Overview of the Three Demo Sites: Italy, Turkey and Greece

Greek Demo Site – Thriasio Wastewater Treatment Plant, Elefsis Gulf

The Greek demo site evaluates the RHE-MEDiation photobioreactor system under real operational conditions of a wastewater treatment plant. It is located at the Thriasio WWTP, operated by EYDAP, which services surrounding municipalities and local industries, discharging into the Gulf of Elefsis.

The project targets an unprecedented range of over 2,500 emerging pollutants, aligned with EU legislative frameworks. Monitoring includes 1,191 pharmaceuticals and transformation products (TPs), 84 PFAS, 90 industrial chemicals, 747 plant protection products and their TPs, 75 PAHs, 25 PCBs (including all dioxin-like congeners), 29 pesticides, and all metals regulated under the Water Framework Directive (WFD).

Operational since November 2024, the system treats approximately 25 m³/day and has demonstrated promising removal efficiencies for pharmaceuticals. Early installation challenges, expected for an innovative system at this scale, were resolved, and stakeholder engagement at multiple levels has supported strong acceptance and adoption of the technology.

The pilot meets the requirements of the WFD, MSFD, and contributes to compliance with the Urban Waste Water Treatment Directive (UWWTD) and the Water Reuse Regulation (EU 2020/741), with the potential to remove up to 80% of targeted pollutants.

Overall, the Greek demo site demonstrates the potential of decentralised photobioreactor-based treatment systems for replication in small and medium-sized communities, supporting EU goals for water quality and pollution reduction.

Italian Demo Site – Mar Piccolo of Taranto

The Mar Piccolo of Taranto is a coastal marine ecosystem whose ecological balance has been increasingly compromised due to anthropogenic development and large-scale industrial settlement. Industrial and port activities have significantly impacted the marine environment, leading to the accumulation of pollutants in benthic sediments. These concentrations often exceed those in the overlying water column by several orders of magnitude, making sediments a long-term source of contaminants that threaten aquatic biota.

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Chemical characterisation carried out by ISPRA, ARPA Puglia and CNR-IRSA has confirmed the presence of numerous priority contaminants, including heavy metals (lead, cadmium, mercury, copper, zinc), polycyclic aromatic hydrocarbons (PAHs), dioxins and furans (PCDD/F), and polychlorinated biphenyls (PCBs). Comparison with Sediment Quality Guidelines (SQG) indicates an ecotoxicological risk for benthic organisms. Exceedances of dioxin and dioxin-like PCB TEQs, according to EU Regulation 1259/2011, have resulted in a ban on the sale and consumption of *Mytilus galloprovincialis* from the area since 2011.

Bluemater installed a microalgae-based bioremediation system at the left bank of the canal inside the Leggiadrezze Nursery, where water flowing toward the Mar Piccolo is captured and treated. During the experimental phase, a wide range of pollutants will be monitored, including 21 PAHs, 28 PCBs, 24 PFAS, 3 pharmaceuticals, 29 pesticides and 25 metals. The objective is to assess treatment performance and improve the quality of water entering the Mar Piccolo.

Turkish Demo Site – Dilovası Municipal WWTP, Kocaeli

The Turkish demo site is located within the Dilovası Municipal Wastewater Treatment Plant (WWTP) in Kocaeli Province, Marmara Region. Unlike the Italian and Greek sites, this system treats physically pre-treated wastewater (after oil, sand and grease removal), before it undergoes conventional biological treatment. A total of 30 photobioreactors (PBRs) have been in operation since March 2025, and removal efficiencies are being monitored for approximately 400 pollutants, including PAHs, PFAS, phenols, PCBs, VOCs, phthalates, heavy metals and standard water quality parameters.

The Turkish demo site will provide validated data on PBR performance in treating physically pre-treated wastewater, an application different from conventional use after secondary treatment in WWTPs. This will help demonstrate the suitability of PBR systems for complex wastewater influenced by industrial and municipal sources.

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