

## Master's Project/Thesis

# Does climate change impact pollution from sewer overflows?

Keywords: wet-weather discharges, micropollutant, modeling, exposure, environmental impact

Proposed: May 2023

Valid until: January 2025

### Background

Growing urban surfaces coupled with climate change lead to increasing impacts on water resources. While wastewater treatment plants in Switzerland are being upgraded to enhance the removal of micropollutants, up to half of the overall micropollutant load can be discharged via combined and separate sewer overflows without treatment (Fig 1). A Swiss model showed that micropollutants washed off urban surfaces during rain events are often discharged without treatment<sup>1</sup> and can be toxic to the aquatic environment<sup>2</sup>. However, it is unknown how the discharged pollutant loads will change in a future climate.



Fig. 1. Combined and separate sewer overflows discharge a wide range of potentially toxic pollutants to surface waters

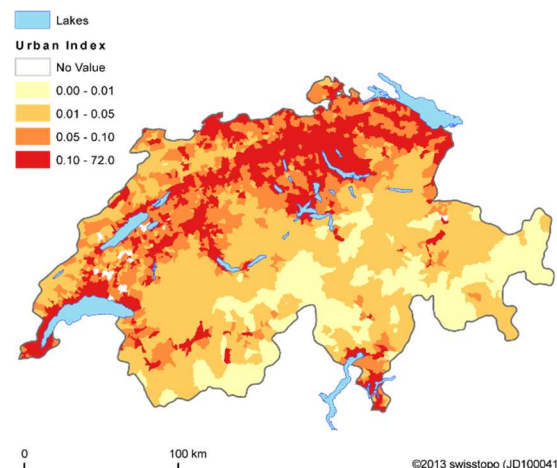


Fig. 2. A high Urban Index indicates a high percentage of urban areas and a small dilution potential of the wet-weather discharges.

### Objectives of the suggested topic

The aim of this thesis is to develop a mass flow model to estimate the pollutant loads (micropollutants, nutrients) discharged in Switzerland via sewer overflows for future climate scenarios.

- Update an existing Swiss-wide mass flow model<sup>1</sup> with new data on sewer overflows and pollutant usage (for Switzerland or selected Cantons)
- Estimate discharged pollutant loads for future climate scenarios
- Estimate impacts of discharges by comparing discharged concentrations with environmental quality thresholds. Potentially include river flows as a dilution factor.

### Specific information / Requirements

Motivation for modeling (e.g. R, Python), use of GIS and data analysis.

**For Master's project:** Group work possible

### Advisors and Supervisors

Advisor: Max Maurer

Supervisors: Lena Mutzner

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### References

(1) Mutzner, L.; Stauffer, P.; Ort, C. Model-based screening for critical wet-weather discharges related to micropollutants from urban areas. *Water Res* **2016**, *104*, 547-557. DOI: 10.1016/j.watres.2016.08.003.

(2) Mutzner, L.; Furrer, V.; Castebrunet, H.; Dittmer, U.; Fuchs, S.; Gernjak, W.; Gromaire, M. C.; Matzinger, A.; Mikkelsen, P. S.; Selbig, W. R.; et al. A decade of monitoring micropollutants in urban wet-weather flows: What did we learn? *Water Res* **2022**, *223*, 118968. DOI: 10.1016/j.watres.2022.118968.