

THE AIGUANEIX

newsletter

#01

July 2024



CONSORCI D'AIGÜES
COSTA BRAVA GIRONA



Diputació de Girona

INTERVIEW

Rafael Mujeriego
Professor of Environmental Engineering at
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IN DEPTH

AIGUANEIX: Why is water
purification necessary?

UNDER THE MICROSCOPE

What are aquifers?

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Introduction

The AIGUANEIX project

Miquel Noguer i Planas
President of Girona Provincial Council
and of Costa Brava Girona Water Consortium



The prolonged and persistent drought of recent years has brought the northern Costa Brava region to a critical situation, with an unprecedented water shortage. Future climate change projections indicate that it will not be possible to sustain the current water demand with natural supplies. So, even though it is a renewable resource, it is limited.

To secure a reliable supply of drinking water for the future, the Costa Brava Girona Water Consortium has initiated the AIGUANEIX project. This project aims to explore methods for generating new water resources by reprocessing treated water and transforming it back into potable water.

In coastal municipalities, the strategic value of treated, still-fresh water is substantial, and improving its quality will be a key tool in addressing future droughts. Once purified, this water will be used to replenish local aquifer reserves through managed recharge efforts.

The AIGUANEIX project aims to demonstrate the technical feasibility of purifying treated water to secure approval from health and water authorities, allowing its storage in aquifers and availability for public use.

The AIGUANEIX project is aligned with the United Nations Sustainable Development Goals and will improve the circularity of water management. This circularity will enhance resilience against future droughts and ensure a reliable water supply for the population.

«The strategic value of treated water is substantial, and improving its quality will be a key tool in addressing future droughts.»

«AIGUANEIX will improve the circularity of water management, enhancing resilience against future droughts and ensuring a reliable water supply for the population.»

Description of the project

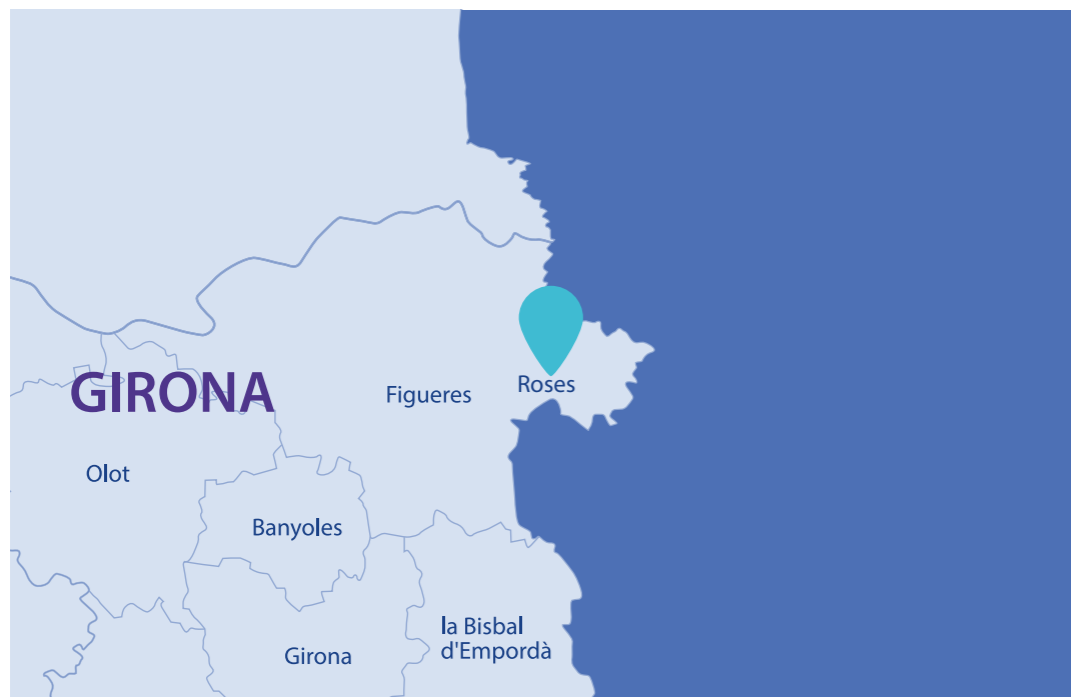
The AIGUANEIX pilot plant is located at the Roses Wastewater Treatment Plant, with the aim of purifying treated water from the municipalities of the northern Costa Brava. Its strategic location allows it to address the risk of water shortages during



Location

Location of the pilot plant

Alt Empordà
Roses
Roses Wastewater Treatment Plant (WWTP)



What stage are we at?

«The goal of CACBGI (Costa Brava Girona Water Consortium) 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 Roses WWTP.



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



Experimentation and analysis



November 2024 – April 2026. Start of the experimentation and analysis phase. The technical team will test the plant under different operating conditions, take samples and analyse the water, in order to make the necessary adjustments to achieve the project's ultimate objective. Subsequently, an analysis and evaluation of the plant's performance and the project's implementation at full scale will be conducted

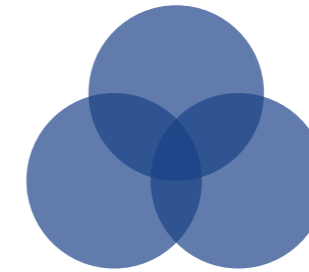
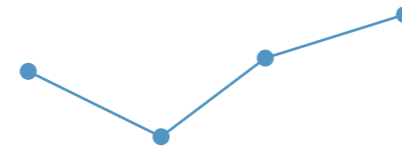
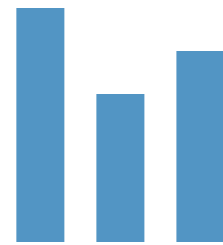
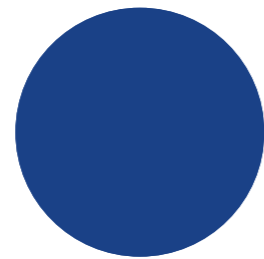


Completion



May 2026. Drawing up of final conclusions and recommendations, and presentation of the project results.

General information



6 months

to build the plant

18 months

of testing

Given the irregularity of rainfall, the circular economy is gaining importance as a model to enhance water resilience.

BENEFITS

AIGUANEIX FOR ALT EMPORDÀ 22 municipalities in a state of emergency for almost a year

In mid-2024, Alt Empordà was considered one of the drought hotspots in Catalonia. During the summer of 2023, the 22 municipalities that rely on the Fluvià-Muga aquifer were the first in Catalonia to be declared in a state of drought emergency. By April 2024, the Darnius-Boadella reservoir's reserves had fallen to 11.35% of its capacity, and the Fluvià-Muga aquifer was at 13.7 metres above sea level, compared to the normal level of 16.67 metres above sea level. Measures to alleviate the drought have included limiting the maximum amount of water

per person per day and imposing restrictions on activities such as filling pools, watering green areas, and washing vehicles.

Given this irregularity of rainfall, the circular economy has gained importance as a model to enhance water resilience. Projects such as AIGUANEIX, which seek to achieve water quality sufficient for gaining approval to recharge aquifers with treated wastewater, could be essential for building reserves of this resource for the residents of Alt Empordà.

The pilot plant will initially generate only a small volume, as it serves as a demonstration project to evaluate whether the water quality targets are achieved. However, the pilot test could potentially be expanded to other coastal municipalities in Catalonia.

In a region like Alt Empordà, which is home to 2,698 businesses, the issue of water scarcity has become an increasingly complex one to address.

AIGUANEIX FOR BUSINESSES The recent drought has resulted in the worst levels ever recorded at the Darnius-Boadella reservoir.

Economically, the states of emergency declared by the ACA (Catalan Water Agency) during the most severe droughts led to resulted in partial suspensions of agricultural irrigation, reduced water usage for livestock, lower water consumption by industrial users, and decreased water use for recreational activities.

The agricultural sector has been one of the hardest hit by the extended drought that has affected the region since 2021. However, the lack of rain has also adversely affected the livestock sector, the plant and flower industry, manufacturing, and the service sector.

In a region like Alt Empordà, which generates €5,541 billion in revenue, is home to 2,698 businesses and in which the service sector (accounting for 81.8% of the revenue) has increasingly gained importance*, the issue of water scarcity has become an increasingly complex one to address.

The AIGUANEIX project seeks to offer an alternative approach to ensure a reliable supply of this irregular resource amidst the climate emergency. It aims to maintain both the quantity and quality of water and to help businesses retain their competitiveness during times of water shortage.

*Data from VIAempresa as of 2024

81 hm³

of recycled water produced in Catalonia in 2023

100 hm³

of recycled water expected to be produced in four years

Debunking myths



In this section, we aim to debunk some of the most common misconceptions about water purification by comparing them with facts and scientific studies.

1

«We will drink water from the sewer system»

Wastewater, which is the water used by people in homes, businesses, industries, etc., undergoes a biological purification process before being returned to the sea in optimal conditions and, in some cases, desalinated afterward. Through purification, we implement a multi-stage process of up to six phases to ensure the water is free from contaminants and organic particles. This process guarantees that the water's quality matches that of rainwater and can even exceed the quality of water from a treatment plant. The purified water does not go directly to the tap. Instead, it will be transferred to the aquifer, where it will be further treated before being distributed to the taps. Throughout this process, a multi-barrier concept is applied, which is the same approach used in all countries where this technology is employed.

2

«The water is just for tourists»

Full-scale production of purified water will be used to help ensure a supply of water for the municipalities. Consequently, all of the people who live in and pass through the areas that are equipped with facilities of this type will benefit from them. In the case of the pilot plant, this location was chosen partially in view of the critical water situation in the Alt Empordà region and, specifically, the municipalities near Cap de Creus; and partially in view of the technical and quality-related challenges presented by the water from the Roses WWTP.

3

«Purified water is less healthy»

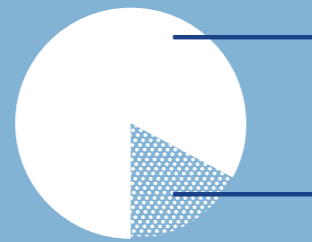
The water that will be added to the aquifers after a purification process will be a resource of the highest quality. The water will be of a quality similar to rainwater because we will have removed all contaminants and salts. It will even need to be remineralised to make it suitable for municipal supply.

AIGUANEIX at a glance

Purified water for the northern Costa



Over 4 million cubic metres of water annually



Alt Empordà (2023)

146,552
inhabitants

Northern Costa Brava

30,670
inhabitants

Why is it necessary to replenish water supply sources?



To ensure the availability of water



To make rational use of the water extracted from the environment

Project impact area

Llançà Colera Portbou

El Port de la Selva

La Selva de Mar

Cadaqués

Alt Empordà

Roses

Why do water reserves decrease during droughts?

Because water consumption exceeds the replenishment from natural water sources.

The interview

Rafael Mujeriego

Professor of Environmental Engineering at the Polytechnic University of Catalonia (UPC)



«Droughts should be managed during wet years; effective planning and preparation are essential.»

Regarded as one of the leading international experts in water management, Mujeriego advised the World Health Organization (WHO) on water issues for over 30 years.

Today, this prominent advocate for recycled water is the president of the Water Reuse Association (ASERSA).

Do you think that in Catalonia we will increasingly rely less on rainfall for potable water? Where will we need to obtain it from?

Considering what is happening in regions with a Mediterranean climate similar to ours, it seems we will experience more frequent, longer, and more intense droughts, interspersed with episodes of heavy and even torrential rainfall. We will need to regulate future precipitation hydrologically, get used to accumulating water, and retain it during periods of abundance to use it during times of scarcity.

What is water purification?

A purification process like the one in Roses involves expanding the treatments applied for water purification. To remove particles, molecules, and microorganisms from the purified water, a series of advanced treatment processes is used.

«Planning plays a crucial role in an infrastructure project like AIGUANEIX.»

What are the benefits of water purification?

The addition of purified water to the General Water Resources System provides water as safe as that from conventional sources, ensures reliable supply and at an economic cost similar to current systems. In fact, reclaiming the water that we traditionally discharge into the sea provides us with additional local resources, giving us self-sufficiency with our own local supplies.

Do similar projects exist internationally?

Yes, they can be found all around the world! One notable visionary and pioneering project is the one built in 1968 in Windhoek, the capital of Namibia. A purification plant has also been in operation since 2008 in Orange County, California. There, water is injected into an aquifer covering 75,000 hectares, which is seven times the size of the city of Barcelona.

In Catalonia, there are two flagship projects: one in Camp de Tarragona, which purifies water for industrial use, and another in Baix Llobregat, where water is recycled and returned to the river.

Can the pilot project in Roses be expanded to other areas?

This project will demonstrate the viability and effectiveness of the purification process and when scaled up, it will result in greater treatment efficiency and reduced unit costs. Without a doubt, it will become a benchmark for other regions around the world experiencing irregular rainfall and water scarcity.

News roundup

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



AIGUANEIX appears on the first international map of water purification projects

The AIGUANEIX project has been included in an international map of notable water purification projects for human consumption. The map, developed by the Australian Water Association, is the first of its kind to bring together all the initiatives being carried out worldwide in this field.

The [map classifies](#) the projects into four different categories and highlights the number of initiatives in California, a region heavily impacted by droughts where this technology has seen significant development.



The foundation stone has been laid for the water treatment plant that will ensure the supply and quality of water in L'Escala

In July, Miquel Noguer, President of Girona Provincial Council and of the Costa Brava Girona Water Consortium; Josep Bofill, Mayor of L'Escala; and Anna Torrentà, the Delegate of the Government of Catalonia for Girona, laid the foundation stone for the future potable water treatment plant (PWTP) in L'Escala.

The facility will be located on a 5,851 m² plot of land in Mas Martí, is set to be completed by the summer of 2025, and will have a capacity of 14,000 m³ per day. The Costa Brava Girona Water Consortium will fund most of the €7,206,897.79 project cost, with additional funding from the Catalan Water Agency (ACA).

Noguer highlighted that this is "the second most significant investment by the Consortium in water supply over the past twenty years".



An investment of €4.5 million has been allocated for emergency actions to address the drought in the coastal and pre-coastal areas of Girona

Girona Provincial Council, through the Costa Brava Girona Water Consortium, has launched an emergency plan to address the drought, featuring a package of nine actions worth €4.5 million in its own funds, distributed across the Girona coastal and pre-coastal areas.

This is an emergency action plan focused on ensuring water supply to the public, involving the recovery and opening of new wells and sources, protecting water quality, and automating the management of services.

Miquel Noguer, President of the Provincial Council, assured that they will stand by non-consortium municipalities in the region on this critical issue of drought, just as they did during storm Gloria and the COVID-19 pandemic.

Under the microscope

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

What are aquifers?

Aquifers are geological formations that store and allow the movement of groundwater. Rainwater filters through the soil until it reaches underground layers bounded by impermeable materials, where it accumulates. If the aquifer does not have an impermeable upper layer, the water level may rise and reach the surface. If there is an impermeable layer on top, the water becomes trapped and can only escape through an outlet (such as a well, spring, or seepage point).

The AIGUANEIX project aims to replenish the aquifers in Alt Empordà with purified water to ensure they continue serving as a water reservoir for both people and nature, and to enhance the region's resilience to future droughts.

Why are aquifers important?

Aquifers are the largest source of freshwater on the planet. They feed rivers and lakes and are a vital source of water for human needs. Without aquifers, there would be serious environmental, social, and economic issues.

650 hm³
extracted annually from Catalan aquifers.



AIGUANEIX: Why is water purification necessary?

If water purification technologies already existed and climate forecasts predicted an increase in droughts, why was this project not implemented sooner?

AIGUANEIX is a water purification project being piloted in northern Costa Brava, which combines existing technologies in an innovative way. But if these technologies already existed, why weren't they implemented here sooner? Let's examine the key factors that have driven the development of AIGUANEIX.

Drought and climate change

Firstly, it is important to note that Catalonia is highly vulnerable to rising droughts caused by climate change and has been facing a severe water scarcity crisis over the past three years. The need to ensure a reliable water supply for the public and to enhance resilience against droughts are two of the main reasons for exploring water purification as a resource for people.

Using purification as a method to obtain drinking water and replenish aquifers provides a new source of water and reduces dependence on rainfall. The goal is to utilize the water from the Roses Wastewater Treatment Plant (WWTP), restore its quality, and return it to the natural cycle. This approach prevents

the discharge of water into the sea and promotes the circularity of this crucial resource.

Water purification

Water purification technology has been implemented in many parts of the world, with notable examples in California, Australia, and Singapore. These regions face water supply issues and have been among the first to implement purification technologies to produce potable water.

AIGUANEIX innovatively combines various existing processes for restoring water quality. The pilot plant installed at the Roses Wastewater Treatment Plant features several different stages to ensure that the resulting water has properties similar to rainwater.



On 25 February 2024, the Darnius-Boadella reservoir reached its record minimum capacity due to the prolonged drought affecting the region. The reservoir was at 6.86 hm³, which is 11% of its capacity. Photograph showing the reservoir on 29 April 2024.

Public-private collaboration

A third factor to consider is that AIGUANEIX is a project led by the Costa Brava Girona Water Consortium and Barcelona Provincial Council, with support from the Catalan Water Agency. It also involves participation from AGBAR, Energi (Enginyeria Energètica Gironina SL), ICRA (Catalan Institute for Water Research), Protecmed (Procesos Técnicos Medioambientales), and Anthesis.

AIGUANEIX has been developed in response to the current context, where drought, technology, and collaboration among entities have combined to create a project designed to boost resilience against future droughts.

The collaboration between these public entities, research centres, and private companies is essential for implementing the project and achieving the objec-

tives set for the pilot phase. The current situation has facilitated effective teamwork among project participants, allowing for advancements in improving future water supply.

Purified water for the northern Costa Brava

The pilot plant is the first step in utilizing treated water as a new resource in a region heavily affected by the current drought. This is a medium-term project intended to be scaled up and implemented as a tangible measure to enhance resilience against future water shortages.

The drive to utilize this technology has emerged from the current situation, with the aim of providing support to society in the years ahead. This approach will function as a system to alleviate the impacts of climate change, thereby mitigating its social and economic effects.



Relevant experiences

Groundwater Replenishment System (GWRS)



Image of the facilities of the Groundwater Replenishment System project. Photograph taken from the Orange County Water District website.

The largest water purification facility in the world

Purified water reused for aquifer replenishment

Orange County, located in the southwestern part of California, is one of the most populated urban areas in the United States. It is a semi-arid region with an average annual rainfall of 33 cm. A large part of the area's water supply (for approximately 2.5 million residents) comes from groundwater. In 2008, due to water scarcity and increasing demographic pressure, two public entities, the Orange County Water District (OCWD) and the Orange County Sanitation District (OC San), had the foresight and vision to do what had previously seemed unthinkable: transform wastewater into potable water.

Water circularity

The Groundwater Replenishment System (GWRS) is the largest facility in the world dedicated to the artificial replenishment of aquifers with recycled water. It uses advanced recycling processes, also known as purification processes, including microfiltration and ultrafiltration membranes, followed by reverse osmosis and a final disinfection step. One third of the produced water is injected into coastal wells that act as a barrier against seawater to prevent the salinisation of the reservoir, while the remaining two-thirds are injected into large basins that allow the replenishment of an aquifer

covering 75,000 hectares. From this aquifer, the water is extracted, purified again to meet drinking water standards, and then distributed

Water quality

The resulting water far exceeds state and federal quality standards. In fact, it is virtually distilled and minerals need to be added to make it suitable for human consumption.

The project has yielded such good results that the model has been exported to two additional districts in Los Angeles as well as to Texas, Australia, Singapore and several other places.

490,000 m³
of water produced daily

1,000,000
people could be supplied
by the volume of water
produced

100 %
of locally recoverable
wastewater flows are recycled

35 %
of the total water demand is
being met

Profile

María José Farré

Researcher at the Catalan Institute for Water Research (ICRA) and Deputy Scientific Director of the AIGUANEIX project

Dr. María José Farré earned her PhD in Chemistry from the Autonomous University of Barcelona. Between 2008 to 2014, she completed a postdoctoral fellowship at the Advanced Water Management Centre at the University of Queensland in Brisbane, Australia.

There, she was involved in the Western Corridor Recycled Water Project, a three-plant facility that purified water using the same technology as the Aiguaneix project and succeeded in producing very high-quality water.

Since 2014, she has been part of ICRA-CERCA, where she researches water treatment with a focus on public health, civil and environmental engineering, and analytical chemistry. She has published over 60 peer-reviewed scientific articles and 4 book chapters. In total, she has received over 3,000 citations.

She is the coordinator of the Horizon Europe project intoDBP, which focuses on disinfection by-products.

In 2024, she has been selected as a member of the Advisory Board of the ATL Chair on Drinking Water, a programme aimed at generating, disseminating, and transferring knowledge on potable water management through the interaction of various stakeholders involved in water management and expert researchers in the field of the chair's challenges.


«I think we should have greater respect for tap water, given its high quality in our country.»



Contact



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This initiative has been developed by the Costa Brava Girona Water Consortium and has received a grant from the Catalan Water Agency under file number REU001/20/000139. This grant was awarded within the framework of the call for investment in projects for the implementation of recycled water reuse actions, as announced by Resolution TES/642/2021, dated 4 March (DOGC No. 8362 of 11 March 2021, ref. BDNS 552136)

Direcció del projecte i finançament:



Amb el suport de:



Direcció científica:



Construcció i manteniment:



Direcció de l'obra:



Conducció experimental:



Creació de materials divulgatius:

