Lehrstuhl für Siedlungswasserwirtschaft
TUM School of Engineering and Design
Technische Universität München

Study Project

"Novel and existing measurement methods for understanding the subsurface processes in Managed Aquifer Recharge systems"

About us

The Chair of Urban Water Systems Engineering is involved in the education of students (Bachelor and Master) in environmental and civil engineering. Our research covers all aspects of the urban water cycle: urban water supply, wastewater treatment and energy recovery, water recycling, drainage systems, industrial wastewater treatment, membrane systems, and the urban water-food-energy nexus. The group of Advanced Water Treatment explores physical, chemical and biological removal mechanisms of contaminants in waste water with a focus on contaminants of emerging concerns.

Topic

Groundwater resources are essential for drinking water and for industrial and agricultural use. However, groundwater is threatened by overuse and contamination. Managed Aquifer Recharge (MAR) is an approach to the sustainable management of groundwater by increasing the available amount of water and improving water quality. For MAR a variety of water sources such as surface water, reclaimed waste water or stormwater can be used. The water is infiltrated into the subsurface where filtration, biodegradation and adsorption take place. However, there can be often also numerous anthropogenic substances in the feed water that enter the aquifer at trace concentrations (µg/L to ng/L). The biodegradation of these substances depends on the characteristics of the compounds, the operation of the MAR system and the environmental conditions.

Environmental conditions such as redox conditions and dissolved organic carbon (DOC) are key factors influencing the biotransformation of trace organic chemicals in the subsurface. The environmental

conditions within a MAR system can be heterogeneous and change over time. An understanding of these subsurface conditions is essential for the efficient application of removal processes in MAR. Groundwater monitoring wells and boreholes provide point information in a 3D subsurface. Geophysical methods such as pumping tests or electrical resistivity tomography (ERT) can help to understand the subsurface in a 3D.

The aim of this study project is to conduct a literature review on possible low-cost measurement methods for understanding subsurface conditions focusing on redox conditions, pH and DOC. Other parameters responsible for biodegradation may also be investigated (e.g. temperature, soil properties, microbial activity). It is also possible to test a method in ongoing experimental setups.

Tasks

- Literature review of existing and upcoming subsurface measurementsthat may be applicable for MAR
- Focus on parameters such as redox conditions, pH and DOC.
- Testing of low-cost methods in ongoing experimental setups at the Chair.

Requirements

- Interest and basic knowledge of water treatment and water reuse
- Interest in laboratory work, testing new sensor systems, using technology in novel or unintended ways (“MacGyver”)

Time Range

The work is designed for a period of 6 months and should be started soon (February/ March 2025).

Kontakt

Felicia Linke
felicia.linke@tum.de
089 289 13704
Chair of Urban Water Systems Engineering
Am Coulombwall 3
85748 Garching
www.cee.ed.tum.de/sww
www.tum.de