

France – INRAE – One stage hybrid treatment wetland treating raw wastewater

www.multisource.eu
pilot1@multisource.eu



Photo INRAE



Courtesy of Ecobird



DESCRIPTION

Located in Craaponne at INRAE REFLET research platform, France, Pilot 1 is a **pilot-scale aerated hybrid treatment wetland** treating **raw domestic wastewater** from combined sewer. Designed by EcoBird, the Rhizosph'air process comprises **2 parallel aerated wetland filters** (20 m² – 25 PE) connected at the saturated part. It allows simultaneous treatment of sludge and wastewater while facing extreme rain events. The compact system deliver a high quality water level for global parameters and can adapt TN removal according to outlet requirements and aeration strategies (treatment on demand) making it a resilient and cost-effective solution for wastewater treatment and reuse in urban area.



TREATMENT PERFORMANCES

- **Conventional Pollutants:** High removal of Total Suspended Solids (99%), COD (96%), and N-NH₄ (90%) and TN (81.4 %). Moderate removal of Total Phosphorus (15%).
- **Metals:** Removal of 70–90% for Cd, Cr, Fe, Cu, Zn, Al and 20–50% for Mn, Ni, and Se.
- **Organic Micropollutants:** Removal >90% for Caffeine, Atenolol, Benzoylcegonine, Mycophenolic acid, > 60 % for DEET, Benzotriazole, Gabapentin, lomeprol, Valsartan, Amoxicilin, 20–50 % for Venlafaxine, Diclofenac, Sotalol and Oxazepam.
- **Pathogens:** Moderate removal (around 2 log for E. Coli and Coliform).



RISK ASSESSMENT

- **Pathogens:** The annual risk of infection from an eventual reuse for toilet flushing is 0.927% for Escherichia coli and 0% for Salmonella.
- **Metals & Pharmaceuticals:** The treatment achieves a high-risk reduction (median: 86.9%).
 While the NBS effectively reduces risk, some effluent risk levels remain non-negligible, requiring potential further treatment.



CO-BENEFIT ANALYSIS

- **Energy Savings:** Up to 2 to 3 times lower electricity consumption than activated sludge. The system consumes around 1.5 kWh/kg of treated BOD₅ (1.8 for 500 PE, 1.3 for 1000 PE and 1 for 4,000 PE) and around 0.5 kWh per cubic meter of treated water (0.7 for 500 PE, 0.5 for 1,000 PE and 0.4 for 4,000 PE).
- **Educational Value:** Over 50 visitors, including students and professionals, promoting awareness of nature-based solutions.