

Spain – ICRA – GreenWall treating greywater



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 Sant Quirze del Vallès, Spain, Pilot 5, is a **full-scale horizontal flow green wall**, treating greywater from 3 showers and 2 handwash sinks in 3 different apartments, as well as rainwater collected from 120 m² of roof. Designed by Alchemia-nova, and put into place in April 2023, it is composed of 16 modules, each including 9 plant pods, with 5 plants per pod. It has a total treatment **surface of 10.94 m²**, combined with a further ozonation step, ensuring efficient pollutant and pathogen removal. It is designed to treat theoretically up to 220 L of greywater per day.

Additionally, it delivers key **co-benefits**, including **cost savings, biodiversity enhancement, and educational value.**



DESIGN AND TECHNICAL DETAILS

Type of influent

Greywater from three apartments.

Design

- Full-scale horizontal flow green wall, surface of 10.94 m².
- The green wall is combined with a further ozonation step.
- Once treated, the water is pumped back to the apartment to be reused for toilet flushing.

Cost

CAPEX is approximately €4,100 per m² of GreenWall, including all accessory equipment, OPEX is €0.34 per m³ of treated water. As a first-unit pilot, further optimization and cost reduction are possible.

Climatic conditions

A dry-temperate climate characterized by recurrent droughts. Temperate climate with seasonal variations in rainfall affecting the mixture between greywater and rainwater.

Operational constraints



Energy consumption:

Pumps for water circulation



Biohazard

Pathogen risks in untreated greywater require protective measures during maintenance.

Maintenance



Vegetation management

Periodic harvesting (1 per year).



Filters cleaning

Periodic cleaning of accumulated solids (1 per month).



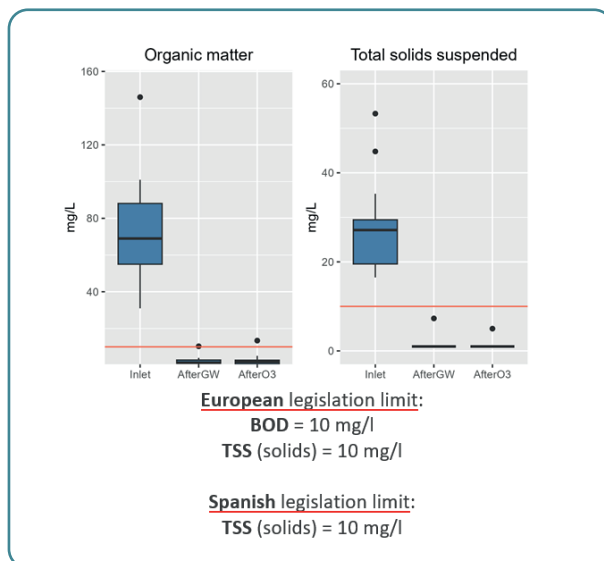
Treated water tank cleaning

Periodic cleaning of accumulated solids (2 per year).



TREATMENT PERFORMANCES

- **Conventional Pollutants:** Significant removal of Ammonia (99%), BOD5 (98%), Total Suspended Solids (96%), COD (83%), TOC (80%), and Total Nitrogen (80%).
- **Organic Micropollutants:** Removal >90% of tramadol and benzotriazole and 30–80% for DEET, caffeine and lidocaine.
- **Microplastics:** Removal of 70–99% on N66, PP, PVC, N6, SBR, PE, ABS and PS, and 50% removal of PET.
- **Pathogens:** High removal (>99%) of E.coli.



RISK ASSESSMENT



Organic micropollutants:

The treatment achieves a high risk reduction (median: 99.9%) of sum of risk posed by caffeine, lidocaine and DEET.



CO-BENEFIT ANALYSIS



New green areas: Add new green areas in urbanized contexts. They are aesthetically pleasing and give other environmental and social co-benefits.



Biodiversity: Supports species diversity, enhancing urban ecology and pollinator communities.



Stakeholder engagement: Promotes interaction among stakeholders with an open science approach. Located in a residential building, it highlights the crucial role of neighbours in both participation and the decision-making process.



Educational Value: Over 70 visitors, including students and professionals, promoting awareness of nature-based solutions.



TAKE-HOME MESSAGES

- **On-site treatment:** Treatment sited in an urban environment with stable performance for a further reuse for toilet flushing.
- **Near zero spatial footprint:** Vertical technology with very low special requirements, ideal for urban contexts.
- **Effective pollutant removal:** High reduction of TSS, COD, BOD5, N-NH4+, TOC, TN and microbiological parameters.
- **Socioenvironmental impacts:** Aesthetic value and increase in urban biodiversity, making cities more drought resilient. Furthermore, community-based aspects, such as education and better well-being of the population.