl.europa.eu/pdfs/news/expert/2018/10/story/20181011STO15887/20181011STO15887_fr.pdf



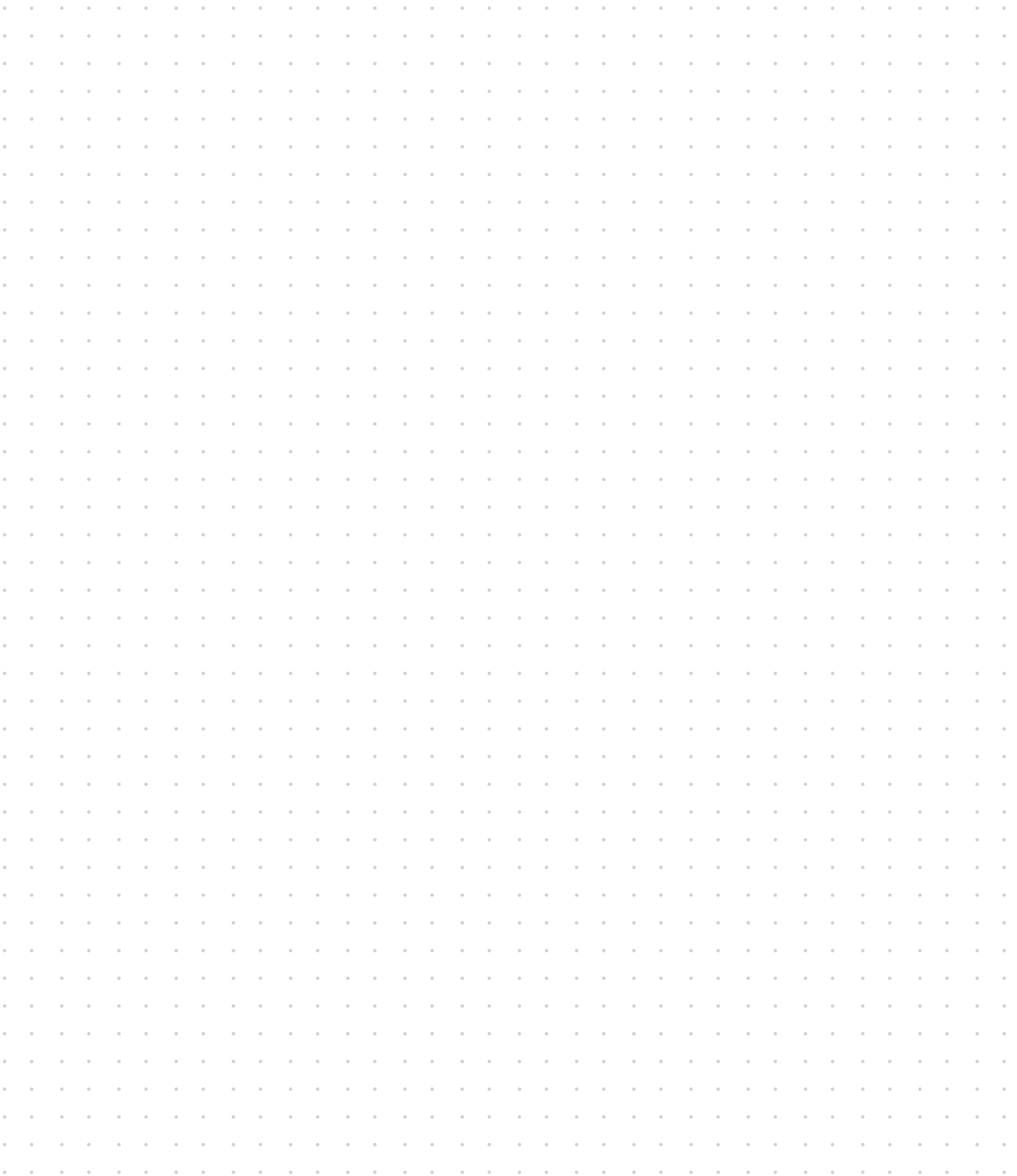


→ Panoramic view of the Tibidabo Amusement Park



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Bibliography

Barcelona City Council, « *Uso y consumo del agua* ». <https://ajuntament.barcelona.cat/urbanisme-accio-climatica-mobilitat-pla-barris-serveis-urbans/es/agua/uso-y-consumo>

Barcelona Metropolitan Area (BMA). *Dessalinitzadora del Prat de Llobregat*. <https://www.amb.cat/en/web/medi-ambient/aigua/instalacions-i-equipaments/detall/-/equipament/dessalinitzadora-del-prat-de-llobregat/348901/11818>

Spanish Association of Desalination and Water Reuse (AEDyR). (2023, July 10th). *La desalación y reutilización son las principales fuentes de abastecimiento de agua en Barcelona 2023*. <https://aedyr.com/desalacion-reutilizacion-son-principales-fuentes-abastecimiento-agua-barcelona-2023/>

CTIF. (2024, February). *Barcelone en situation de pénurie d'eau depuis le 1er février, état de pré-urgence depuis novembre 2023*. <https://www.ctif.org/fr/news/barcelone-en-situation-de-penurie-deau-depuis-le-1er-fevrier-etat-de-pre-urgence-depuis>

Dario Salinas Palacios, « *L'eau en Espagne : un enjeu géopolitique pour la Catalogne* », Diploweb.com, 2016, June 30st. <https://www.diploweb.com/L-eau-en-Espagne-un-enjeu.html>

Government of Catalonia, Department of European Union and Foreign Action. *El projecte "ReViubesos, renaturalització de la desembocadura per millorar la resiliència metropolitana", seleccionat pels fons FEDER de la Unió Europea*. 2025, September 5th. https://exteriors.gencat.cat/ca/ambits-dactuacio/afers_exteriors/ue/fons_europeus/actualitat/detalls/noticia/20250905_reviubesos

Jeffrey Blain, « *Le modèle des super-îlots à Barcelone : un exemple de régénération d'une ville* », *Géoconfluences*, February 2024 <https://geoconfluences.ens-lyon.fr/informations-scientifiques/dossiers-thematiques/de-villes-en-metropoles/articles-scientifiques/superilots-barcelone>

Lepesant, G. (2025). [*Étude sur la gestion de l'eau à Barcelone*]. Groupe Caisse des Dépôts. <https://www.caissedesdepots.fr/sites/ms-cdc-fr/files/2025-07/Etude%20Gilles%20Lepesant%20-%20CDC.pdf>

Martin Charlet, « *Le bassin de la Muga, illustration très locale de la pénurie d'eau en Catalogne* », *Géoconfluences*, April 2024. <https://geoconfluences.ens-lyon.fr/actualites/eclairage/penurie-eau-catalogne>

Spanish Ministry for Ecological Transition and the Demographic Challenge. (MITECO). *Proposition de Pacte d'État face à l'urgence climatique [Propuesta de Pacto de Estado frente a la Emergencia Climática]*. Government of Spain, December 2025. Document available online (in Spanish): <https://www.miteco.gob.es/content/dam/miteco/es/prensa/Propuesta%20Pacto%20de%20Estado%202025%20diciembre.pdf>

Noyé Jean-Claude, « *La gestion de l'eau à Barcelone : un défi colossal* », *Journalists and Writers for Nature and Ecology (JNE)*, 2025, June 4th. <https://www.jne-asso.org/2025/06/04/la-gestion-de-leau-a-barcelone-un-defi-colossal/>

Observatory of Public Water and Sanitation Services (SISPEA). (2025). *Syndicat Mixte du SI Zone Industrielle Artois Flandres – Service eau potable (2025)*. Eaufrance. <https://www.services.eaufrance.fr/service/203850/2025>

French Biodiversity Agency (OFB), 2026. *Prix moyen global de l'eau au 1^{er} janvier 2025*. Eaufrance. <https://www.eaufrance.fr/chiffres-cles/prix-moyen-global-de-leau-au-1er-janvier-2025> / <https://www.immoabroad.com/es/spain/cuanto-cuesta-el-agua-en-espana-guia-completa-2024>

European Parliament, « Eau potable dans l'UE : meilleure qualité et meilleur accès », *Thèmes*, 2018, October 19th, mise à jour le 27 mai 2025. https://www.europarl.europa.eu/pdfs/news/expert/2018/10/story/20181011STO15887/20181011STO15887_fr.pdf



→ Aerial view of the Ciutat Vella district with Barceloneta beach



→ Aerial view of Barcelona's harbor district



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