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

Master Thesis

“Insights into a ‘Black Box’ - exploring time series of sequential managed aquifer recharge technology (SMART) experiments”

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

Despite high wastewater treatment standards, numerous anthropogenic trace substances enter the aquatic environment via municipal wastewater in Germany. The use of an additional purification stage for trace substances is currently being tested and implemented, particularly at medium to large wastewater treatment plants, in order to achieve the greatest possible reduction in inputs into the environment.

Nature-based solutions as an additional treatment step such as sequential managed aquifer recharge techniques (SMART) are currently tested at pilot field scale in Berlin (https://www.cee.ed.tum.de/en/sww/research/advanced-water-treatment/trinkwave-transfer/). SMART consists of a first infiltration step, then an aeration step and a second infiltration step. The second infiltration step with oxic and carbon-limited conditions enhances biotransformation of trace organic

chemicals. The SMART approach is based on previous experiments at various scales (e.g. column experiments, pilot 3D tank). Environmental conditions such as temperature and redox conditions are key factors for biotransformation of trace organic chemicals. However, these conditions can change over time and thus influence the biotransformation.
The aim of this master thesis is to look at the experimental data of these experiments and especially focus on short-term changes and their potential impacts on biotransformation of trace organic chemicals. Further questions can be explored depending on the available data.

Tasks

- Summarize time-series data of all experiments using Sequential Managed Aquifer Recharge Technology (SMART)
- Explore data using statistical approaches and programming tools in R, Python or similar
- Develop open questions based on the findings in the time-series

Requirements

- Interest and basic knowledge in water treatment and water reuse
- Interest in programming (no experience required)

Time Range

The work is designed for a period of 6 months and should be started soon (Autumn 2024).

Kontakt

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