4-5 June 2025

Murcia region & online

#EU GREEN WEEK

LIFE BIODAPH$_2$O: Eco-efficient system for wastewater tertiary treatment and water reuses in the Mediterranean region

BIODAPH$_2$O

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Coordinator

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Universitat de Girona

LIFE PRISTINE Open Days:

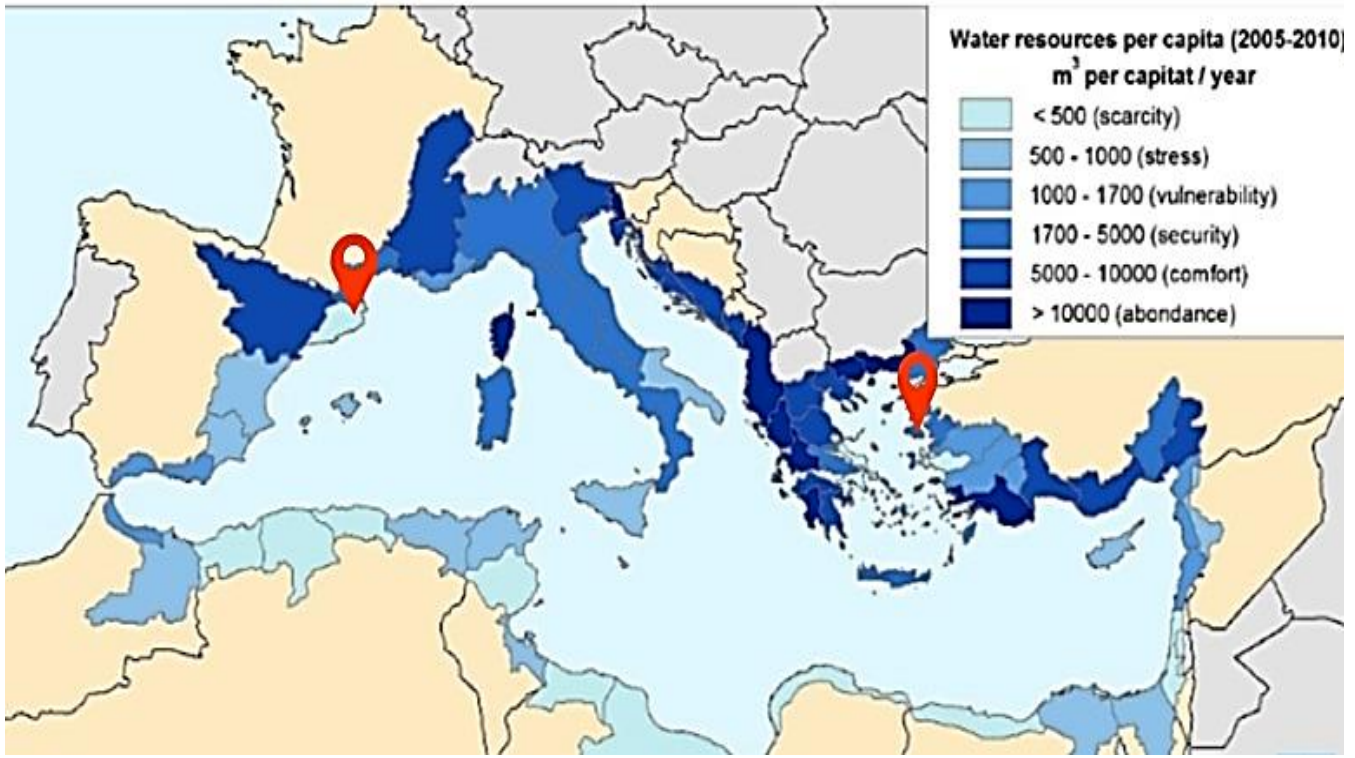
An innovative solution to remove contaminants of emerging concern from water streams

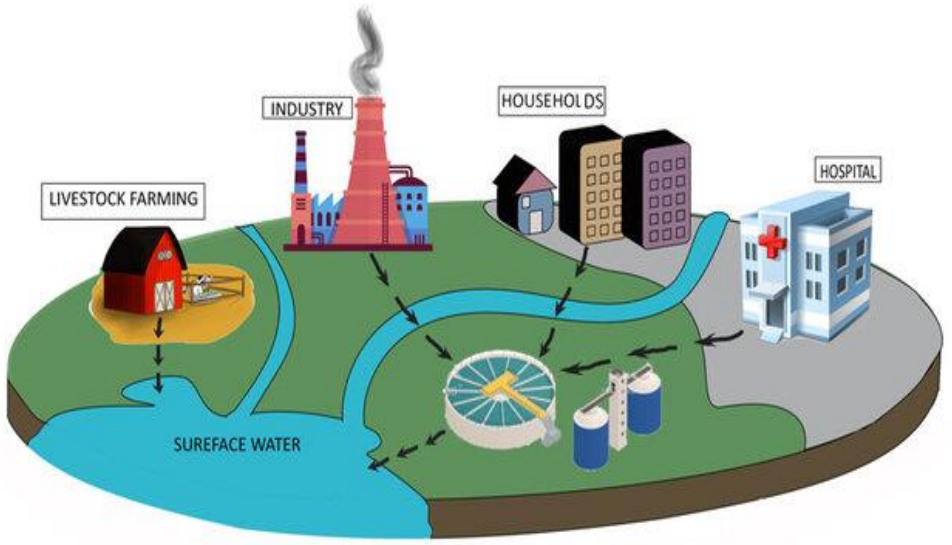
acciona eurecat nx filtration xylem Let's Solve Water esamur

The context

- Water scarcety
- Agricultural uses: 80% water in southern countries
- The inefficiency of the treatment systems led to environmental pollution of water

- The problem with emerging pollutants:
  - Pharmaceuticals and personal care products (PPCPs)
  - Perfluoroalkyl substances (PFAs)
  - Microplastics (MPs)
  - Antibiotic resistance genes (ARGs)

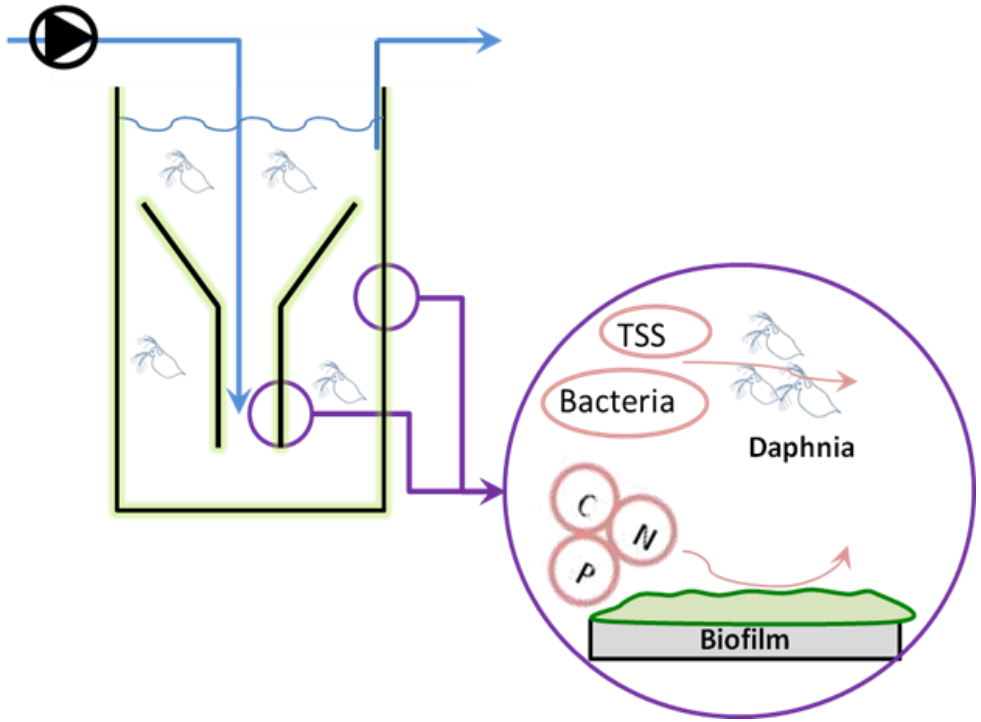




Directive (EU) 2024/3019

BIODAPH a nature –based system

Pillars of BIODAPH technology



Combination of biological filtration (*Daphnia Magna*) and nutrient polishing (biofilm)

Integration of zooplankton in NBS

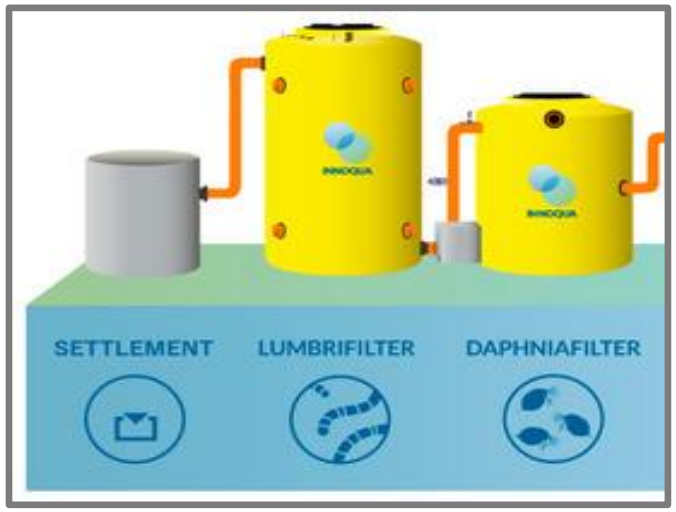
Daphnia is sensitive to:

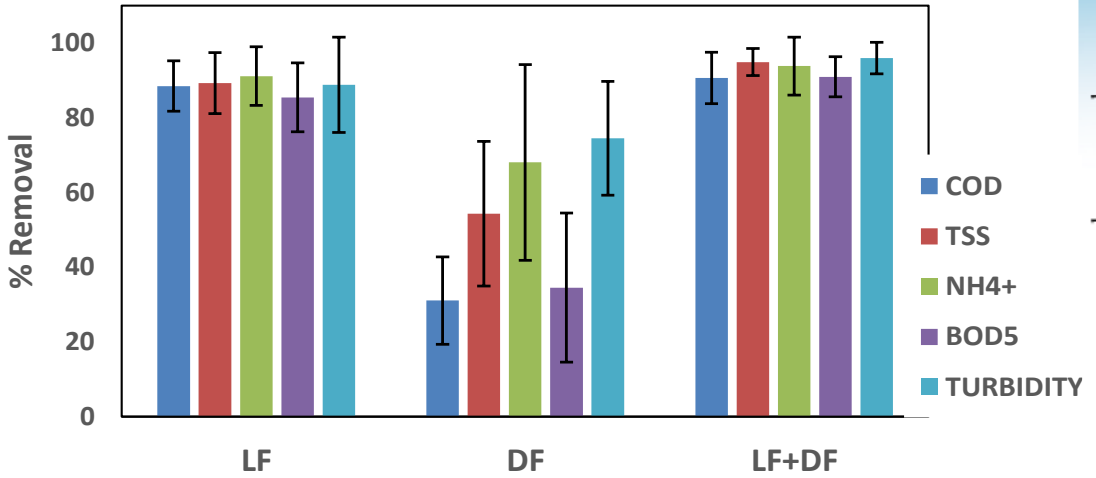
- metals
- organic matter
- high ammonia and nutrient concentrations

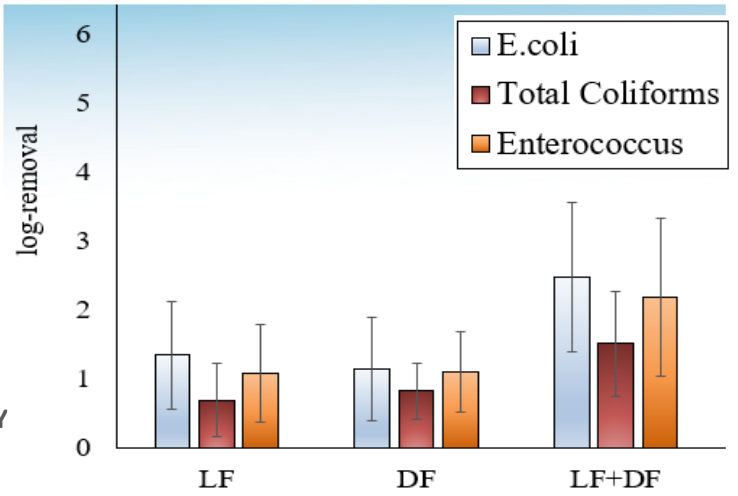
limited to a **tertiary/quaternary** treatments

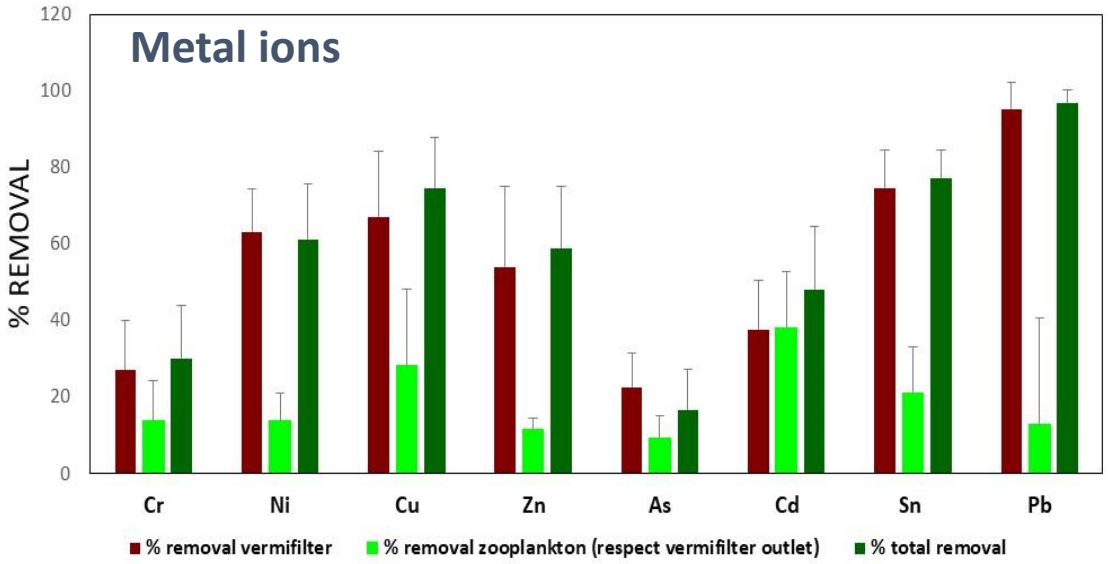
Results in a previous project

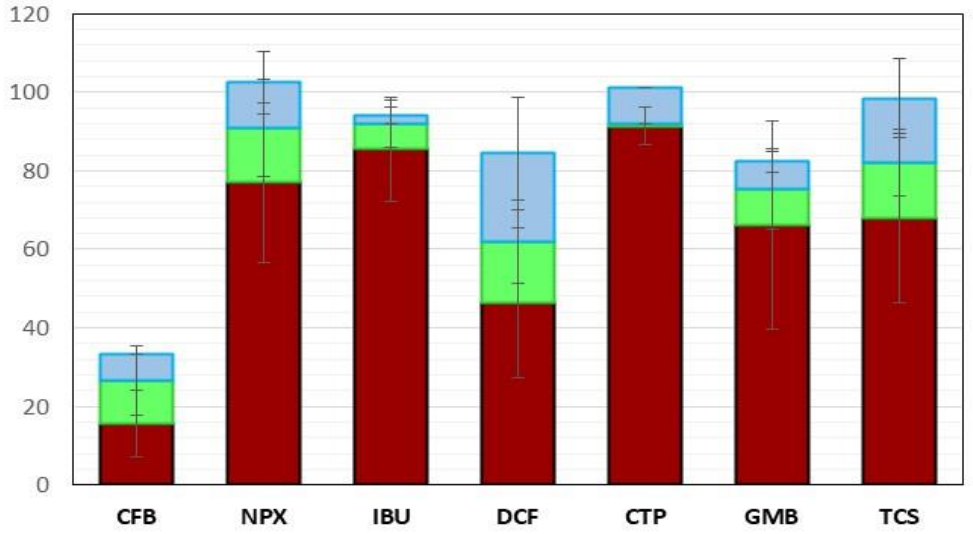
Horizon 2020-GA 689817











Emerging contaminants

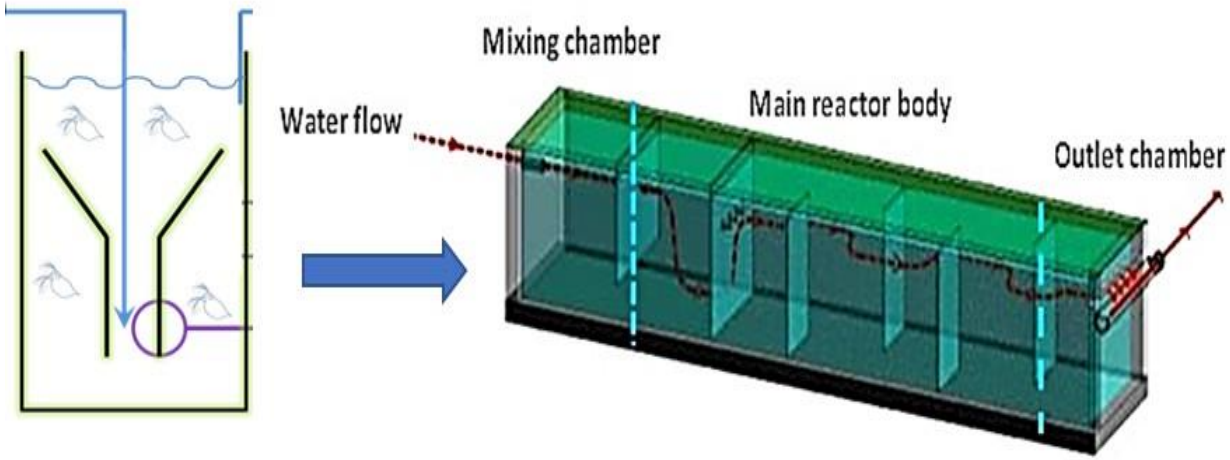
CFB-clofibric acid
NPX-naproxen
IBU-ibuprofen
DCF-diclophenac
CTP-citalopram
GMB-gemfibrozil
TCS-triclosan

What is **BIODAPH$_2$O**

https://life-biodaph2o.eu/

BIODAPH$_2$O is a demonstration project which main objective is the **scaling-up** and implementation of BIODAPH technology at two demo sites located in water-stressed regions of the Mediterranean area with the objectives of:

- To diminish discharges of pollutants and pathogens in freshwater ecosystems
- To promote agricultural reuse of this reclaimed water



Scaling-up: 1.5 m^3 to 100 m^3

Coordinator

Universitat de Girona

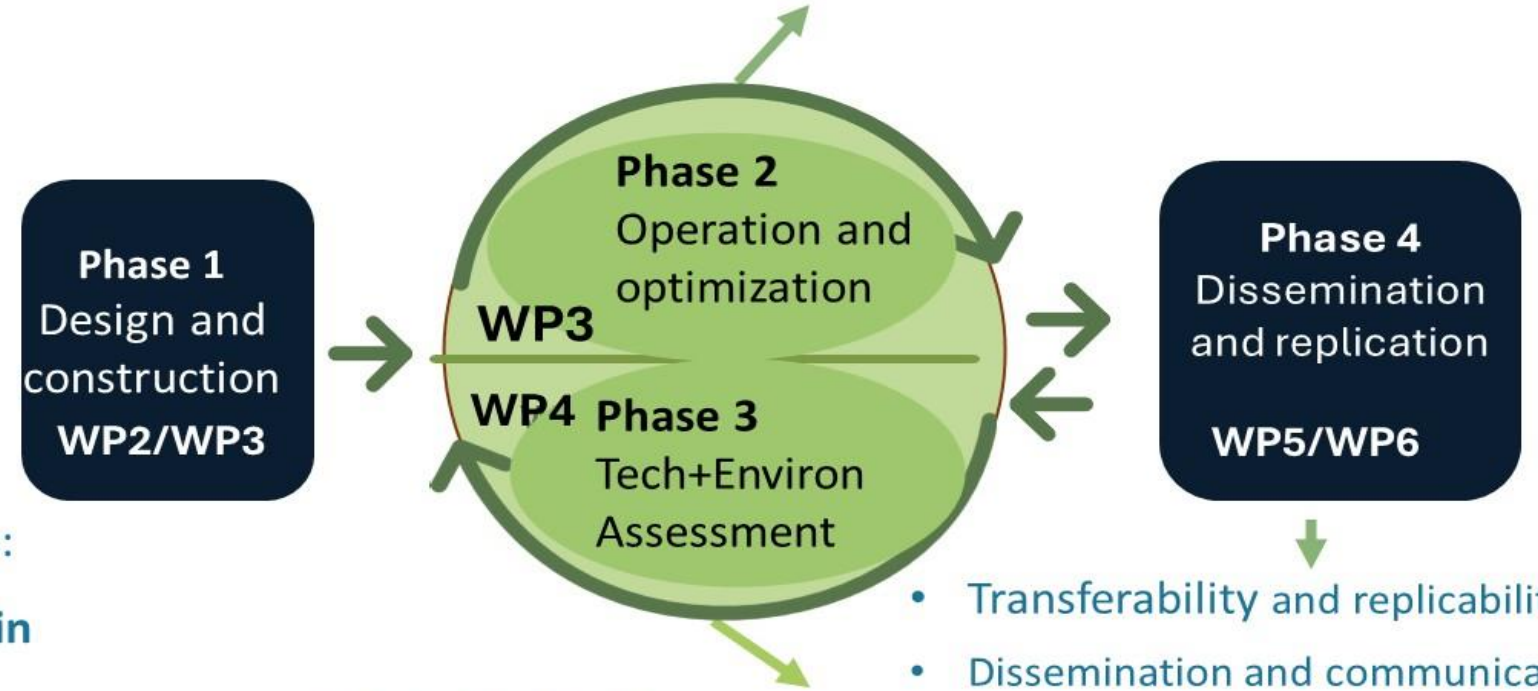
Partners

Total amount: 2,128,772.06
% EC Co-funding: 1,277,263.23
Duration: 01/08/2022 – 31/08/26

Project BIODAPH$_2$O phases

Assessment of the efficiency at different operating conditions:
Removal of **pollutants** (emerging contaminants, nutrients, suspended solid & pathogens) in accordance with **national & EU regulations**

- To **upscale BIODAPH** technology
- To **optimize hydrodynamic** and **biological** design parameters



- To **build** and **install** the reactors:
  - To treat **200 m^3/day in Spain**
  - To treat **10-50 m^3/day in Greece**

- Transferability and replicability plan
- Dissemination and communication plan

- **LCA, LCC, S-LCA**
- Environmental Technology verification (**ETV**)
- Exploration and business plan

Two demo-sites, two configurations, and two objectives

Quart
Girona
(Catalonia, Spain)

INPUT
Municipal Wastewater

Activated sludge system

BIODAPH reactors
200 m^3/day

OUTPUTs
Reclaimed water

Onyar river

- To improve the quality of aquatic ecosystems

Constructed wetlands

Antissa
Lesvos Island
(Greece)

INPUT
Municipal Wastewater

HYDROUSA

UASB

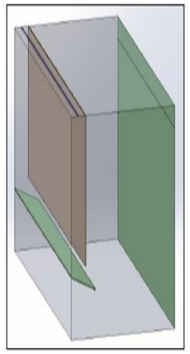
BIODAPH reactor
10-50 m^3/day

OUTPUTs
Water for fertigation
Compost

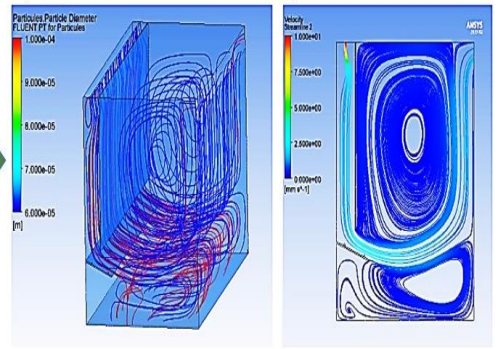
Agroforestry

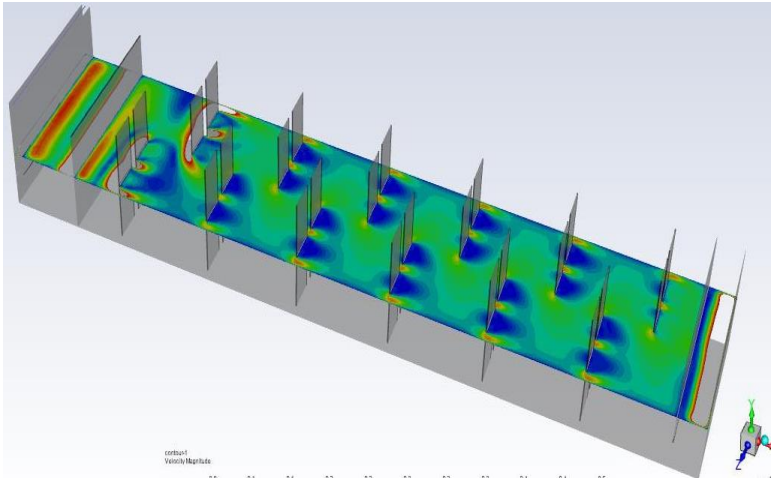
- To obtain reclaimed water for agricultural irrigation EU 2020/741

BIODAPH reactor :Design and construction



CFD





LAMELLA PLATE

INLET

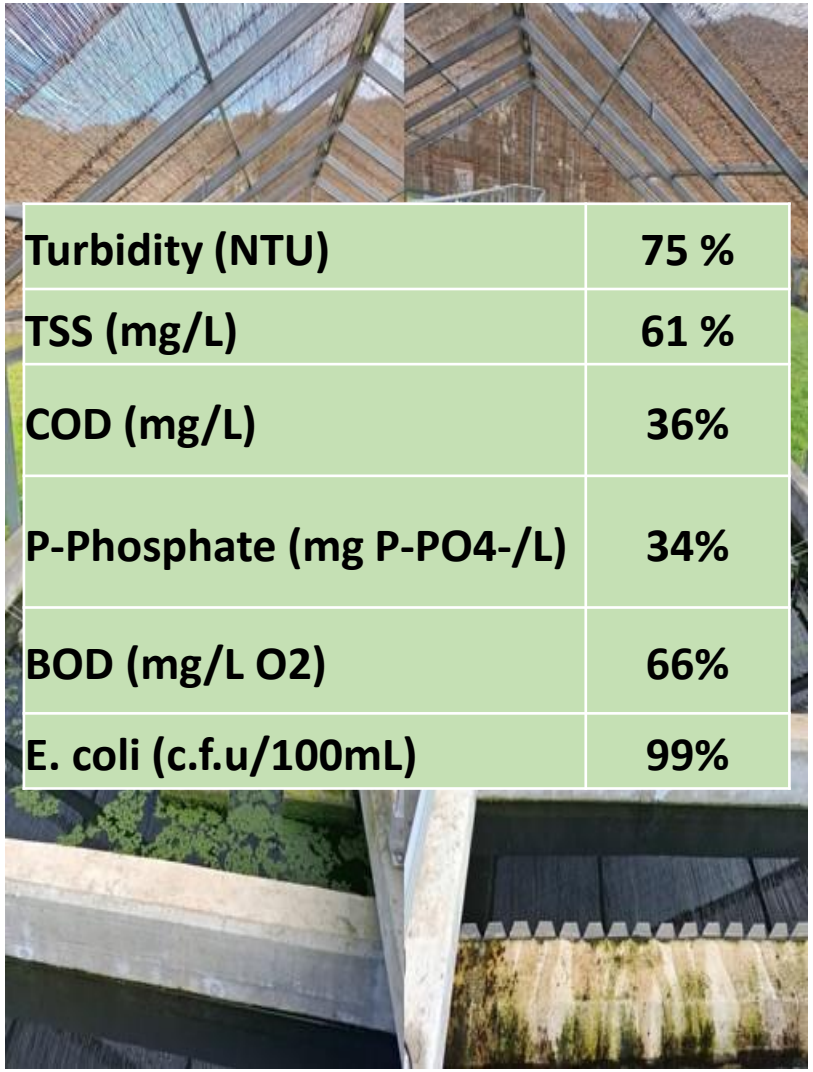
WATER FLOW

OUTLET

MAIN BODY

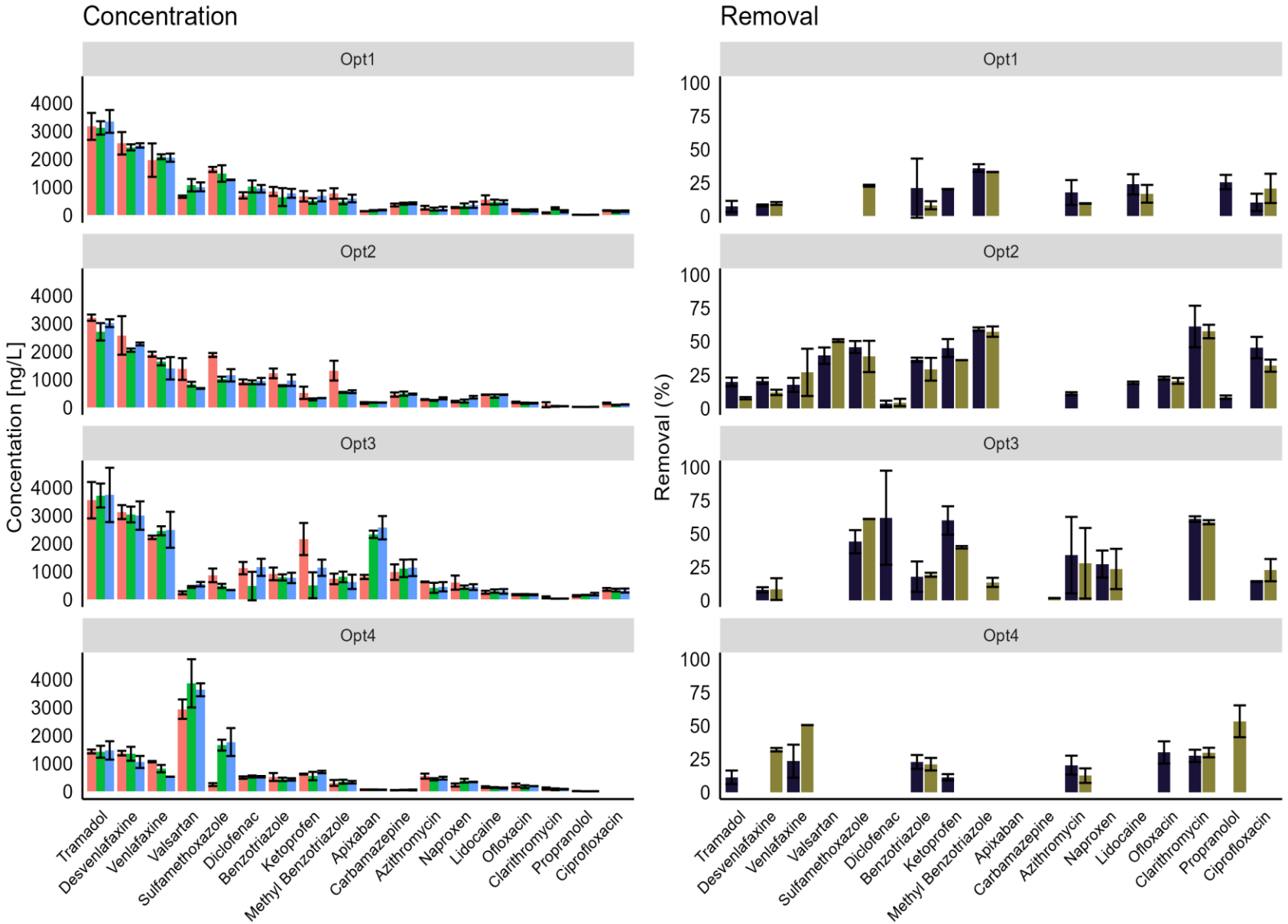
Spanish Patent and Trademark Office, Model Utility, ES1234189

Efficiency



Turbidity (NTU)	75 %
TSS (mg/L)	61 %
COD (mg/L)	36%
P-Phosphate (mg P-PO4-/L)	34%
BOD (mg/L O2)	66%
E. coli (c.f.u/100mL)	99%

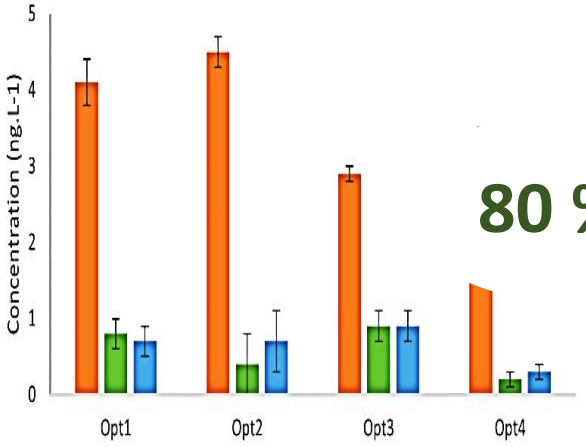
Emerging contaminants



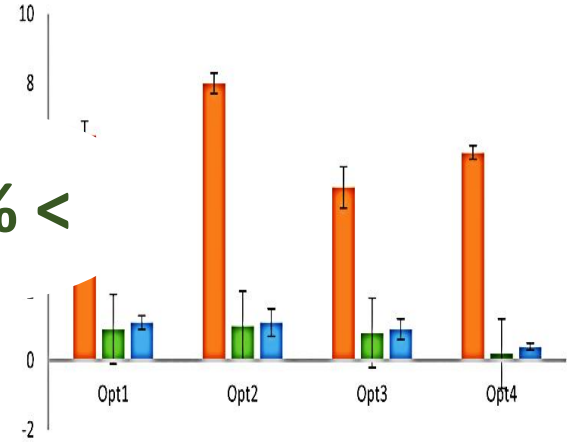
BIODAPH$_2$O

PFAs

PFBS

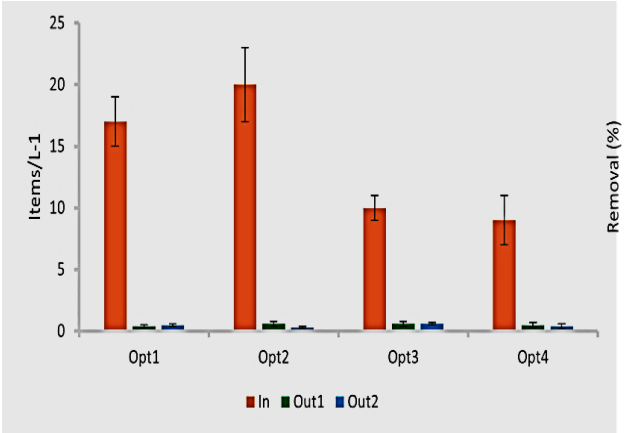


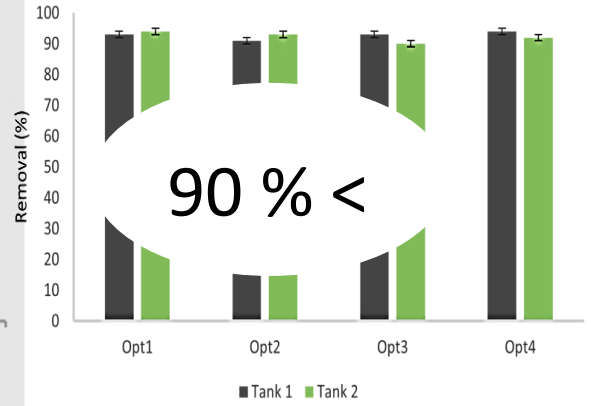
PFOS



80 % <

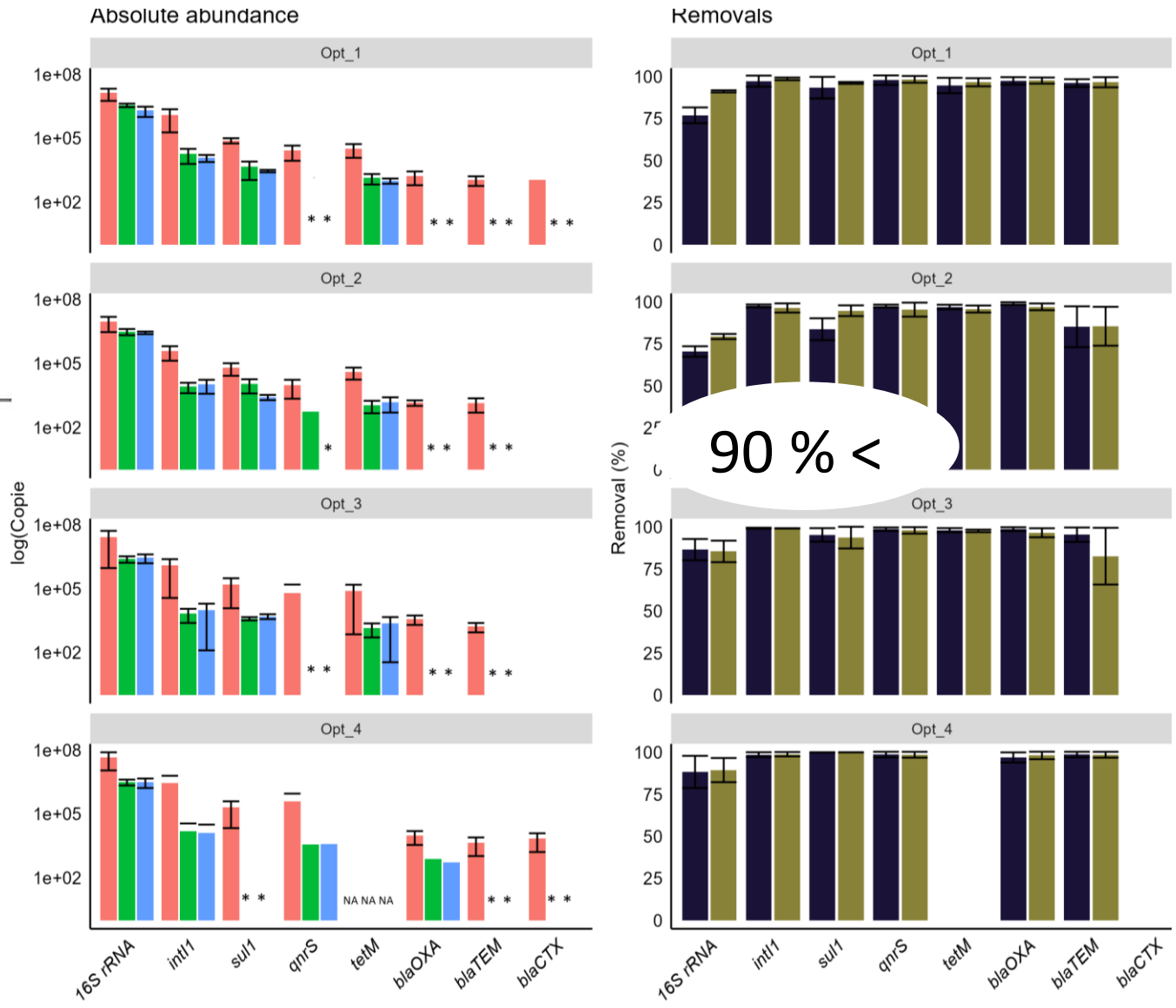
Microplastics





90 % <

Antibiotic Resistance Gens (ARGs)



90 % <

LIFE PRISTINE Open Days: June, 4th 2025

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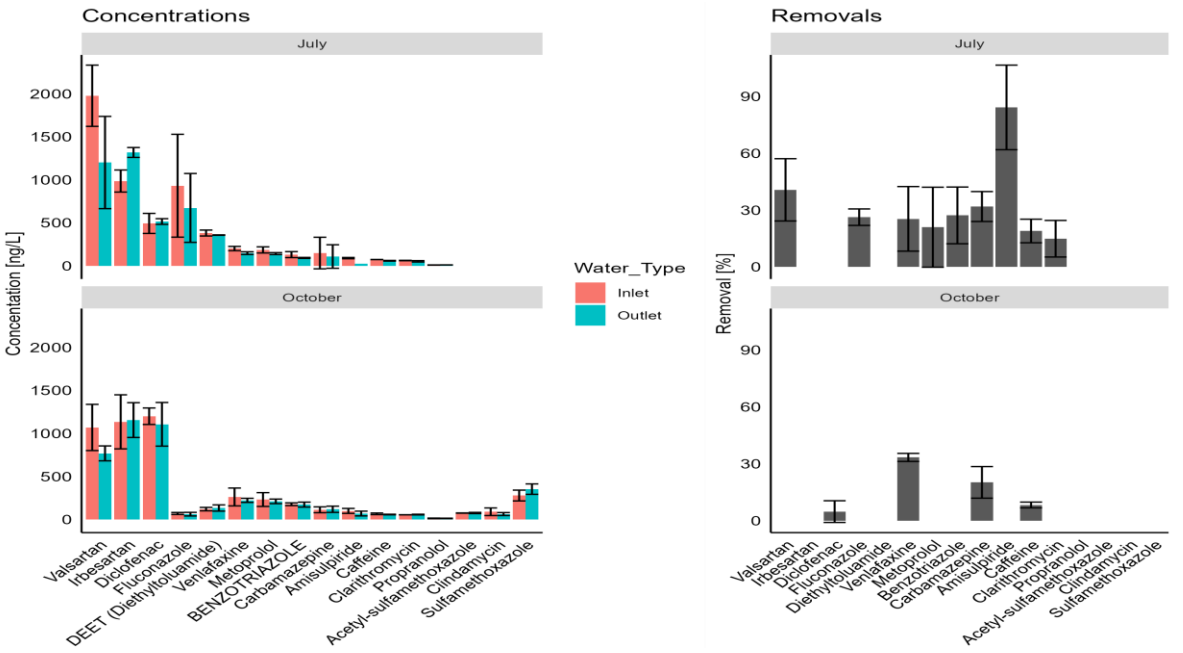
BIODAPH reactor in Antissa demo case (Lesvos, Greece)

Emerging contaminants



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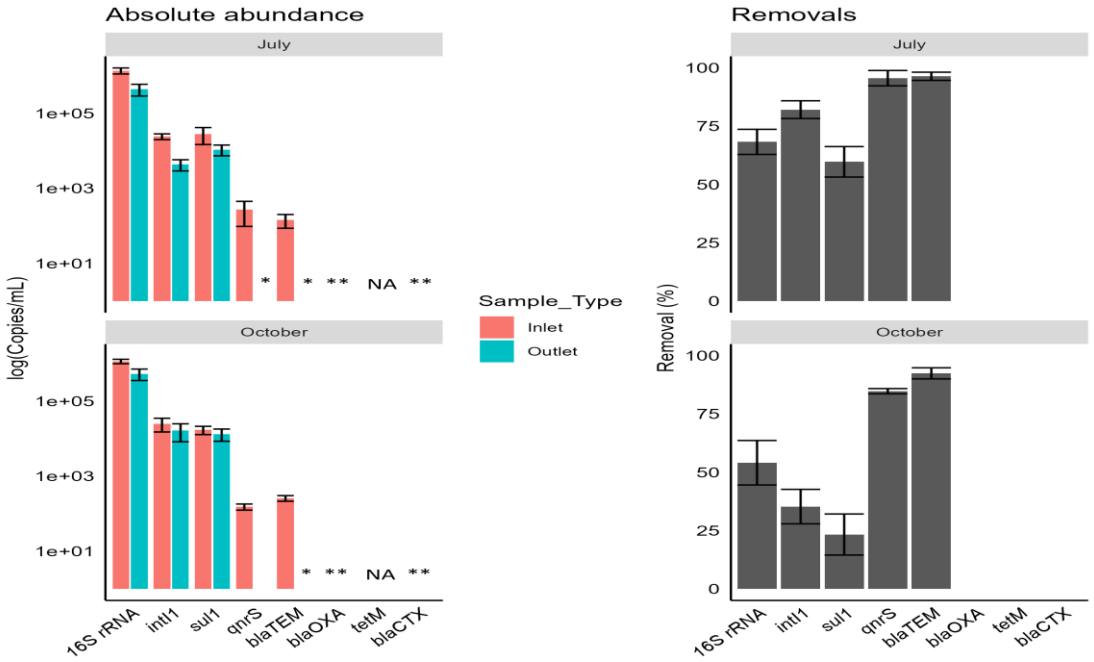

Expected impacts

Water Reuse

Production of 146,000 m^3 of reclaimed water at the Spanish site and 13,200 m^3 for irrigation at the Greek site

"The power of Daphnias“

Improvement of the river ecosystem services and reduction of emerging pollutants by 70-80% in crops irrigated with BIODAPH reclaimed water

Circular economy

Significant reduction in operating costs as the treatment is free from chemicals and is less energy-intensive

Efficient WWTP

Up to 98% reduction of energy consumption in comparison with conventional and advanced WW tertiary systems

Zero pollution

Removing emerging pollutants by ~70% for pharmaceuticals, 90% for AMR, 80% for microplastics, and 60% for PFAS

Sustainable management

Reduction of the carbon footprint and greenhouse gas production by more than 80%

Acknowledgements

Innovative ecological-based modular water reclamation system **INNOQUA**.
EU H2020-WATER-2015-two-stage. 2016-2020.

Assessment of two nature-based solutions as tertiary wastewater treatments for water reuse.
A focus on the removal of micropollutants. **NATUREAQUA** (PID2021-127326PB-I00).

BIODAPH: An eco-efficient tertiary system for water reuse in agricultural irrigation (TED2021-132721B-I00).

BIODAPH2O - Eco-efficient system for wastewater tertiary treatment and water reuses in the Mediterranean region
EU LIFE2021-SA-ENV. 2022-2026.

BIODAPH$_2$O

https://life-biodaph2o.eu/

Thank you!

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LIFE PRISTINE Open Days:
An innovative solution to remove contaminants of emerging concern from water streams

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