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Greening walls for treatment and reuse of domestic greywater

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The sustainable management of water resources is one of the most concerning challenge to cope with water scarcity and increasing water demand. The treatment and the reuse of wastewater represents a valid and convenient solution that is progressively spreading, turning wastewater from a waste to a valuable resource for water, energy, and nutrients. Specifically, the portion of wastewater more suited for treatment and reuse is greywater, defined as household wastewater with the exception of toilet flushes and sometimes also kitchen sinks. Recently, a large body of research is directed to the reuse of greywater treated by nature-based technologies, that allow to couple environmental, economic and energetic benefits. However, it is still necessary to better understand and evaluate the ability of these green systems to efficiently remove the contaminants.
In this study, we propose an innovative and sustainable system for treatment and reuse of grey wastewater in urban areas through vertical green walls constructed on unused surfaces of buildings. The system integrates the benefits linked to the introduction of green space in urban areas with the advantages connected with the reuse of purified greywater (non-potable reuse) and the reduction of potable water use, allowing a sustainable use of water resources. We performed experimental tests aimed to identify vegetation types and growing media suited for pollutant removal from greywater and aesthetically pleasant. The identification of design and operational parameters has led to the construction of a green wall irrigated daily with synthetic greywater. The removal efficiency of the green wall was weekly monitored with regards to different pollution parameters (BOD, COD, nitrogen, phosphorus, etc.). Preliminary results showed good results in terms of treatment performances, indicating the suitability of the green wall for treatment of greywater. A wider set of experiments is currently being performed to verify differences in removal efficiency among different system configurations in terms of type of growing material.