16th Newsletter of the UFZ Green Roof Research

04th November 2023

CLEANER doctoral college team
(Photo: A. Künzelmann)

Research green roof
at the Helmholtz Centre for Environmental Research – UFZ

Europäische Union

Europa fördert Sachsen.
EFRE
Europäischer Fonds für regionale Entwicklung

This construction measure is co-financed by tax funds on the basis of the budget passed by the members of the Saxon state parliament.

Research partners:

UFZ HELMHOLTZ Centre for Environmental Research

UNIVERSITÄT LEIPZIG

BfN Bundesamt für Naturschutz

Practice partners:

Ingenieurbüro Blumberg

ZinCo

Stadt Leipzig
Amt für Umweltschutz

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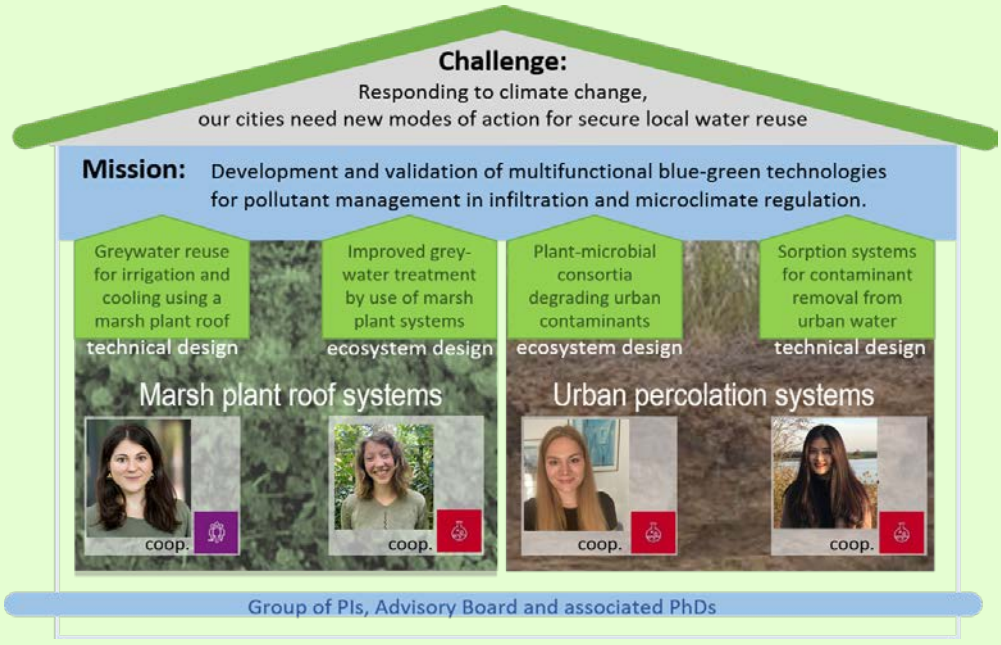
PhD college „Fostering pollutant-sink functions of Blue-Green Infrastructures: towards local urban water cycles in climate-resilient cities - CLEANER“

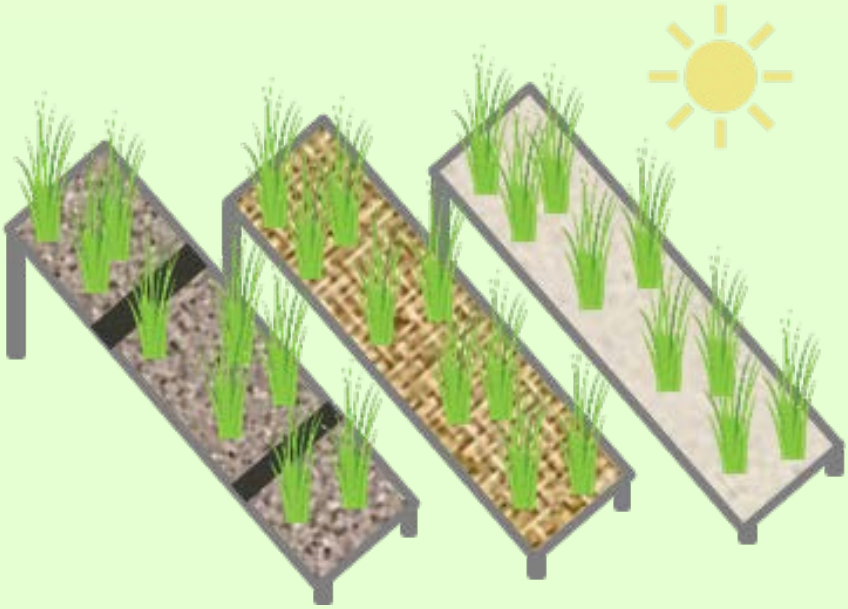
On 28 August 2023, the kick-off meeting of the new doctoral programme with the short title CLEANER took place (photo see cover page). The aim of the doctoral programme in the field of environmental technology and biotechnology is to develop blue-green infrastructures in urban areas for the purification of low-polluted wastewater. The focus is on marsh plant roofs for the purification of grey water and on tree trenches as elements for the retention of frequently polluted street runoff.



General structure of the doctoral college (Author: K. Mackenzie)

Topic 1:
Development of a multifunctional marsh plant roof system

As part of Sabine Franke's doctoral thesis, a marsh plant roof is to be developed to purify the greywater produced in the company canteen on the science campus. The system is to be designed in such a way that the highest possible nutrient degradation takes place, micropollutants are removed and sufficient hygienization is achieved. For this purpose, the degradation and retention pathways of nitrogen and phosphorus as well as micropollutants will be characterized and control options for these processes will be investigated. In addition, the cooling potential of the marsh plant roof will be researched and determined on the basis of models.



Author: Sabine Franke

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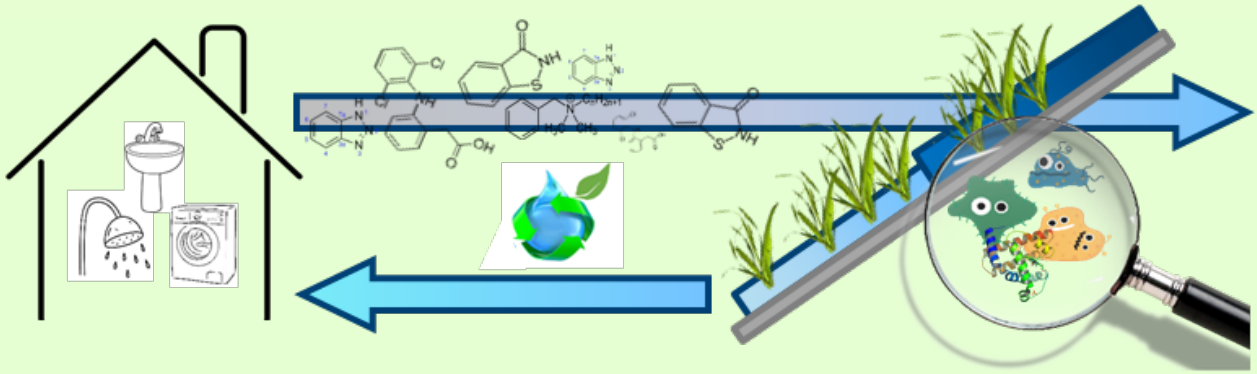
Topic 2:
Microbial transformation in redox-differentiated marsh plant roofs

Sarya Derado is working on the biological processes in marsh plant roofs that contribute to greywater purification. She is investigating how quickly and to what extent marsh plants can transform specific household chemicals from greywater. Microorganisms and enzymes that drive these transformations are also being characterized. Hotspots of transformation in redox-differentiated areas are identified and design recommendations for the construction of marsh plant roofs are derived based on these findings.



Author: Sarya Derado

Topic 3:
Plant-microbe interplay influencing urban polluntant transformation in percolation systems

Karolin Seiferth's doctoral thesis aims to characterize the biological processes involved in the transformation of pollutants in road runoff, which takes place in tree rigs. Specifically, interactions between the tree and the microbes that contribute to pollutant degradation are characterized. The pathways and rates of pollutant conversion are investigated and the metabolites identified. This complex approach makes it possible to optimize the interactions of the individual components by deriving control options for the removal of pollutants.

Author: Karolin Seiferth

Topic 4:
Design and validation of reactive urban percolation systems for efficient pollutant biotransformation

To support biological systems in the transformation of poorly degradable substances, Xiangyu Ji will develop adapted sorption systems for blue-green infrastructures. The physicochemical properties and morphology of the developed sorptive materials will enable reversible enrichment, retention and biodegradation of urban pollutants under highly fluctuating inflow volumes and concentrations. During the development of the sorption systems, it will be investigated how the microbial uptake and degradation of particle-bound pollutants can be optimized.

Author: Xiangyu Ji