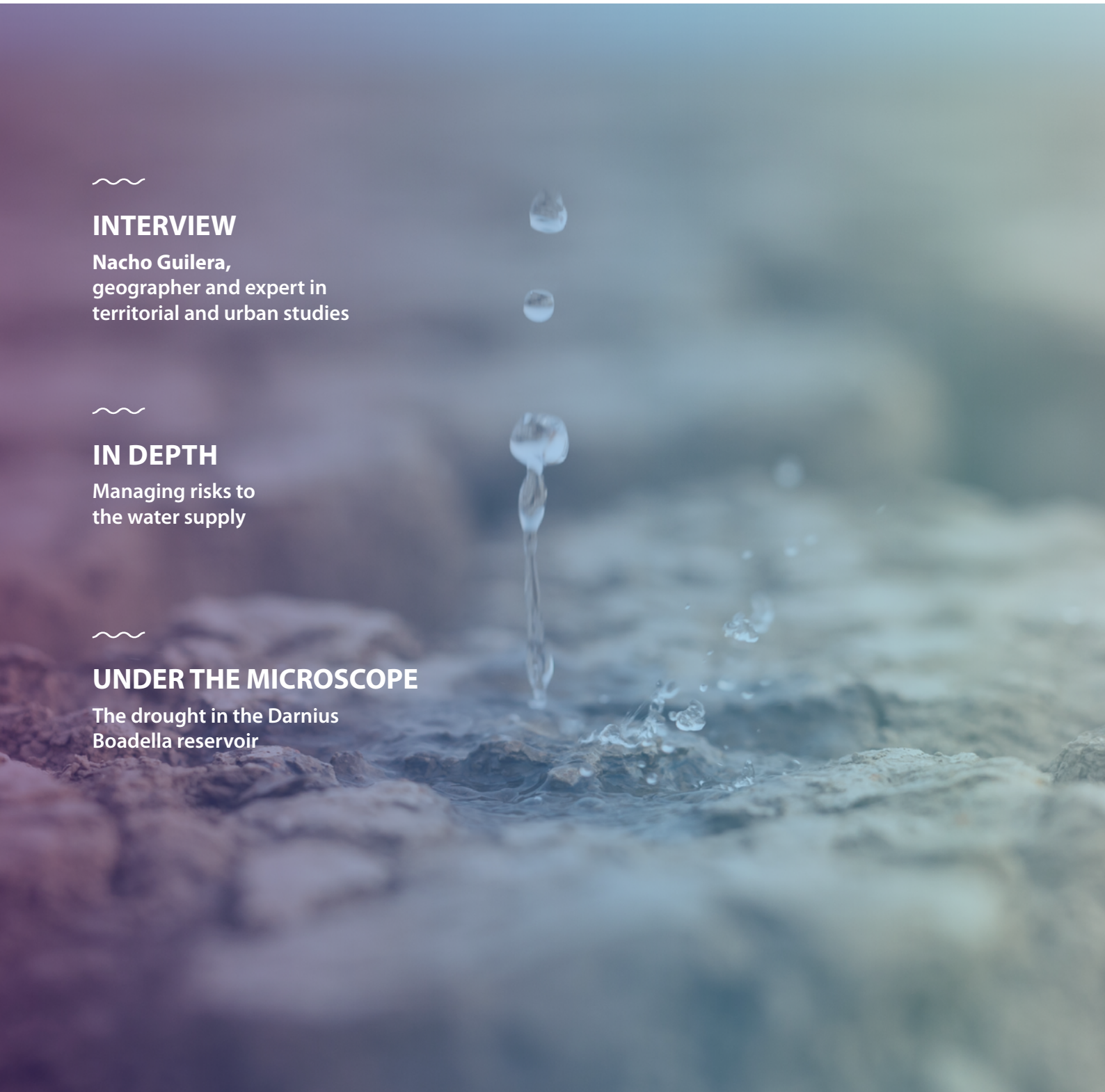
The **AIGUANEIX** newsletter

#02

January 2025

CONSORCI D'AIGÜES COSTA BRAVA GIRONA

Diputació de Girona



INTERVIEW

Nacho Guilera,
geographer and expert in
territorial and urban studies

IN DEPTH

Managing risks to
the water supply

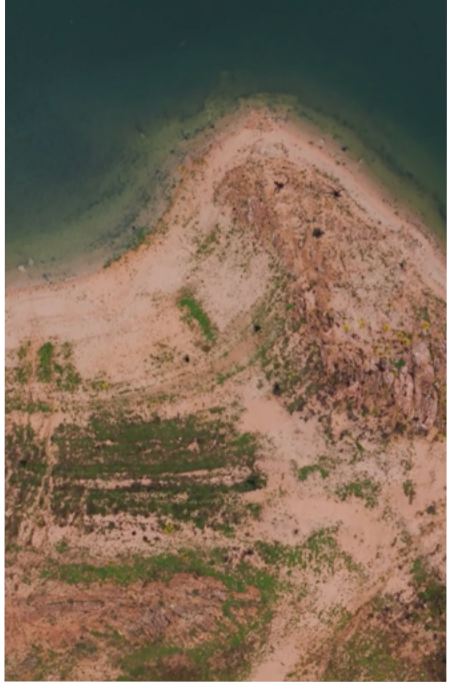
UNDER THE MICROSCOPE

The drought in the Darnius
Boadella reservoir

Contents

Editorial

Aquifers in drought conditions



Water is vital to life and enables us to carry out our everyday activities. A lack or excess of water can have a major impact on society, as demonstrated by the drought experienced in the northern Costa Brava region, the flooding in Cadaqués in November and the terrible damage caused in Valencia by the cold-drop phenomenon "DANA" last October, which is still fresh in our memories. Adequate management is essential to preventing these situations and reducing the impact of both an excess and a lack of water. For this reason, it is vital that we keep a close eye on the state of all our water reserves, including aquifers.

To understand the importance of aquifers, we can compare them to a "piggybank" in which savings, in the form of rainwater, accumulate after filtering through the soil. As well as being used by nature itself in aquatic ecosystems, part of this water remains available to us and helps to meet our needs. Sustainable and sensible management of aquifers is essential to reducing risks and making society more resilient in the face of future episodes of drought; however, we need to have savings in the "piggybank" so that we can use them in times of need (i.e. when there is a lack of rain).

In the northern Costa Brava region, these bodies of groundwater have suffered badly from the lack of rain. As they are the main source of water for a number of municipalities, and in view of the absence of other available water resources (meaning there were very few savings in the "piggybank"), they have also suffered from overexploitation and salinisation. As a result, we urgently need to diversify our water supply, in order to spread the load and ensure that the aquifers contain an adequate amount of reserves and can supply water of sufficient quality.

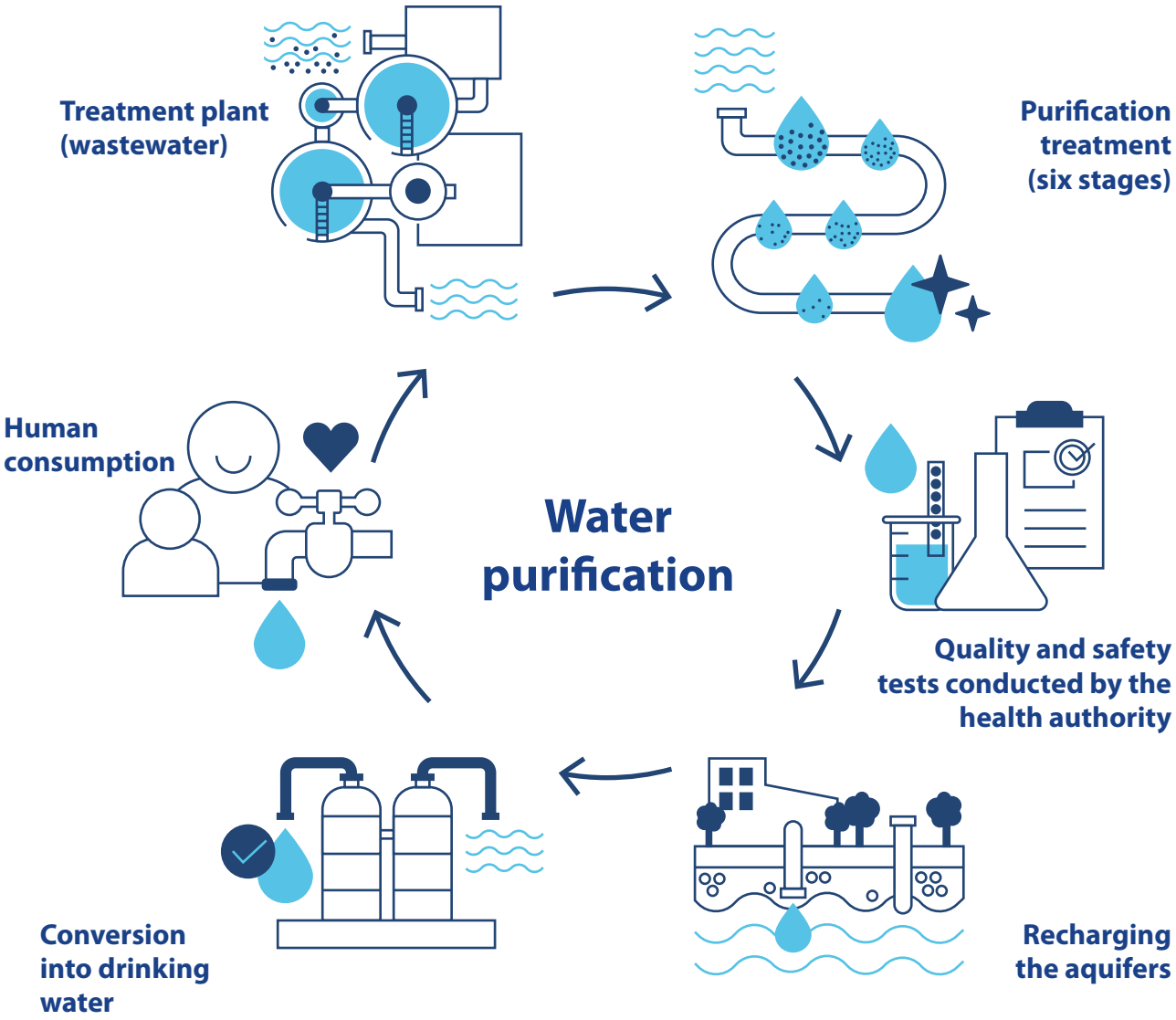
By recharging aquifers through a project such as AIGUANEIX, we close the loop in which water is obtained from the environment, used by citizens and returned to the natural environment. Moreover, because the water is returned to the same point, rather than downstream of where it was obtained, it becomes circular. AIGUANEIX aims to foster resilience in the face of future droughts through the sustainable management of water resources and by using aquifers as water reserves, thereby securing the supply of water to citizens.

"Sustainable and sensible management of aquifers is essential to reducing risks and making society more resilient"

"AIGUANEIX aims to foster resilience in the face of future droughts through the sustainable management of water resources and by using aquifers as water reserves"

Description of the project

AIGUANEIX seeks to produce purified water that complies, in a technologically efficient way, with the regulations governing the supply of water. Once the wastewater has been treated, its quality and safety must be verified so that it can be injected into an aquifer and potentially used for drinking water in the future. If the pilot project achieves the quality targets, a full-scale project can be implemented.



What stage are we at?

"The goal of the Costa Brava Girona Water Consortium (CACBGI) is to have a full-scale facility by 2027"

Lluís Sala

Construction

April 2024. Arrival of the base container for the pilot plant at the workshop.

May-September 2024. Assembly of the pilot plant and the treatment and control systems.

June-July 2024. Modifications to the Wastewater Treatment Plant (WWTP) at Roses.

September-October 2024. Installation of the pilot plant at the Roses WWTP.

Experimentation and analysis

January-June 2025. Start of the experimentation stage. The technical team tests the plant under different operating conditions, takes samples and analyses the water, in order to make the necessary adjustments to achieve the project's ultimate aim.

July 2025-April 2026. Analysis of the results obtained. Additional tests to assess the ongoing viability of the system of operation chosen.

Completion

May 2026. Assessment of the plant's operation and application of the project at full scale, and presentation of results.

2026-2027. Construction of a full-scale purification plant to recharge aquifers in the northern Costa Brava region.

General information

Reusing water allows us to increase our reserves and reduce our dependence on rainfall

Maintaining the water supply ensures decent living conditions, adds social value and enhances well-being

Water purification will enable us to create a stable reserve that should reduce the need for future restrictions

BENEFITS

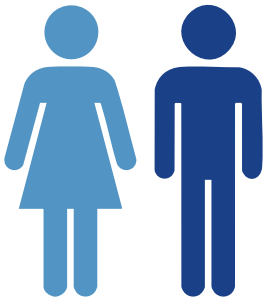
AIGUANEIX FOR CITIZENS
Over 30,000 people will benefit

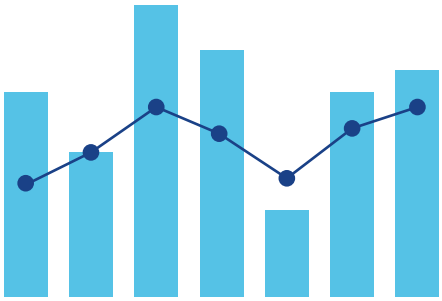
Sustainable water management and a sustainable water supply have become vital to ensuring the resilience of the population of the northern Costa Brava region in the face of future droughts. That is why AIGUANEIX has become a critical project within the context of climate change and the future evolution of rainfall.

Obtaining water from a new source, such as the purification of water treated at a WWTP, offers numerous benefits for citizens. Systems that reuse water, such as AIGUANEIX, enable us to increase our water reserves and reduce our dependence on rainfall. The existence of additional water reserves will make restrictions less likely in the event of future droughts. As a result, we can prevent citizens from suffering the impacts of a water shortage on their daily lives and activities.

At the same time, maintaining the water supply will ensure decent living conditions, add social value and enhance well-being, which can be affected when restrictions are imposed on homes, companies and services. Nor must we overlook the associated economic impact, and the prevention of potentially major financial losses in a number of business sectors that depend on the water supply.

AIGUANEIX is not only a project designed to tackle drought; it also has an extremely important social dimension, with wide-ranging implications for the people of the northern Costa Brava region.





A number of areas within the Natura 2000 Network and Aiguamolls de l'Empordà Natural Park depend on the health of the aquifers

AIGUANEIX FOR THE ENVIRONMENT

The Alt Empordà is home to 2,000 different species

Along with glaciers and the poles, aquifers are among the most important reserves of fresh water on the planet, so protecting them must be a priority in order to tackle climate change. Excessive extraction of water from underground reserves has a severe impact on both the environment and society.

The AIGUANEIX project represents a first step towards building full-scale water purification plants and storing the water they produce in aquifers, so that it can subsequently be used by municipalities. This activity also brings with it a number of environmental benefits, the most important of which is preventing the salinisation of coastal aquifers. This phenomenon occurs when an aquifer's reserves becomes so low that seawater is able to penetrate. When this happens, the salinity of the groundwater increases, which makes it unsuitable for consumption and causes problems for surface-dwelling species that depend on the aquifer. If the salinity is too high, this can kill off aquatic animals and plant life, thereby exacerbating the environmental impact of the phenomenon.

Injecting purified water into aquifers will help to maintain the water table, i.e. the upper limit of the water in the aquifer, and thus reduce the risk of salinisation. As a result, the extraction and exploitation of the aquifer will be offset by the injection of water from the purification plant. Moreover, an aquifer with larger reserves will need less rainwater to create surface water courses, which will also help to preserve the biological richness of aquatic ecosystems.

Thus, the seed planted by the AIGUANEIX project will help to protect water resources and preserve the habitats that are most threatened by climate change.

Storing water in coastal aquifers prevents their salinisation, maintains the water table, protects water resources and preserves the habitats that are most threatened by climate change

Debunking myths

In this section, we aim to debunk some of the most common misconceptions about water purification through the use of facts and scientific studies

1 "Purified water is of lower quality"

To guarantee the quality of the purified water produced by a project like AIGUANEIX, sophisticated physical, chemical and microbiological analyses will be conducted on a periodic basis in accordance with the work plan established by the project's scientific management team. These analyses will measure the presence and amount of the compounds specified in the regulation governing the quality of water for human consumption (Royal Decree 3/2023). Additionally, the AIGUANEIX plant has online sensors to immediately detect the presence of unwanted contaminants and any operational errors that may occur during the treatment process, in order to resolve them and ensure that the water produced is of the highest possible quality.

2 "Water that is used for agriculture will be supplied to cities"

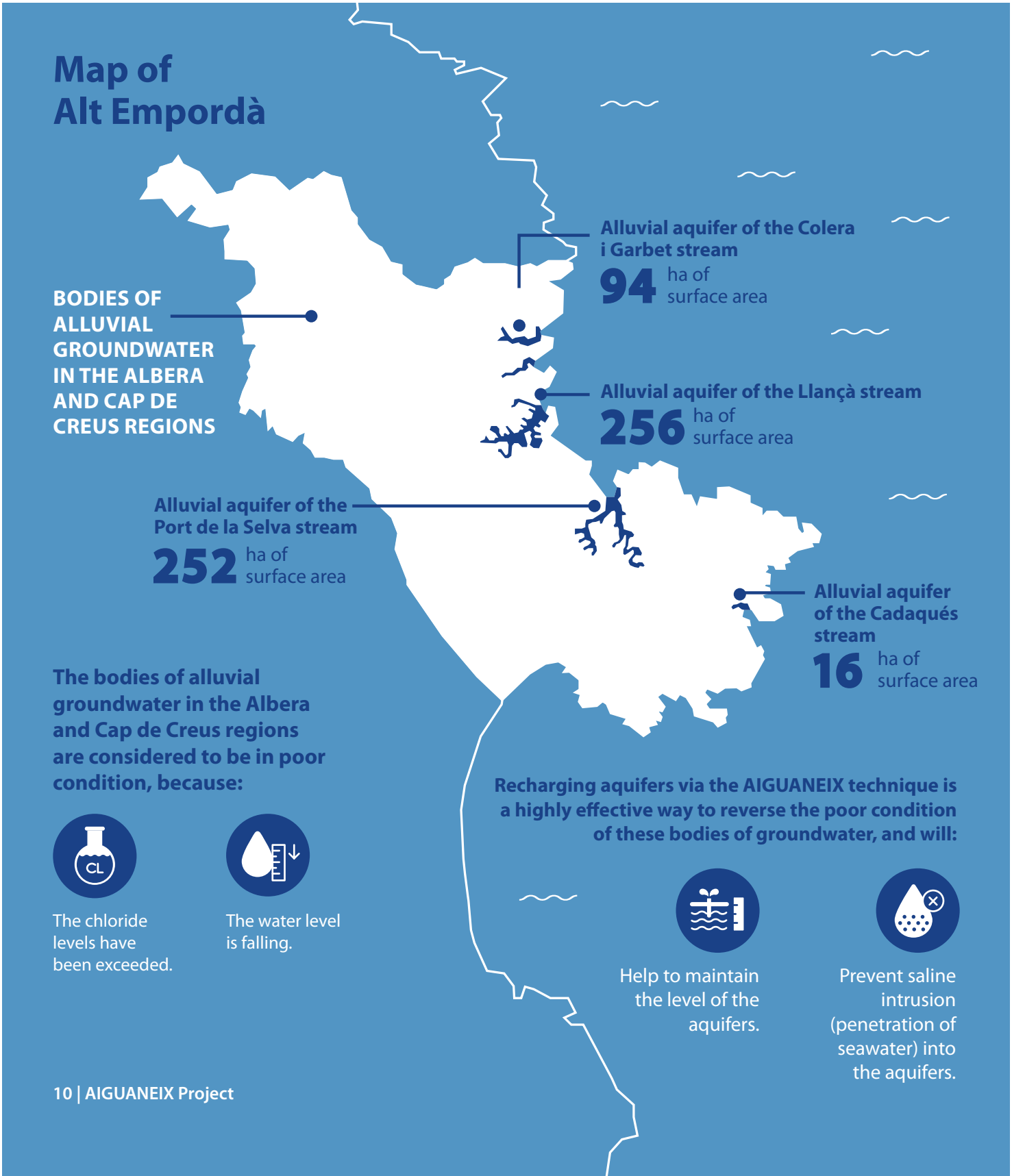
Agriculture accounts for 70% of society's water consumption, and food production is the human activity that consumes the most water. It is impossible to generate this amount of water solely by purifying the water treated at WWTPs, as this water originates from urban sources which – with the exception of large conurbations – account for just a small part of the overall water cycle. For this reason, the process of purifying water and recharging the aquifers is aimed primarily at ensuring the supply of water for urban use. At the same time, it will reduce the capture of water from other sources and free up resources that can be used for other purposes.

3 "Desalination plants are more useful"

Although desalination plants use technology that is known and widely accepted by citizens, desalination is expensive and requires a great deal of energy, and the challenges posed by capturing seawater and disposing of waste brine are highly complex from a technical and administrative perspective. Purification produces water of equivalent quality to that obtained through desalination, as the main treatment process involved is the same (reverse osmosis); however, the energy cost is lower, as the amount of salt to be removed is lower than the equivalent amount for seawater. Moreover, as the waste that is generated has a lower salinity level than seawater, it should not have any impact on the environment. Consequently, the purification of treated water produces new water locally, near to where it is needed, and with an acceptable level of environmental impact.

AIGUANEIX at a glance

The AIGUANEIX project aims to inject purified water into the coastal aquifers that form part of the following bodies of alluvial groundwater in the Albera and Cap de Creus regions:



The interview

Nacho Guilera

Geographer and expert in territorial and urban studies

"Paradoxically, we've seen that in the Mediterranean, the major risk is a lack of water resources owing to intense droughts combined with episodes of torrential rain and flooding"

Nacho Guilera boasts more than 20 years of experience in environmental consultancy, and is currently the head of consultancy services at Anthesis Spain.

He is a qualified geographer and has a Master's degree in Territorial and Urban Studies. Guilera's experience centres on the incorporation of environmental sustainability criteria into the design of public spaces and urban and territorial development.

What are the challenges posed by climate change?
Realisation and awareness. The consequences of climate change have been amply demonstrated, but we need to be aware of the dangers we are facing. Emergency management is also important, with specific regard to territorial planning and management, infrastructure (such as the AIGUANEIX project), warning and alarm systems and protocols, emergency plans, etc.

What risks does climate change pose to water management?
In the Mediterranean, the major risks are the increasingly more frequent and intense periods of drought, combined with episodes of torrential rain and flooding, like the tragic events we witnessed in Valencia. In coastal areas, rising sea levels may have a very severe impact on communities and their economic activities.

We need to comprehensively manage the cycle of this increasingly scarce resource, and take emergency management into account

Will there be an increasingly significant impact on our health?
If we don't combat global warming, and if we don't implement structural and strategic changes with regard to water management, these risks will grow. The droughts and episodes of flooding will affect the availability of food and the risk of transmitting water-borne diseases. In our immediate environment, there will be an increased number of personal impacts caused by episodes of flooding.

What needs to be done in order to improve our adaptation and resilience?
We need to comprehensively manage the water cycle, on the assumption that water will become an increasingly scarce resource; and we need to take into account management of the emergencies arising from the inevitable impacts. We need to drastically improve the efficiency of intensive uses of water (agricultural, urban and leisure-related uses) in order to protect the quantity and quality of the water in aquifers and aquatic ecosystems. We also need to implement measures that provide flexibility with regard to the use of water, in order to adapt to new scenarios and adapt our economic activities in line with the new reality of water scarcity. It is essential that we activate effective emergency protocols in order to minimise damage, especially to human lives.

How can we adapt our towns and cities?
With adequate management and planning. We need to take action locally on the assumption that water will become scarcer, and collaborate at the regional and national level on strategies to reduce consumption, improve efficiency and guarantee the water supply.

We also need to improve our urban and territorial planning in order to adapt our towns and cities in line with the main risks, given than over 700,000 people live in areas susceptible to flooding (according to data from the Government of Catalonia). Consequently, we have to rethink our growth model and emergency procedures in order to guarantee our safety and increase people's awareness of the risk. There also needs to be more coordination between municipalities and supra-municipal bodies in order to tackle the problem in a real and effective way.

News roundup

We bring you the latest updates for the water sector, featuring the most significant local, national and international news from recent months.

AIGUANEIX begins its experimentation stage

The pilot plant for the AIGUANEIX project, which is testing the viability of new environmental uses for recycled water at the WWTP in Roses, began operation in January of this year. The AGBAR group completed construction of the plant in December 2024.

If the project is shown to be viable, this will open the door to new environmental uses for recycled water, such as recharging aquifers that will be used to supply water. As well as a preventive measure to avert saline intrusion into aquifers, the initiative will also improve the quality of bodies of groundwater and increase the resilience of the water supply.

The Costa Brava Girona Water Consortium will invest more than €2M in improvements to the Portbou reservoir

The Costa Brava Girona Water Consortium will invest more than €2M in improvements to the Portbou reservoir over the next two years. In addition to this investment, the Catalan Water Agency (ACA) will provide funding to update the reservoir's facilities.

Portbou reservoir, which has a capacity of 100,000 m^3, will receive maintenance and safety updates that its previous owner, the municipal council, was unable to provide. In parallel, a self-protection plan has been drawn up and the safety regulations have been reviewed, while steps are being taken to implement safety measures for the local population and a number of renovation plans are being prepared. There are also plans to carry out improvement works this year on an alternative route to the reservoir, so that the upper part of the dam can be accessed in the event of flooding.

Microplastics hinder the treatment of wastewater

A recent study has revealed that microplastics in wastewater may provide a refuge for pathogens. This would constitute a risk to public health and the environment, as these microorganisms would be able to enter natural water reserves and the food chain. The results of the study show that microplastics survive the treatments carried out at WWTPs and may carry biofilms that serve as transmitters of pathogens.

This research underlines the need to subject wastewater and treated water to a variety of processes in order to lower the potential risks. These processes include those applied in the AIGUANEIX project, such as chloramination (which helps to eliminate biofilms) and ultrafiltration (which eliminates particles and any pathogens adhering to the water extremely effectively).

Under the microscope

We explain scientific and technical concepts related to AIGUANEIX in a straightforward and engaging way.

The drought in the Darnius Boadella reservoir

The drought suffered by the Alt Empordà region has brought the Darnius Boadella reservoir to its lowest level: just 11% of capacity in February 2024. The reservoir was opened in 1969 in order to provide protection against flooding and ensure the supply of water to the region, in view of the erratic nature of the River Muga. It has a total capacity of 61.1 hm^3.

Since then, the region has suffered various episodes of drought that have drastically lowered the reservoir's water levels (as occurred in 1983 and 2008), but never to the historic low recorded last year. Over the last 10 years, the average water level of the Darnius Boadella reservoir has been 32 hm^3, and it has not reached its full capacity since 2020.

Types of drought

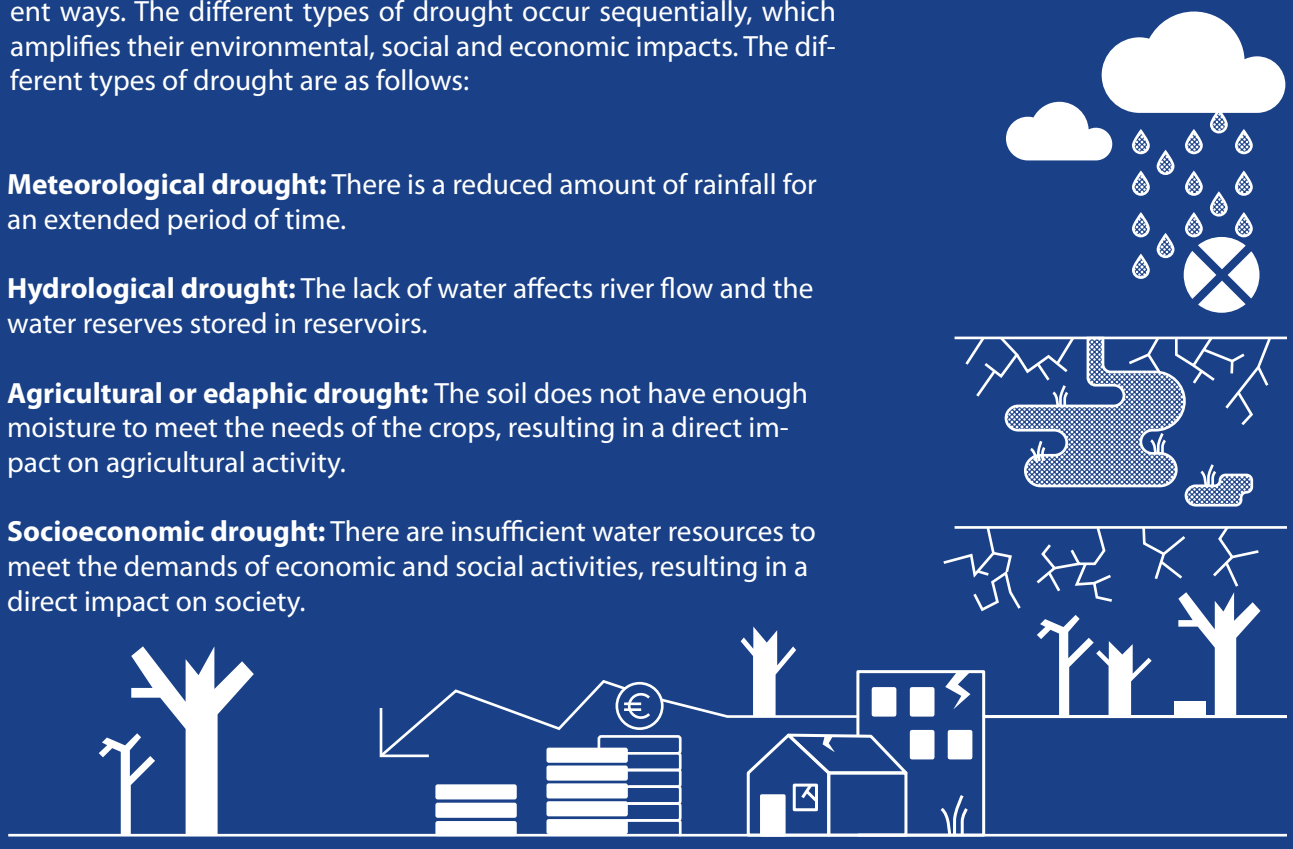
There are various types of drought, which affect reservoirs in different ways. The different types of drought occur sequentially, which amplifies their environmental, social and economic impacts. The different types of drought are as follows:

Meteorological drought: There is a reduced amount of rainfall for an extended period of time.

Hydrological drought: The lack of water affects river flow and the water reserves stored in reservoirs.

Agricultural or edaphic drought: The soil does not have enough moisture to meet the needs of the crops, resulting in a direct impact on agricultural activity.

Socioeconomic drought: There are insufficient water resources to meet the demands of economic and social activities, resulting in a direct impact on society.



Managing risks to the water supply

Droughts, floods, contamination and overexploitation of aquifers are all events that can affect the water supply. What are the risks and how can they be managed to reduce their impacts?

The water supply is an essential service to society; it is vital not only for our daily activities, but also for our economic activity. The water shortage we have experienced in recent years has brought a range of disruptions that have affected us on many different levels, thereby demonstrating just how important the water supply is. At the same time, the shortage has also forced us to consider the risks related to this essential service and how to manage them.

What do we mean by "risk" ?

Firstly, it is important to understand that a "risk" is the possibility that a negative event will occur. In other words, it is a "danger". In order to calculate the magnitude of a risk, we must take into account the likelihood of it occurring and the severity of its consequences. It is not easy to make this calculation intuitively. The perception that the general public may have of a particular risk does not always correspond to its magnitude, when this is calculated using scientific techniques.

For example, people may be worried about the quality of drinking water from taps in cities with modern treatment and control systems, and may think that the water is unsafe or unhealthy, even though it has been amply demonstrated that the risk of health problems is extremely low given that the water meets very strict health standards.

Managing the risks to water for human consumption

In this case, we must consider how to manage the risks that are posed, taking into account factors such as the type of risk, the likelihood of the event occurring, the potential severity, and the perception of the public or the people affected. Thus, in the case of water for human consumption, the main risks are microbiological and chemical in nature, and are governed by the corresponding regulations.

The microbiological risks arise from biological agents such as bacteria, viruses and parasites, which can contaminate the water and threaten human health in the short term. The chemical risks involve exposure to toxic chemical substances, which usually generate impacts over the medium- or long-term.

Although some of these substances are of natural origin and are extremely toxic, the vast majority are synthetic molecules produced by the chemical industry. These risks can be minimised thanks to the processes that take place at water-treatment facilities and the continuous quality controls that are carried out.

Spanish and European legislation recognises water as an essential product, comparable to a foodstuff in terms of the rigour of the health criteria that apply to it, and have introduced the requirement to carry out risk assessments in order to guarantee the quality of the water, from initial capture to final consumption.

An operative sets up the pilot plant for the purification of water from the Wastewater Treatment Plant in Roses. The plant incorporates six different processes to guarantee the elimination of any potential contaminants and pathogenic agents.

Consequently, adequate risk management not only involves prior quantification and taking action once an initial impact has occurred; it is also necessary to implement protective and preventive measures before any incidents are able to occur.

AIGUANEIX aims to produce water that complies with the regulatory standards that guarantee its suitability for recharging aquifers

Risk management in AIGUANEIX

The AIGUANEIX project, under the scientific management of the Catalan Water Research Institute (ICRA), takes into account all of the potential risks associated with the water supply and incorporates six different treatment processes, which make it possible to eliminate any potential chemical contaminants and pathogenic agents that may be present in the water. From ultrafiltration and advanced oxidation to reverse osmosis, filtration with activated carbon and chloramination, AIGUANEIX aims to produce water that complies with the regulatory standards that guarantee its suitability for recharging aquifers. In addition to these processes, a variety of online sensors and exhaustive analytical monitoring make it possible to determine, with great precision, the quality of the water and the effectiveness of these treatment processes.

Moreover, the AIGUANEIX project specifically includes the development of a series of protocols designed to reinforce the robustness of the treatment, in line with the preventive measures stipulated by the regulations.

Through these actions, AIGUANEIX aims to bolster the resilience of the water supply for the northern Costa Brava region while meeting the most stringent requirements and ensuring maximum respect for public health.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FRONT END ACCESS
FOR PERSON ONLY
NOT FORKTRUCK
OR VEHICLE
THIS END


SOSA
(NaOH) (25%)

Relevant experiences

Jourdain programme (France)

France's first experience of circular water recovery

The programme involves the indirect production of drinking water

1.5 M
m^3 of additional drinking water between May and October

5 stages
successive stages of water treatment at the refining plant

25 km
the distance travelled by the water before being deposited in a vegetated area

19.5 M
euros over a 10-year budget

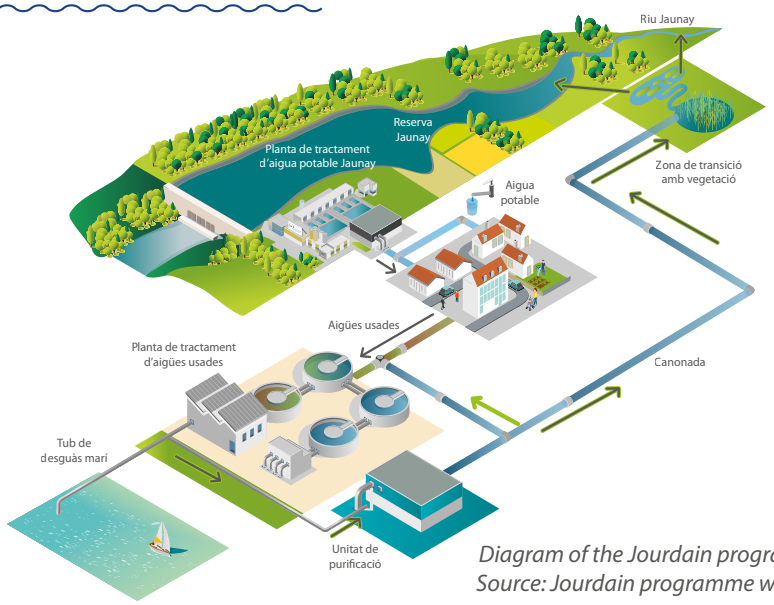

Diagram of the Jourdain programme. Source: Jourdain programme website.

La Vendée is an administrative division within France's Pays de la Loire region that has suffered a number of severe droughts over the last 20 years. Vendée Eau, the public service responsible for the production and distribution of drinking water to the region's inhabitants, is working to implement a series of ingenious solutions designed to maintain an optimum supply of drinking water. In the words of the head of the service, Jérôme Bortoli, "In view of the large volume of treated wastewater that was being discharged into the Atlantic Ocean, we decided to explore the option of indirect reuse for drinking water".

A pioneering project for France

This vision gave rise to the Jourdain programme, a circular water-recovery project led by Vendée Eau. Thanks to the new refining unit, since November 2023 part of the wastewater treated at the Les Sables d'Olonne WWTP is no longer discarded into the ocean; instead, it undergoes up to five stages of treatment in order to remove salt, microbiological compounds, microcontaminants (e.g. pesticides) and pharmaceutical and industrial compounds. The purified water is then sent to the Jaunay dam some 25 km away, where it is discharged into an area covered with vegetation. There, it mixes with river water and is transported to the Jaunay reservoir, where the Jaunay drinking-water production plant converts it into water suitable for domestic consumption.

Quality and safety

The technology on which the refining plant is based is Barrel™, an ultrafiltration and low-pressure reverse osmosis system that contains 200 membrane elements along with an ultraviolet disinfection and chlorination process. In order to certify the quality of the water discharged, up to 800 different components are analysed. The experimental stage of the project will continue until 2026. In 2027, the water-treatment capacity may be increased up to 600 m^3/h.

Profile

Raquel Maynés
Head of Costa Brava operations at AGBAR, and deputy technical director of construction of the pilot plant

"We're interested in evaluating a project like AIGUANEIX in terms of both the quality of the water and the volume obtained, as well as the energy costs and the volume of wastewater involved"

Raquel Maynés Mateu holds an advanced degree in Civil Engineering from the Polytechnic University of Catalonia (UPC). Her experience with the AGBAR group goes back some 20 years, as she first worked with the organisation in 2005.

During the first six years of her career she worked as a technical specialist at Sorea, where she developed master plans and projects for the sewer system in Catalonia and the Balearic Islands. She also worked in the Technical Office for the Vallès Oriental-Maresme management unit. Over the next 10 years Raquel held positions related to the management of quality and environmental control systems for sewer networks across the Iberian Peninsula, developed master plans and projects for implementation at the national and international level, and collaborated with studies on urban resilience and water regeneration.

For the last year she has been the director of operations at AGBAR Costa Brava, where she manages the water supply and sewer network for numerous municipalities within the Costa Brava region. Within the context of this position, she is also the current deputy technical director of the AIGUANEIX project and provides support to the Costa Brava Girona Water Consortium with regard to the final design and construction of the AIGUANEIX pilot plant.

Contact

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This initiative has been developed by the Costa Brava Girona Water Consortium and has received a subsidy from the Catalan Water Agency under file no. REU001/20/000139. This subsidy was awarded within the framework of the call for investments in the implementation of actions designed to reuse recycled water, as published in Resolution TES/642/2021 of 4 March (Official Gazette of the Government of Catalonia (DOGC) no. 8362 of 11 March 2021, ref. BDNS 552136).

Project management and funding:

CONSORCI D'AIGÜES COSTA BRAVA GIRONA

Diputació de Girona

With the support of:

Agència Catalana de l'Aigua

Generalitat de Catalunya

Scientific management:

ICRA Institut Català de Recerca de l'Aigua

Construction and maintenance:

Agbar

Protecmed

Works management:

Energi

Experimental operation:

transparenta
UTE Transparenta Sanejament Costa Brava

Creation of outreach materials:

Anthesis