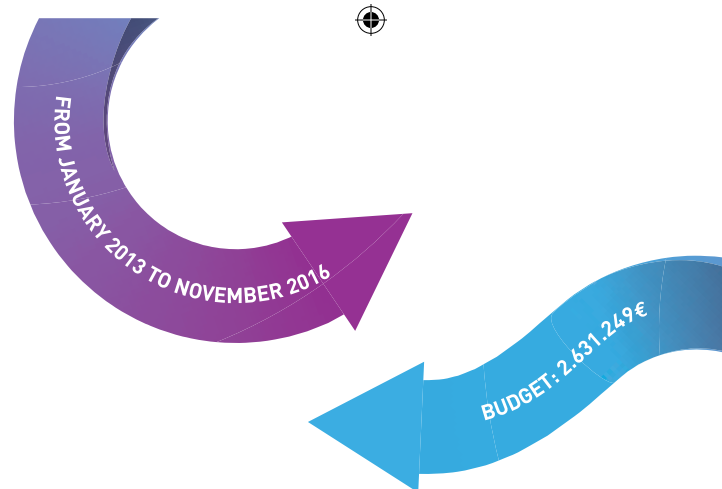


# THE DEMONSTRATION PLANTS

The pilots of the LIFE AWARE Project are located in the Baix Llobregat Waste Water Reclamation Plant, in Barcelona, Spain. Three pilots have been constructed for the project:

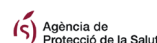
- **MBR:** Biological treatment scheme for the reduction of COD, BOD, SS and TN, with a treatment capacity of 50-60m³/d and equipped with multitubular UF membranes operating in airlift mode.
- **Capillary NF:** Two backflushable capillary NF membranes with high rejection of organic matter and total production of 50-60m³/d.
- **Distribution network prototype:** Simulation of distribution networks of reclaimed water in order to identify under controlled conditions the main factors that influence the development of biofilm and to evaluate biofilm characteristics.



## BENEFICIARIES



## STAKEHOLDERS



### COFINANCED BY



LIFE11 ENV/ES/000606 aWARE



Innovative hybrid MBR systems to promote Water Reuse

<http://www.life-aware.eu/>

## OBJECTIVES

- ▶ To demonstrate the technical and economic feasibility of an innovative **hybrid MBR-PAC-NF** treatment scheme as an alternative to most commonly implemented water treatment and reclamation technologies and to compare them in terms of removal efficiency of **priority and emerging pollutants**.
- ▶ To conduct a **Life Cycle Assessment (LCA)** and **Cost Benefit Analysis (CBA)** for the hybrid MBR-PAC-NF system and the conventional wastewater treatment and reclamation plant.
- ▶ To optimise the operational parameters and fouling control strategies of an **advanced wastewater treatment scheme based on UF-RO** technologies.
- ▶ To consolidate knowledge about a wide range of **wastewater treatment and water reclamation technologies** and identify key issues regarding the production, demand and distribution of reclaimed water.
- ▶ To contribute to the achievements of **EU challenges in the water sector**, through demonstration of innovative technologies and management solutions. Widespread transfer of project outputs and know-how directly to stakeholders related to the water sector throughout Europe.

## GENERAL CONCLUSIONS

Persistent priority and emerging pollutants to the conventional treatment were found to be efficiently removed (80-95%) by both AOPs and PAC-MBR for the following treatment schemes.

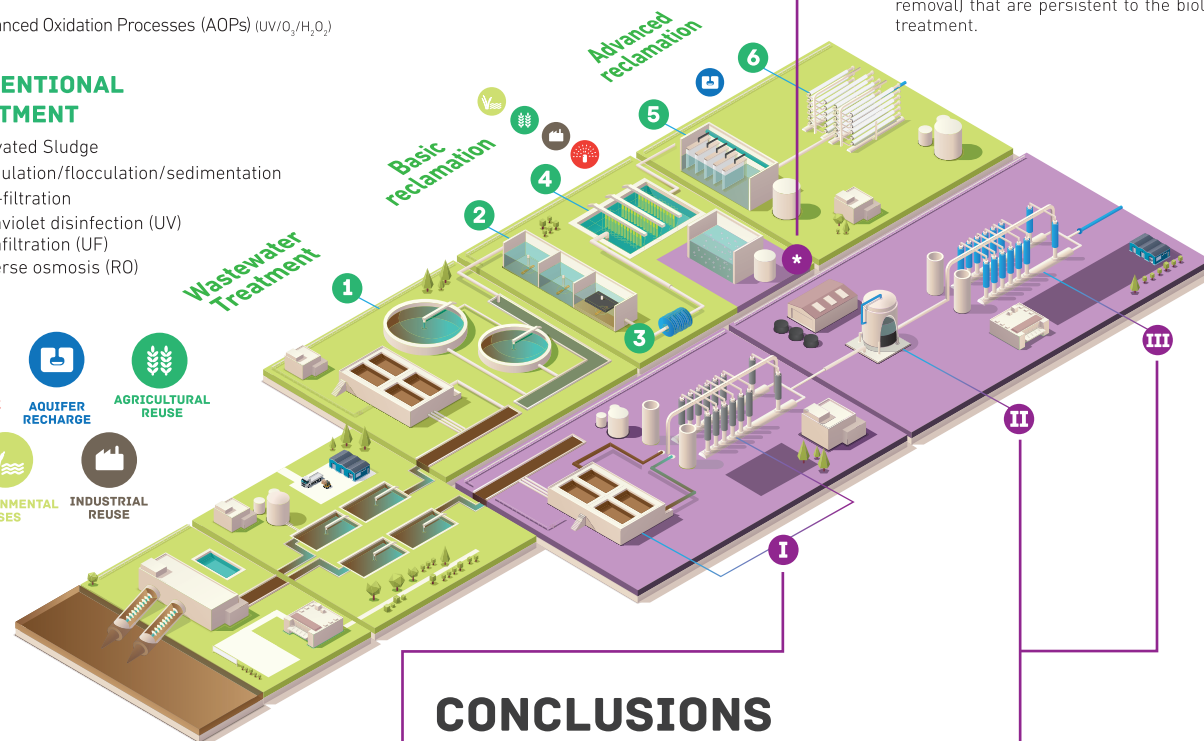
- ▶ For environmental uses or reuse in agriculture **without salinity reduction**, the application of **AOPs with the Basic Water reclamation effluent represents less than 20% additional costs** in comparison to conventional treatments.
- ▶ For aquifer recharge or reuse in agriculture **with partial salinity reduction**, the **PAC-MBR as pretreatment of RO** presents **comparable overall costs** than conventional treatments.
- ▶ The work conducted within the aWARE project has enabled to identify the **relative influence of different factors** in biofilm development for **distribution networks of reclaimed water and to evaluate biofilm characteristics**.

### aWARE CONCEPT

- I Membrane Bioreactors (MBR)
- II Activated carbon (GAC, PAC)
- III Nanofiltration (NF)
- \* Advanced Oxidation Processes (AOPs) ( $UV/O_3/H_2O_2$ )

### CONVENTIONAL TREATMENT

- 1 Activated Sludge
- 2 Coagulation/flocculation/sedimentation
- 3 Disc-filtration
- 4 Ultraviolet disinfection (UV)
- 5 Ultrafiltration (UF)
- 6 Reverse osmosis (RO)



### AOP's

- ▶ AOPs applied within conventional water reclamation showed to be the most efficient for removal of organic pollutants (over 90% removal) that are persistent to the biological treatment.

## CONCLUSIONS

### MBR and Basic Reclamation

- ▶ Footprint reduction of 50%.
- ▶ Improvement in water quality in terms of solids and turbidity.
- ▶ Recalcitrant organics that showed low to medium removal across the treatments without PAC presented medium to high removal with PAC addition (70-100%).
- ▶ PAC presents the advantage of enhancing removal of metals when dosed into the MBR.

### PAC-NF and advanced water reclamation UF-RO

- ▶ PAC-NF presents 50% lower energy demands in comparison to UF-RO and 50% lower membrane area installed.
- ▶ No removal of salts or nutrients but similar levels of reduction in turbidity and removal of organic matter.
- ▶ Removal for most persistent organic micropollutants (40-90%) with low PAC concentrations of up to 25mg/L match or exceed the performance of UF-RO (50:50 blend).
- ▶ Possibility of recycling the concentrate of the PAC-NF to the biological system with significant enhancement on the removal of persistent priority and emerging on the overall reclamation scheme.