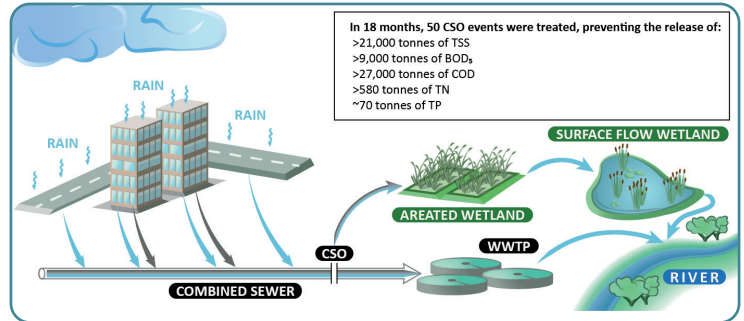


Italy – IRIDRA – Hybrid treatment wetland treating combined sewer overflows

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Jaurrieta, Lide; Pueyo-Ros, Josep; Comas, Joaquim; Beral, Henry; Guillaume-Ruty, Sophie Hai Yen; Gonzalvo, Gisela, 2024, "Illustrations of nature-based solutions for urban water management", <https://doi.org/10.34810/data1745>, CORA. Repositori de Dades de Recerca, V1



DESCRIPTION

Located in Merone, Italy, Pilot 4 is a **full-scale aerated hybrid treatment wetland** addressing frequent and prolonged **combined sewer overflows**, which can last for days and cause untreated discharges into water bodies. Designed by IRIDRA with COMO ACQUA and local stakeholders, it combines **4 aerated wetland beds** (4,000 m²) with a **surface flow wetland** (1,500 m²), ensuring efficient pollutant removal while maintaining low operational costs. Its hydraulic flexibility allows adaptation to intense weather events, making it a resilient and cost-effective urban water management solution.

TREATMENT PERFORMANCES

- **Conventional Pollutants:** High removal of Total Suspended Solids (95.6%), COD (85.3%), and BOD5 (89.0%). Moderate removal of Total Nitrogen (31.9%) and Total Phosphorus (20.9%).
- **Metals:** Removal of 70–90% for Cd, Cr, Fe, Cu, Zn, Al and 20–47% for Mn, Ni, and Se.
- **Organic Micropollutants:** Removal >90% for ciprofloxacin, trimethoprim, mycophenolic acid, and citalopram, 30–80% for atenolol, losartan, and valsartan, <30% for venlafaxine and carbamazepine.
- **Microplastics:** Removal of 70–90%, except for PET (15–20%).
- **Pathogens:** Moderate removal (0.5–2 log).

RISK ASSESSMENT

- **Pathogens:** The annual risk of infection from an eventual reuse for toilet flushing is 0.473% for Escherichia coli and 0% for Salmonella.
- **Metals & Pharmaceuticals:** The treatment achieves a moderate to high-risk reduction (median: 64.7%). Contrast agents pose no risk. While the NBS effectively reduces risk, some effluent risk levels remain non-negligible, requiring potential further treatment.
- **Environmental Impact:** The overall risk is low, thanks to the dilution factor (medium risk for Se, As, Cd, Mn, and Zn).

CO-BENEFIT ANALYSIS

- **Cost Savings:** Up to 5 times lower CAPEX & OPEX than conventional infrastructure, with €0.10/m³ operational costs vs. €0.46/m³ for grey solutions.
- **Biodiversity:** Supports bird species diversity comparable to semi-natural wetlands, enhancing urban ecology.
- **Educational Value:** Over 100 visitors, including students and professionals, promoting awareness of nature-based solutions.