CERIS : Civil Engineering Research and Innovation for Sustainability

SUPERGREEN – Sustainable Purification of wastewatER with GREEN walls

Summary

Conventional wastewater treatment technologies are characterised by high energetic and economic costs (72 billion €; 25% of 2014 EU environmental expenditures) that represent a big challenge for sustainability. Moreover, approximately 70% of domestic wastewater sent to treatment is actually made up of diluted greywater, which is discharged from showers, bathtubs, washing machines, and hand washing sinks and whose contaminant content is much lower than in blackwater from toilets. Onsite greywater purification can thus provide a local source of reusable water, which could be recycled for other uses (e.g., toilet washing and irrigation, depending on local regulation) that would otherwise employ clean water. This reuse would turn greywater from a waste product into a resource, but it is currently hampered by the lack of an affordable treatment technology for that is able to operate in densely inhabited urban areas where space is limited and expensive.

The aim of SUPERGREEN is to couple greywater recycling as a nutrient-rich irrigation source together with the use of green walls, which are vegetated vertical elements that exploit unused building surfaces to provide benefits such as greening, improved aesthetics, and shading. SUPERGREEN featured an extensive campaign of laboratory experiments to investigate the efficiency of green walls in treating greywater.

The analysis considered different mixtures of conventional and innovative and recycled materials as growing media, aimed at identifying the most efficient green wall configurations in terms of treatment efficiency. The experimental studies were developed in Turin, Italy, and in Lisbon, Portugal.

In Turin a set of 6 green wall panels were set up to test different filling media mixes, including coconut fiber and perlite as base medium, and additives as granular activated carbon, compost, biochar and polyacrylate. Five plant species (*Hedera helix, Carex morrowii, Iris germanica, Lonicera nitida, and Ranunculus asiaticus*) were selected in this study. Results demonstrated that a mixture of coconut fiber (80%) and perlite (20%) had the best performance as a single media, while the use of biochar as additive performed best among all the additives tested.

In Lisbon a commercially available green wall modular systems was adapted to be irrigated with greywater. Modifications of the modules were performed to obtain a vertical flow through a set of 3 pots. The filling media used in this study was granulated cork and two plant species were studies: *Asplenium onopteris* and *Adiantum capillus-veneris*. Results showed that planted systems performed better than non-planted ones and demonstrated the potencial of recycling cork as a filling media, thus contributing to circular economy.

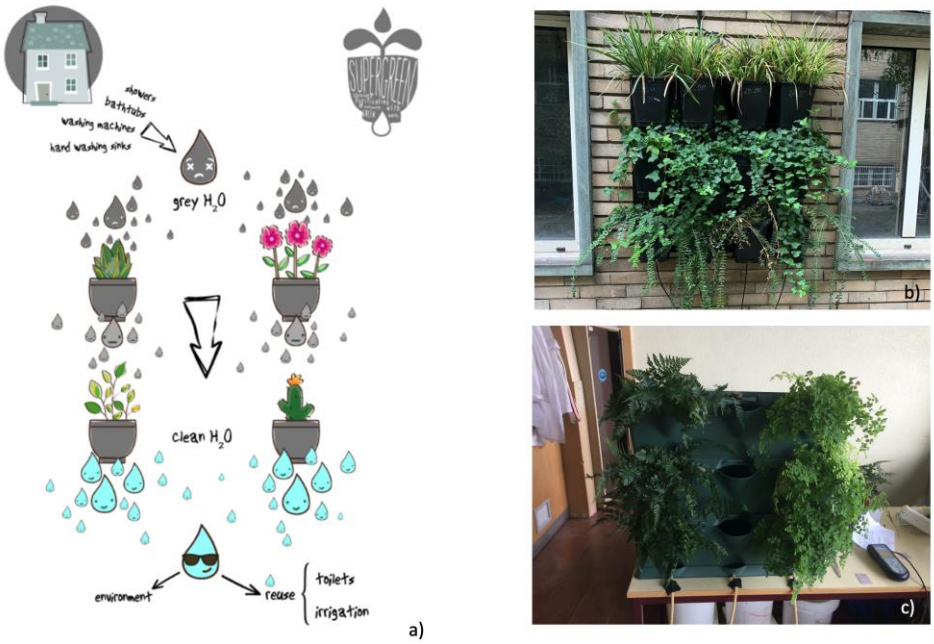

Figure 1. a) SuperGREEN principles; b) green wall in Turin; green wall in Lisbon.

Project Reference

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www.researchers.polito.it/en/success_stories/metti_in_rete_projects/green_walls_for_water_purification