

# LA RECARGA DEL RÍO LLOBREGAT CON AGUA REGENERADA: REUTILIZACIÓN POTABLE INDIRECTA EN BARCELONA

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13 de Noviembre de 2024

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Agència Catalana  
de l'Aigua



Generalitat  
de Catalunya

# Location

## Catalonian river basin district



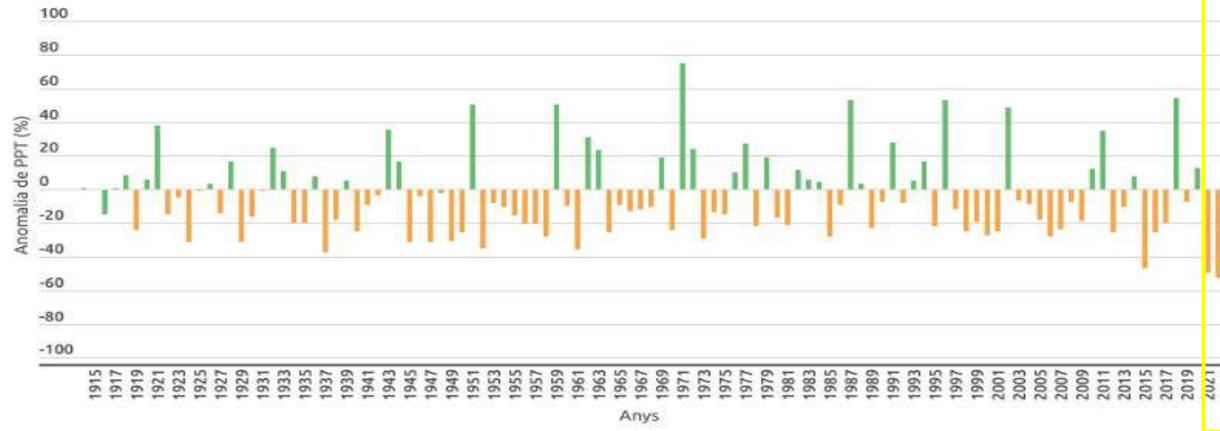
International and national river basin districts and sea regions

- |  |   |
|--|---|
| International river basin district               | Regional sea coastline                          |
| National river basin district                    | Black Sea                                       |
| International river basin district outside EU-27 | Mediterranean Sea                               |
| National river basin district outside EU-27      | Celtic Sea, Bay of Biscay and the Iberian Coast |
| International river basin district boundary      | Greater North Sea                               |
| Country boundary                                 | Baltic Sea                                      |
| EU-27 boundary                                   | Outside EU-27                                   |



# An unprecedented four-year drought (still ongoing)

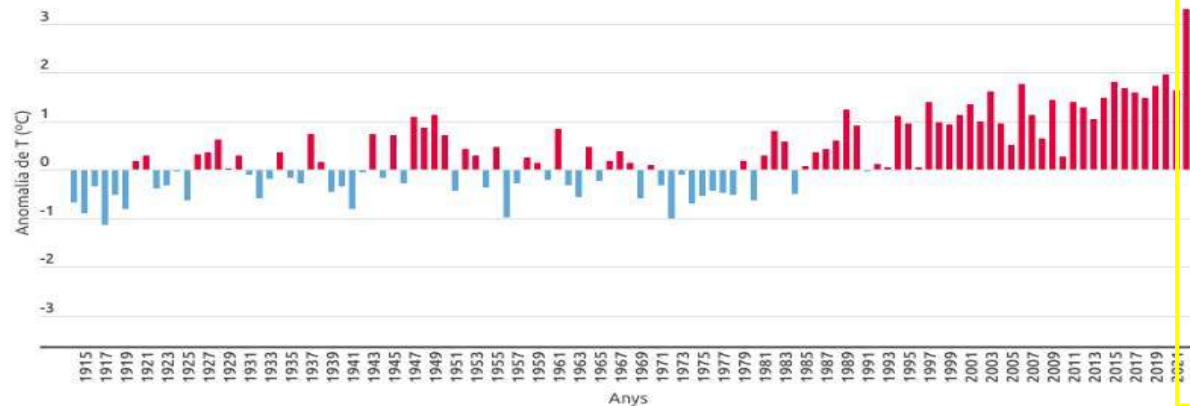
Observatori Fabra - Anomalia de la precipitació acumulada anual



**Rainfall deficit of 50%**

On the graph:  
Annual precipitation anomalies (%)

Observatori Fabra - Anomalia de la temperatura mitjana anual

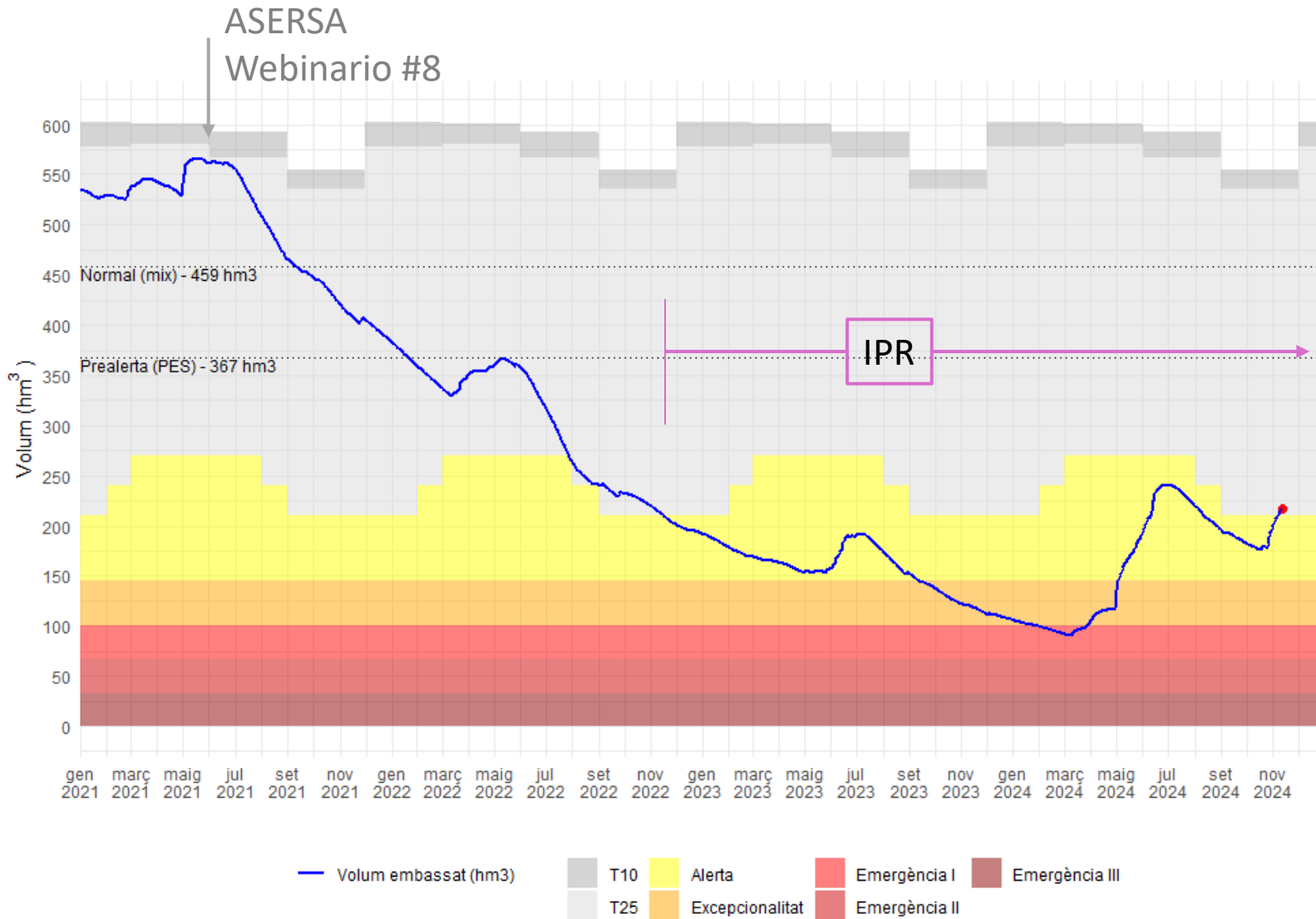


**Record temperatures**

On the graph:  
Annual average temperature anomalies (°C)



# An unprecedented four-year drought (still ongoing)

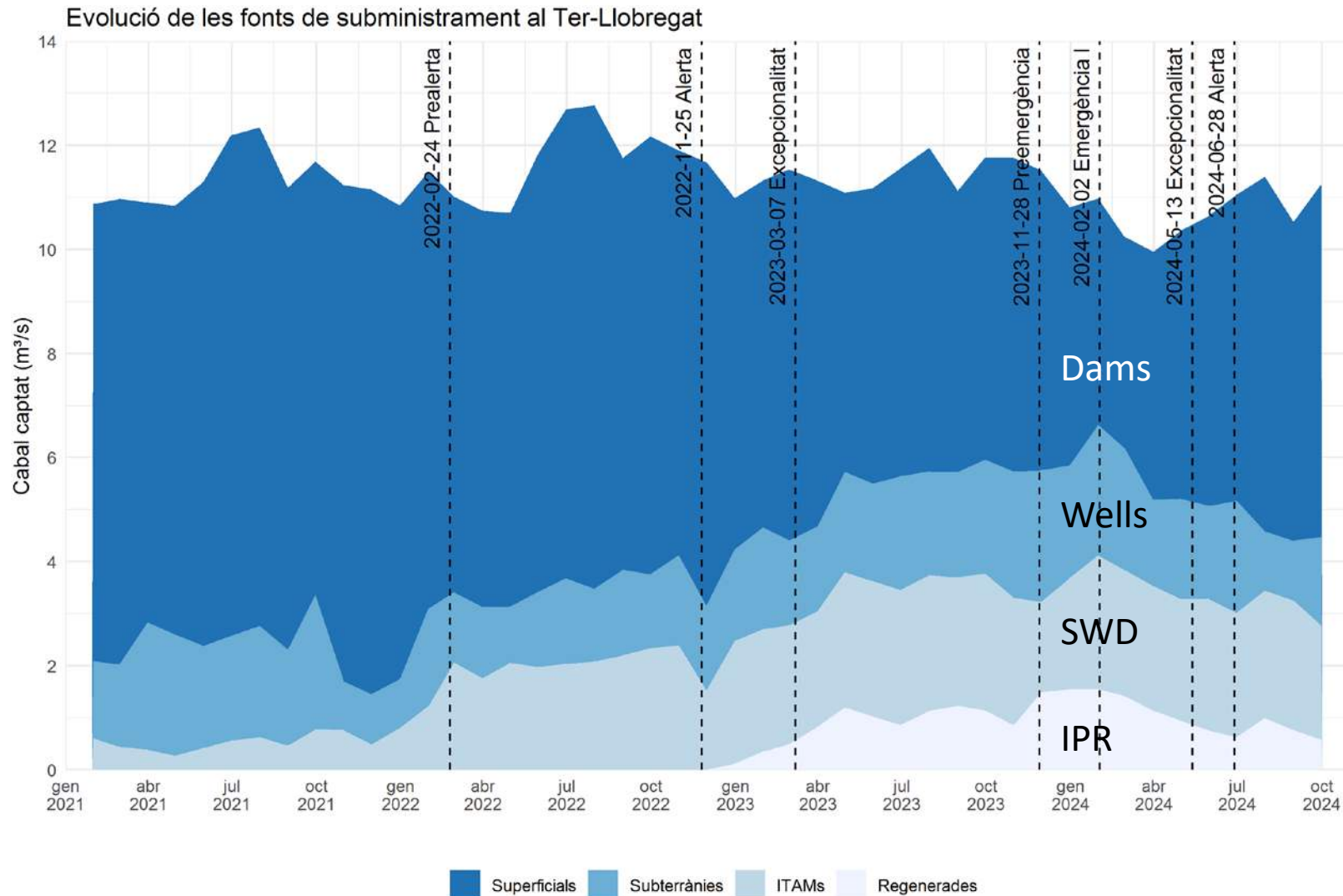


Sept. 21



March 24

# An unprecedented four-year drought (still ongoing)

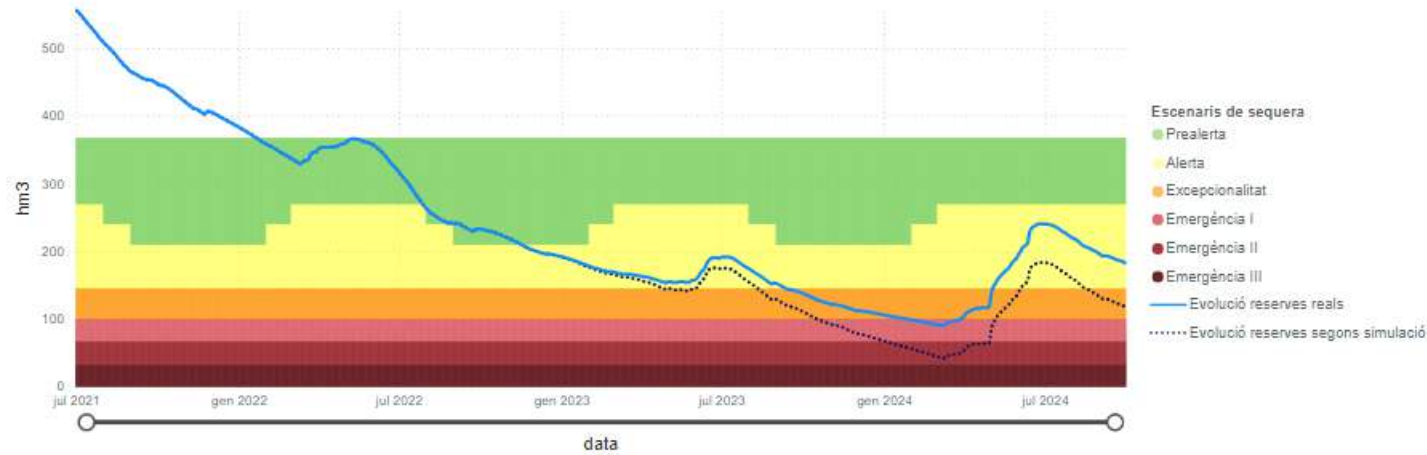


Última actualització: 2024-10-24 04:35:54, última dada: 2024-10-22

# An unprecedented four-year drought (still ongoing)

## Simulador de l'efecte de les mesures adoptades en aplicació del Pla de sequera (PES)

Evolució de les reserves d'aigua als embassaments del sistema Ter-Llobregat (juliol 2021 - setembre 2024)



[https://sequera.gencat.cat/ca/accions/com-garantim-laigua-durant-la-sequera/evolucio-sequera-amb-pla-sequera/index.html#googtrans\(ca|es\)](https://sequera.gencat.cat/ca/accions/com-garantim-laigua-durant-la-sequera/evolucio-sequera-amb-pla-sequera/index.html#googtrans(ca|es))

### Aigua aportada de nous recursos



### Estalvi d'aigua generat per les mesures (PES)



### Dies sense aigua





# The first steps

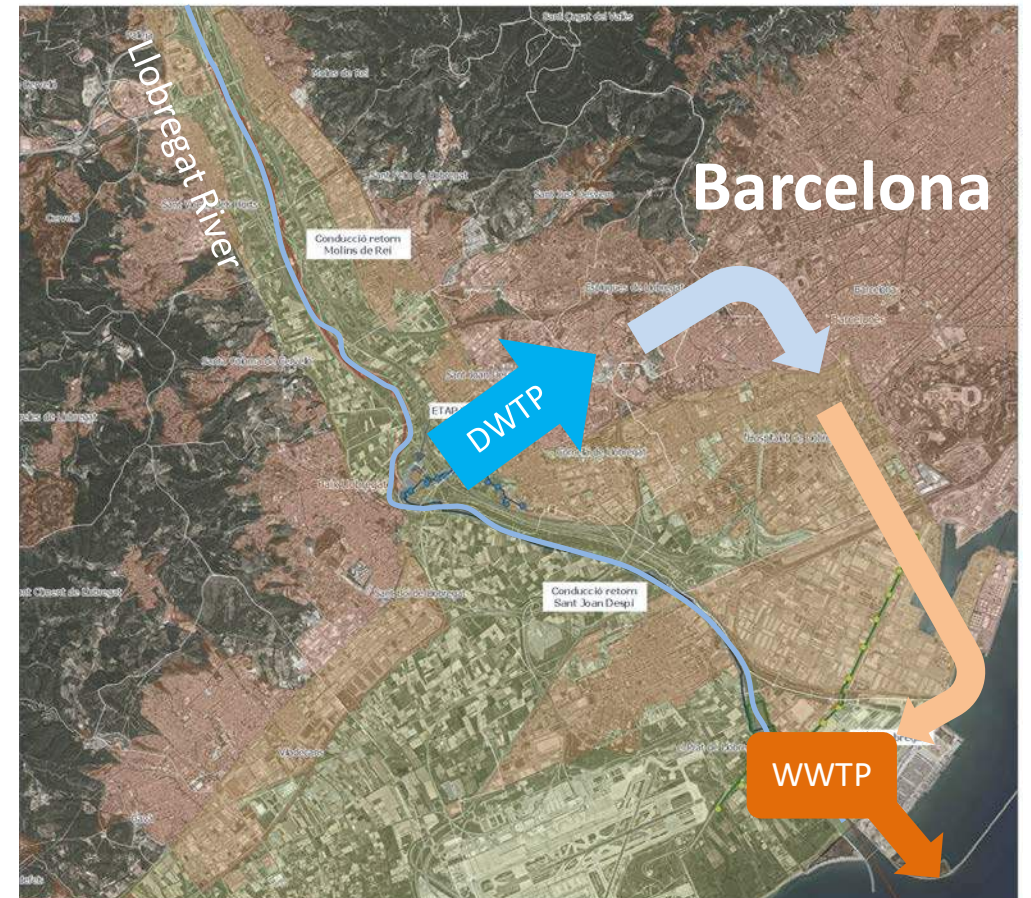


## WWTP El Prat de Llobregat

The WWTP was built, initially discharging into de Mediterranean Sea



*El Prat de Llobregat Wastewater Treatment Plant*





# The first steps



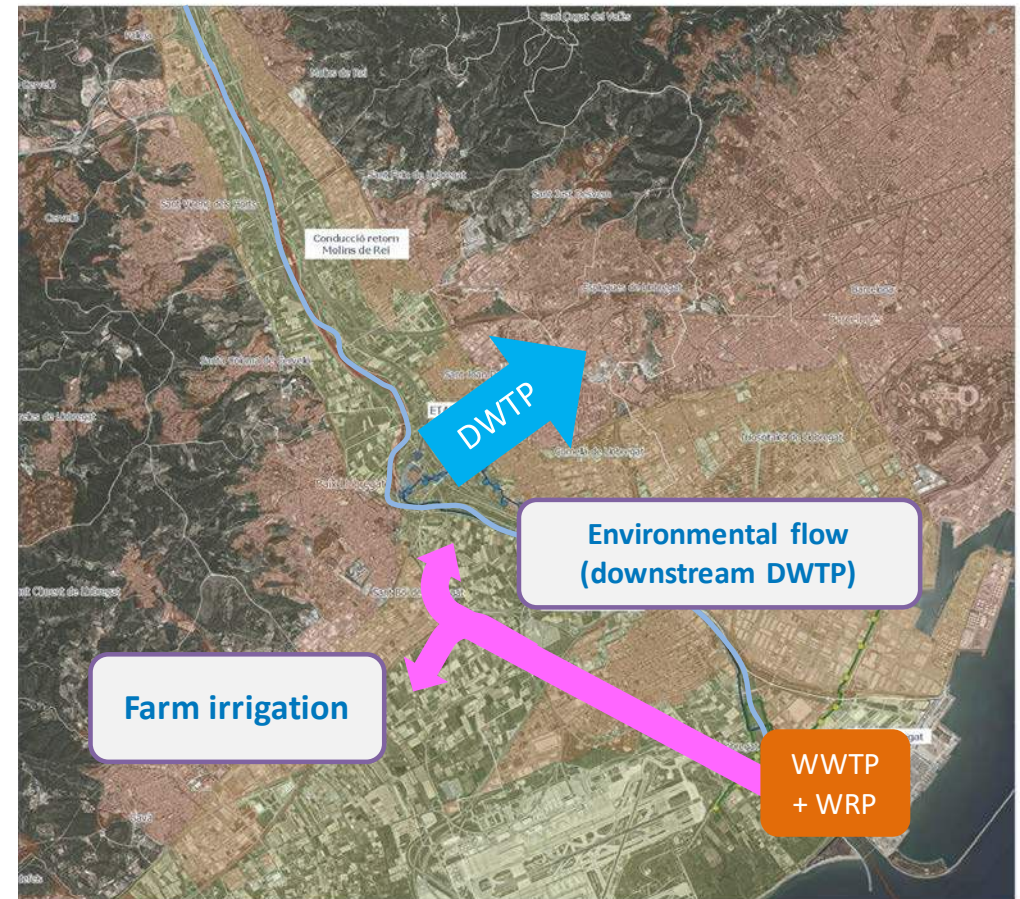
○  
WWTP El Prat de Llobregat  
The WWTP was built, initially discharging into de Mediterranean Sea



*Water Reclamation Treatment Plant*

## Water reuse scheme

A reclamation plant was built, and **water reuse** began for farm irrigation and environmental flow





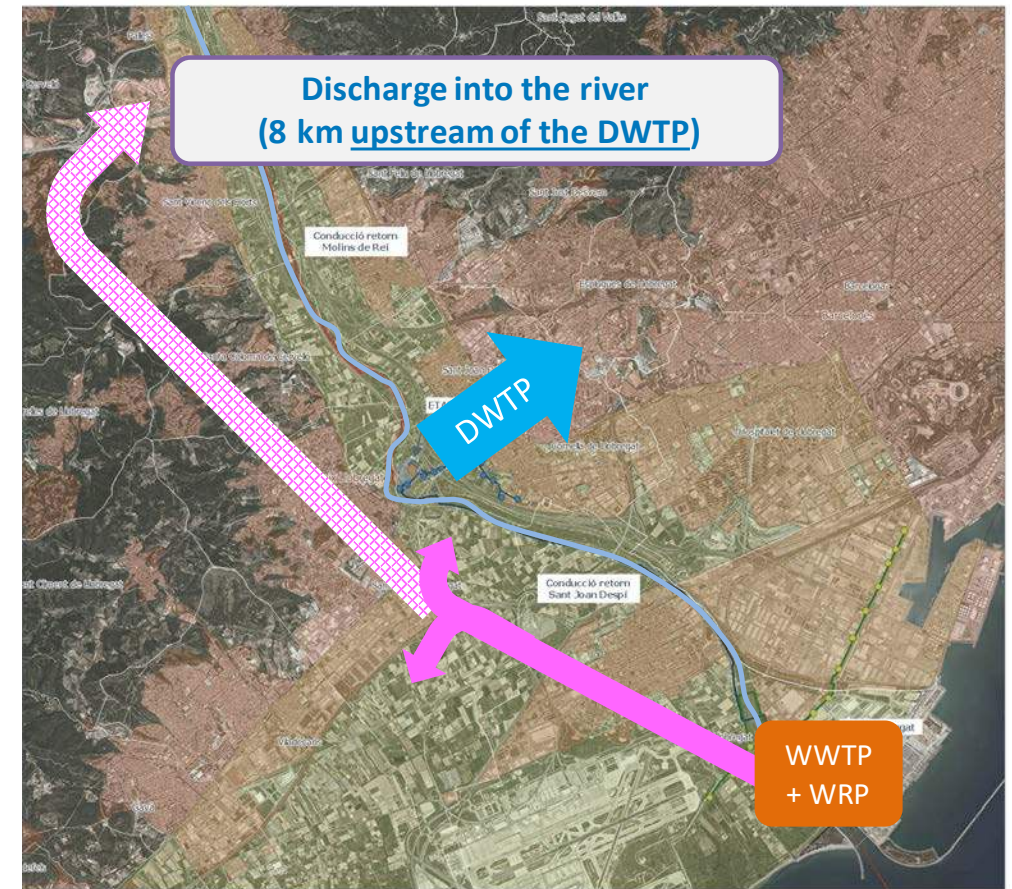
# The first steps



**WWTP El Prat de Llobregat**  
The WWTP was built, initially discharging into de Mediterranean Sea

**The IPR pipe**  
Following the 2008 drought, a pipe to discharge reclaimed water upstream of the DWTP was built as a “safety net”. Some initial trials were performed.

**Water reuse scheme**  
A reclamation plant was built, and water reuse began for farm irrigation and environmental flow



# The first steps

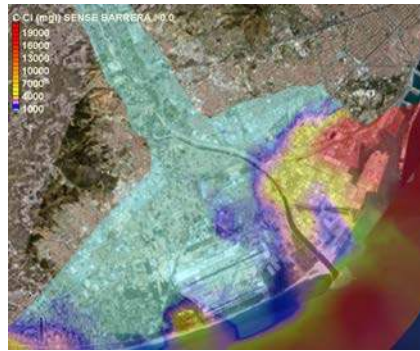


**WWTP El Prat de Llobregat**  
The WWTP was built, initially discharging into de Mediterranean Sea

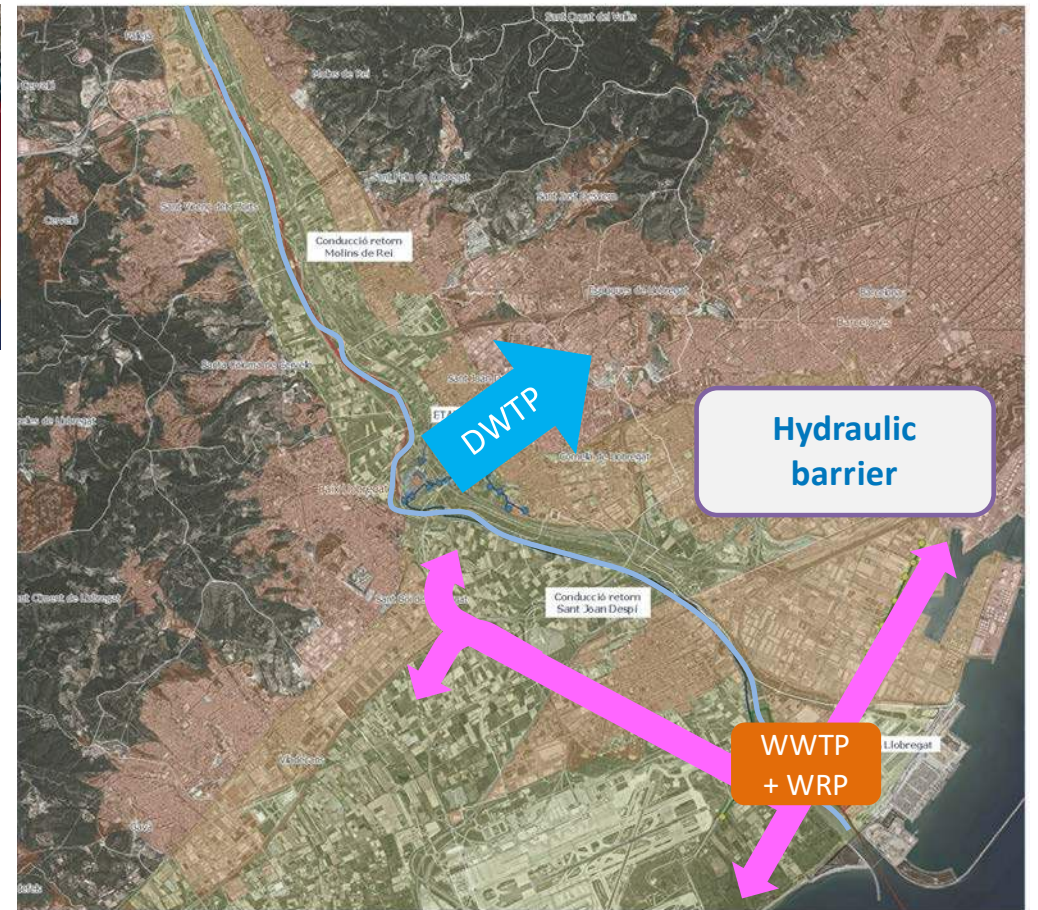
**Water reuse scheme**  
A reclamation plant was built, and water reuse began for farm irrigation and environmental flow

**The IPR pipe**  
Following the 2008 drought, a pipe to discharge reclaimed water upstream the DWTP was built, as a “safety net”. Some initial trials were performed.

**Groundwater replenishment**  
A **hydraulic barrier** was built to fight seawater intrusion in the aquifer. It was our first step in IPR.



*Chloride in the GW*





# A new impulse for IPR



## Design of the Demonstration Trial

During the drafting of the new Drought Plan, the Catalan Water Agency created **two working teams** to design an exhaustive trial of the IPR facility.



## Stakeholders

- Catalan Water Agency
- Catalan Health authority
- Metropolitan Area (local authority)
- ABEMCIA (facilities' operator)

## External Expert Panel

Microbiologists, toxicologists, environmental chemists, science communicators, ecologists, water treatment experts,...



# A new impulse for IPR



## Design of the Demonstration Trial

### WATER RECLAMATION TREATMENT PLANT



Coagulation-flocculation  
Lamellar settling  
Microscreens (10 μm)  
UV disinfection (50 mJ/cm<sup>2</sup>)  
Sodium hypochlorite (*opt.*)



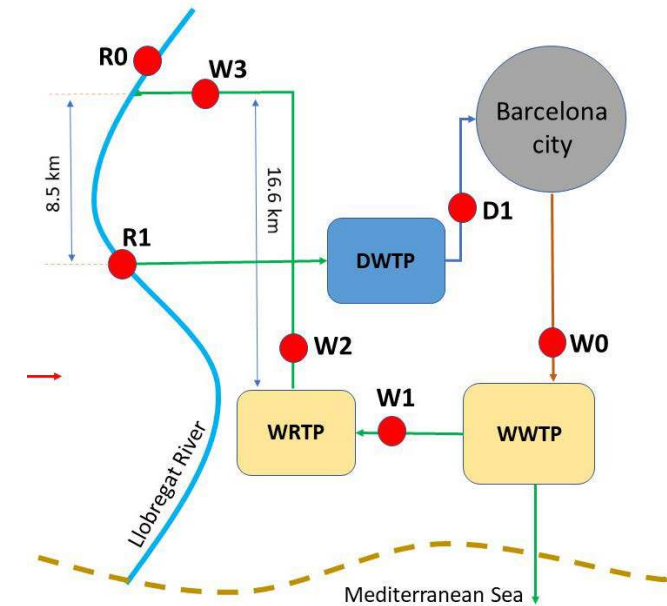
### DRINKING WATER TREATMENT PLANT



Pre-oxidation (ClO<sub>2</sub>)  
Flocculation, settling and sand filtration

UF + RO

O<sub>3</sub> + GAC



Sampling points

# A new impulse for IPR



## Execution of the demonstration trial

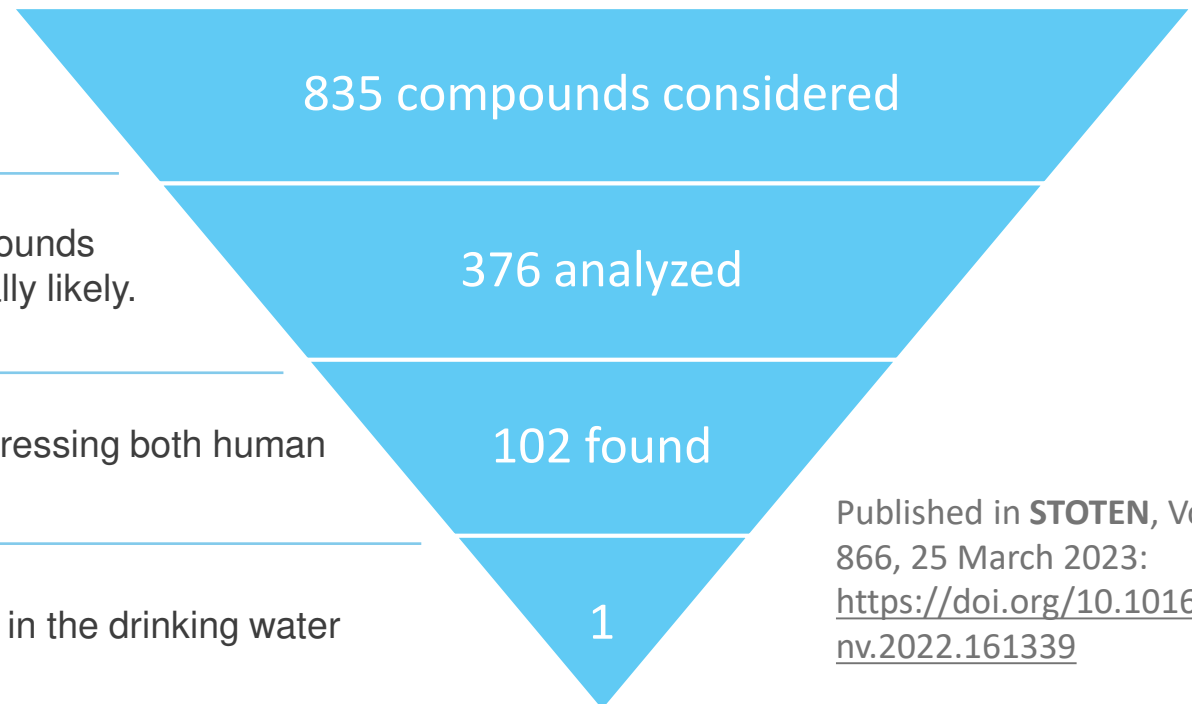
The trial was conducted in June-July of 2019, to assess the efficiency of the entire treatment train (WWTP-WRTP-River buffer- DWTP).

Sources are checked to drafts a **preliminary-list** of 835 compounds for consideration

A **“short-list”** was agreed upon, consisting of those compounds whose presence in treated wastewater was judged minimally likely.

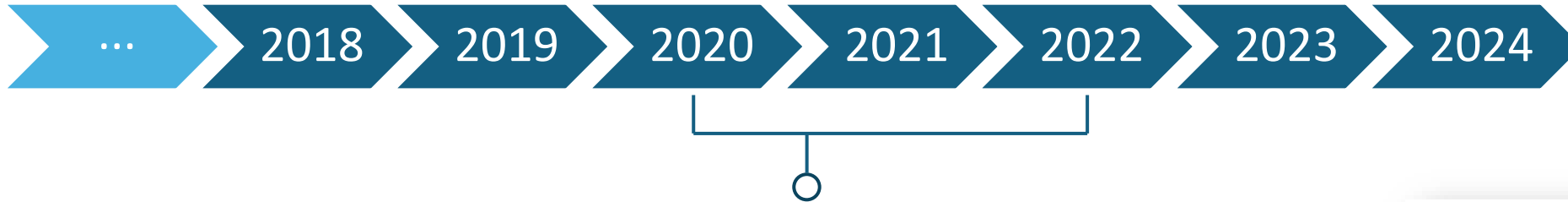
**Guide values** were established for these compounds, addressing both human health and environmental health concerns.

Only **one compound** (1,4-dioxane) was found near its GV in the drinking water



Published in **STOTEN**, Volume 866, 25 March 2023:  
<https://doi.org/10.1016/j.scitotenv.2022.161339>

# A new impulse for IPR



## Pollution source control

Intensified sewage monitoring was set up, identifying three factories as the main source of 1,4-dioxane.

Administrative processes, established under the Drought Plan, were initiated to modify their discharge permits to the sewage.



*Drought Plan*



# IPR in operation



## The IPR discharge begins

Following the declaration of the [Drought Alert](#) and according to the plan, the IPR discharge began in December 2022. The discharged flow was gradually increased over the following six months.

During operation, [no guideline values have been exceeded](#) in the drinking water.

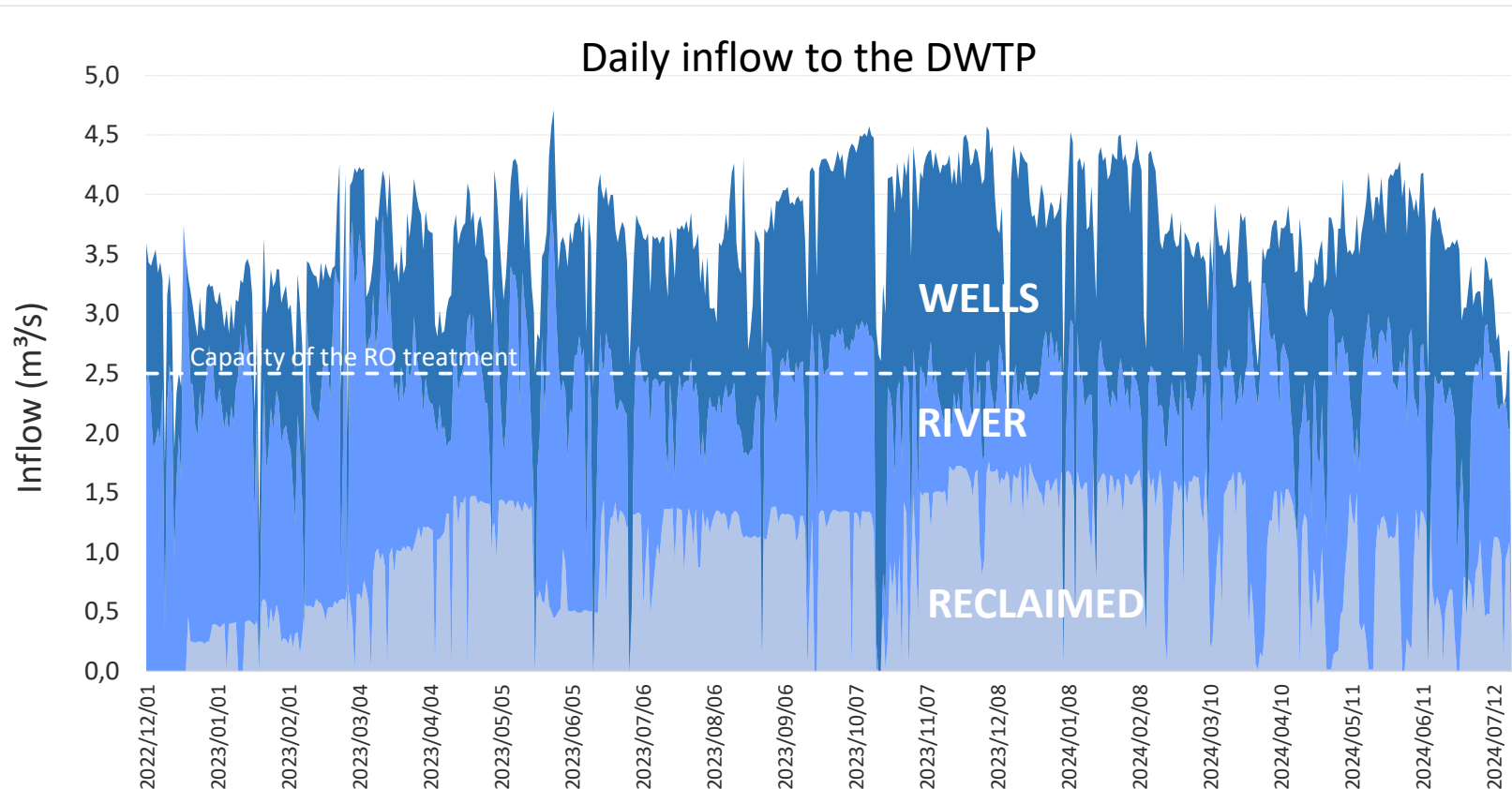


# IPR in operation

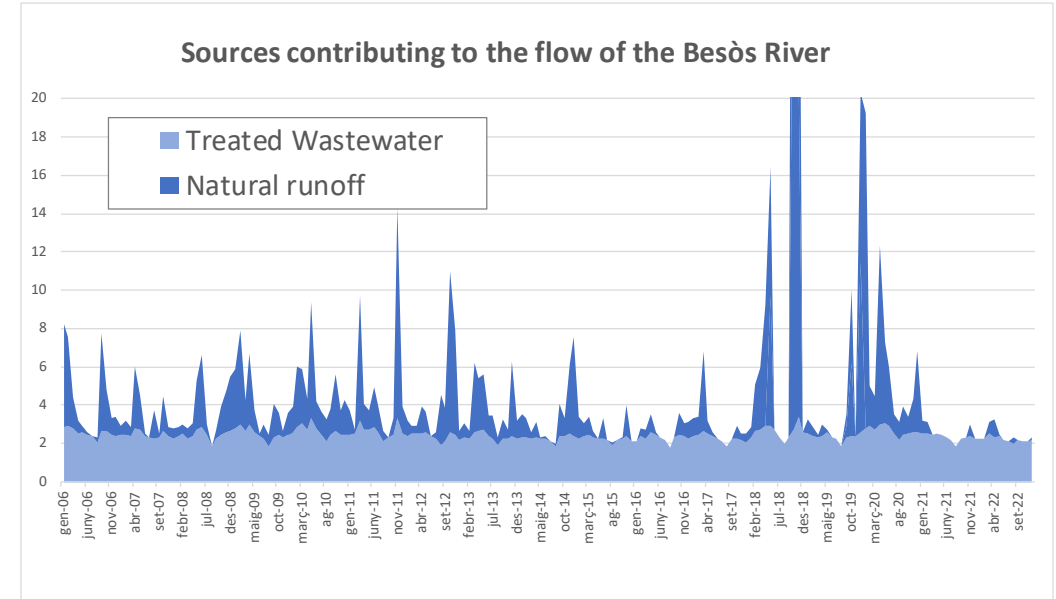


**The IPR becomes a crucial component of the supply mix**

To the date, the IPR has been in operation for 23 months, contributing 55 hm<sup>3</sup>.



# Next project: Indirect Potable Reuse at the Besòs river



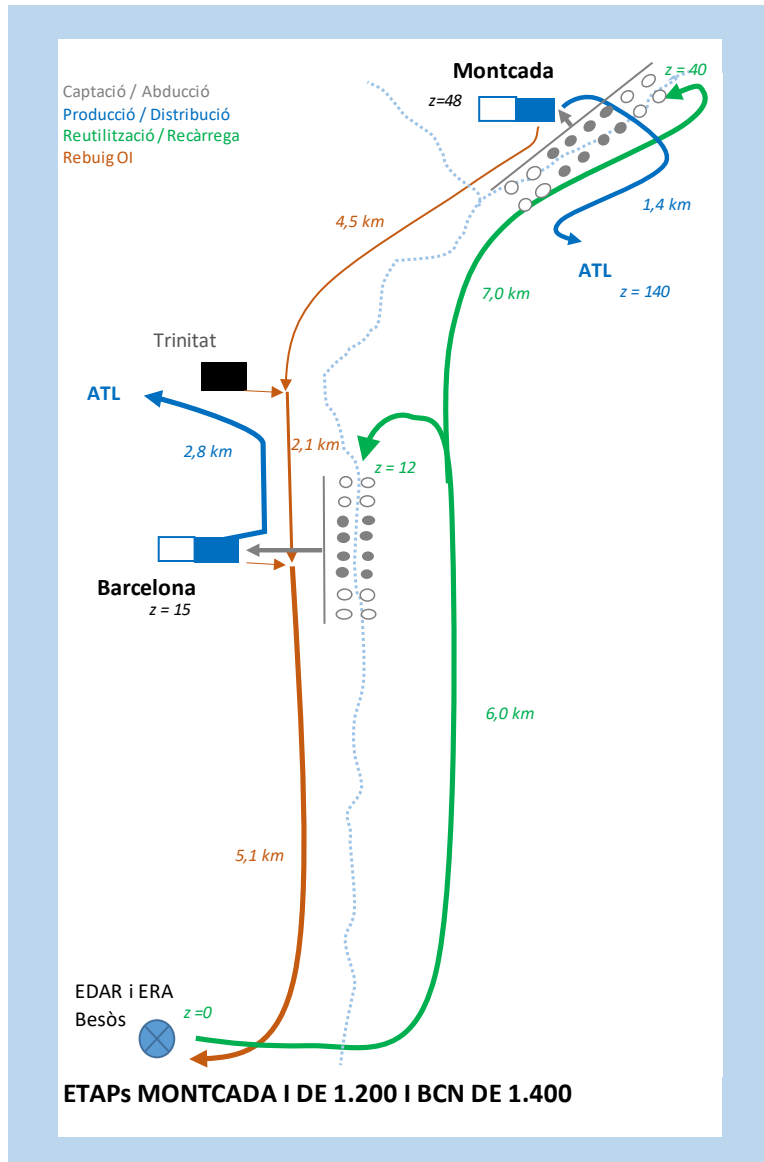
*Besòs River*



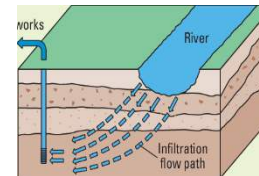
*Besòs Wastewater Treatment Plant (Barcelona)*



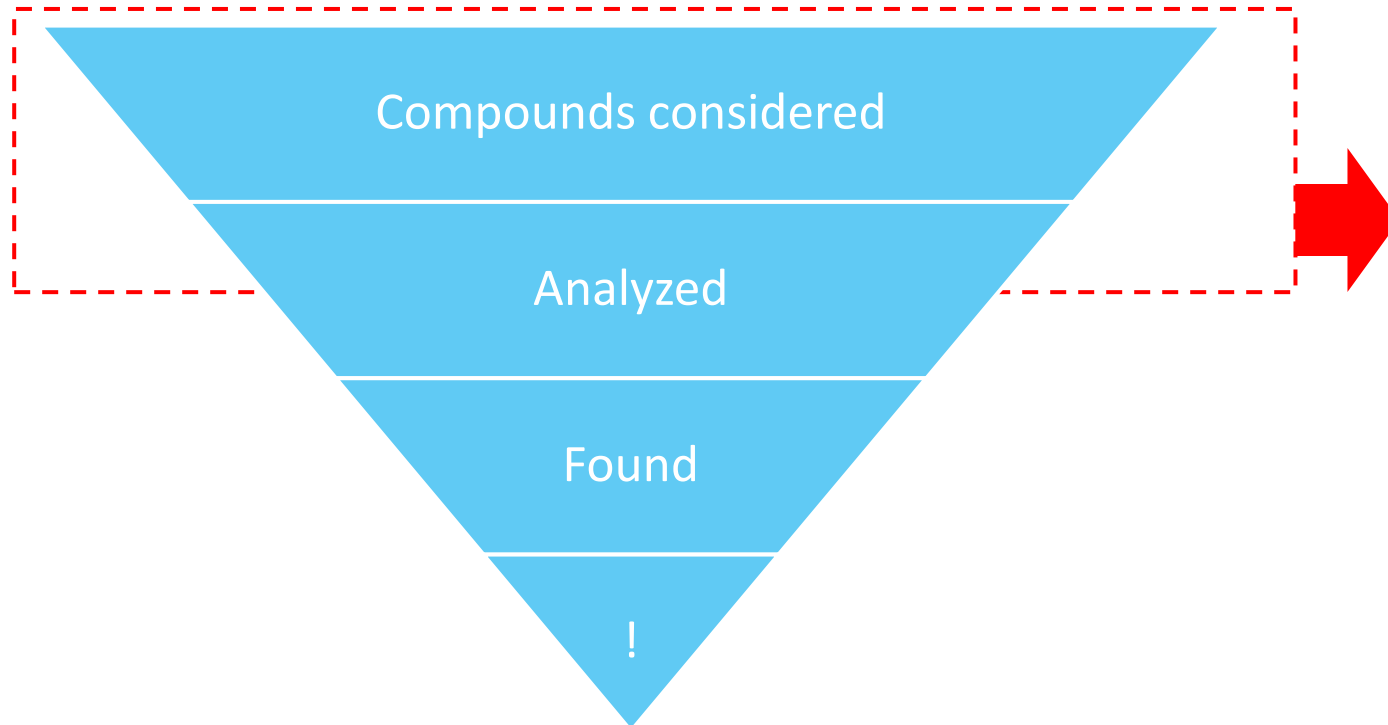
# Next project: Indirect Potable Reuse at the Besòs river



*Wells for the future  
Barcelona's Besòs  
Drinking Water  
Treatment Plant*



## Next project: Indirect Potable Reuse at the Besòs river



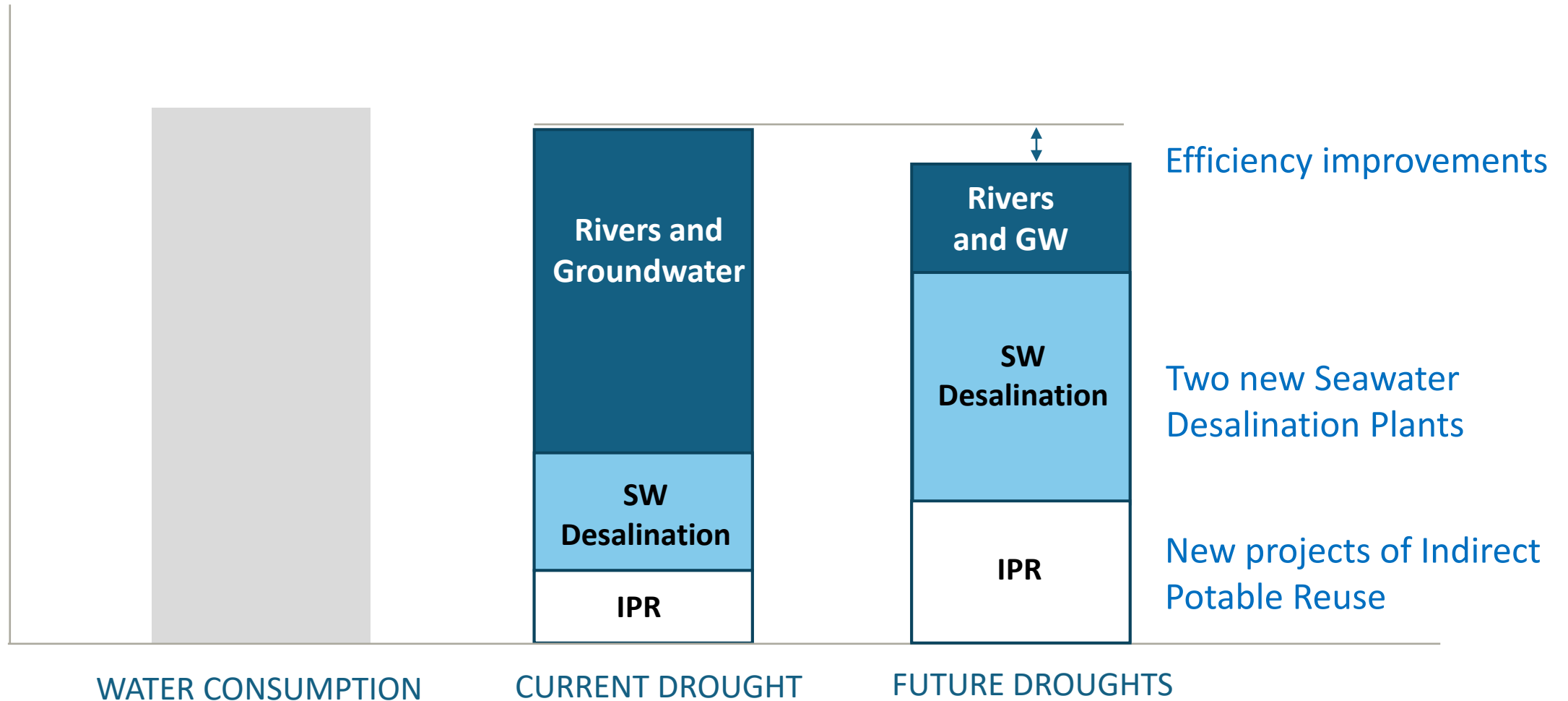
### Non-target analysis:

The preliminary list can now be replaced by a NTA, that can provide a comprehensive list of micropollutants detected in wastewater.

Second-round target analyses are still required.

# Towards water security

Planned components of the bulk water supplied to the Greater Barcelona Area during droughts



*IPR: Indirect Potable Reuse*



# Conclusiones

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## Preparación para la sequía:

- Infraestructura de reutilización potable indirecta concebida inicialmente como una “red de seguridad”
- Fue esencial la implicación temprana de todos los actores y de la comunidad científica.
- La investigación previa también fue muy útil.
- La campaña de demostración fue esencial para identificar los problemas a resolver.
- Es fundamental disponer de un marco legal para poder modificar temporalmente los límites de vertido al sistema de saneamiento. El Plan de Sequía puede incluirlo.

## Siguientes pasos:

- La RPI parece socialmente aceptada en Cataluña, ofreciendo una vía prometedora para alcanzar la seguridad hídrica.
- El desarrollo de las técnicas analíticas Non-Target facilitará los nuevos proyectos.

## Futura regulación europea de la reutilización potable indirecta?

- Debería considerar la cadena completa de tratamiento (depuración-regeneración-potabilización).
- Podría focalizarse en establecer valores guía adicionales para el agua potable, aplicables en sistemas alimentados con aguas regeneradas.

# Muchas gracias por su atención

## **Agència Catalana de l'Aigua**

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