

Dynamic Substance Flow Analysis of rainfall-mobilized micropollutants

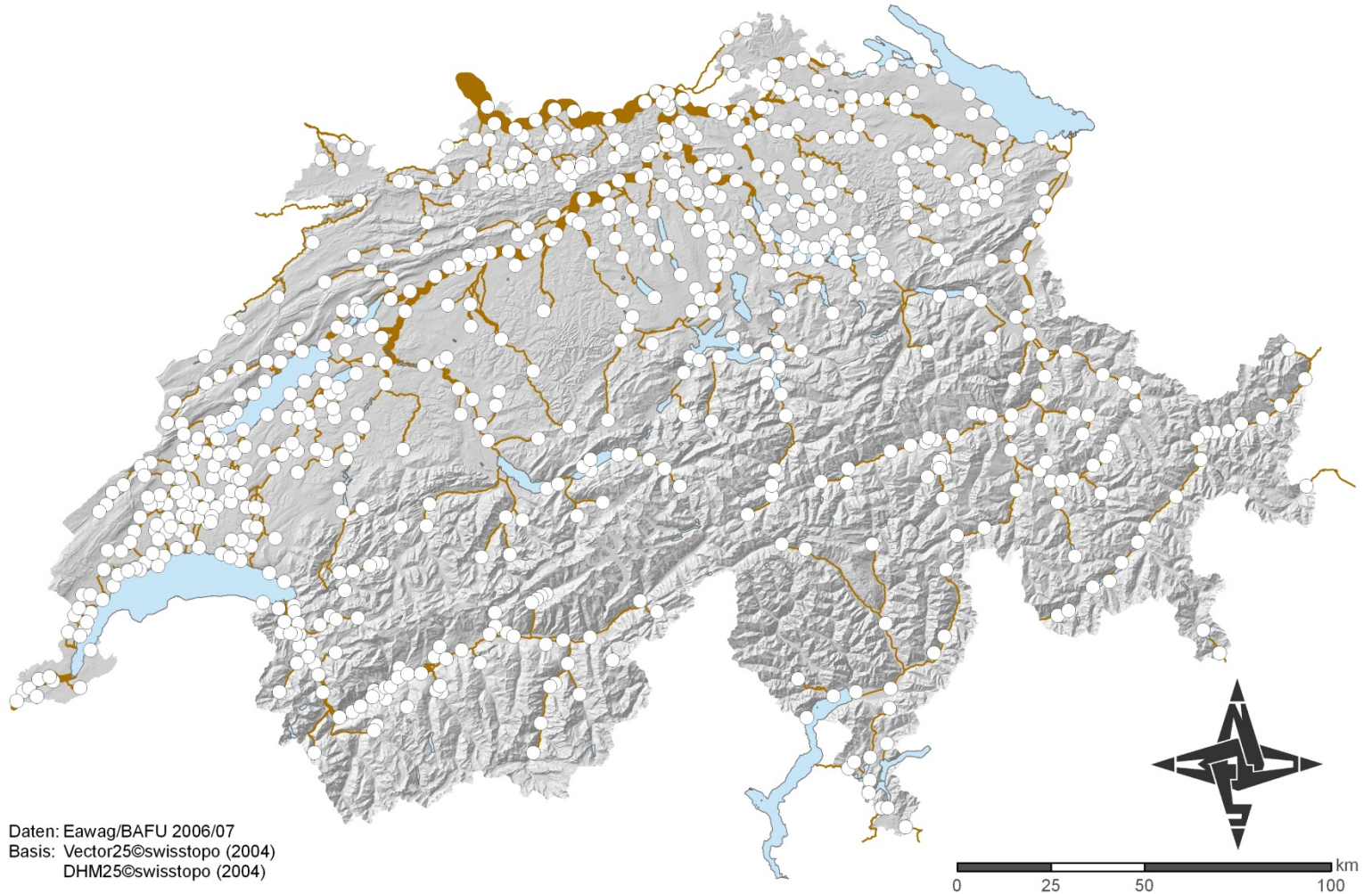
Philipp Stauer, Lena Mutzner, Christoph Ort



Motivation

Emissions from wastewater treatment plant

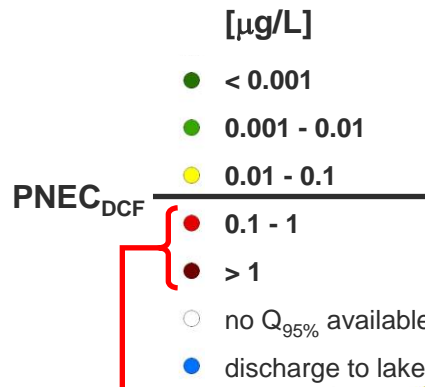
Ort et al. 2009



0 25 50 100 km

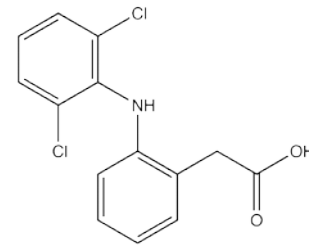
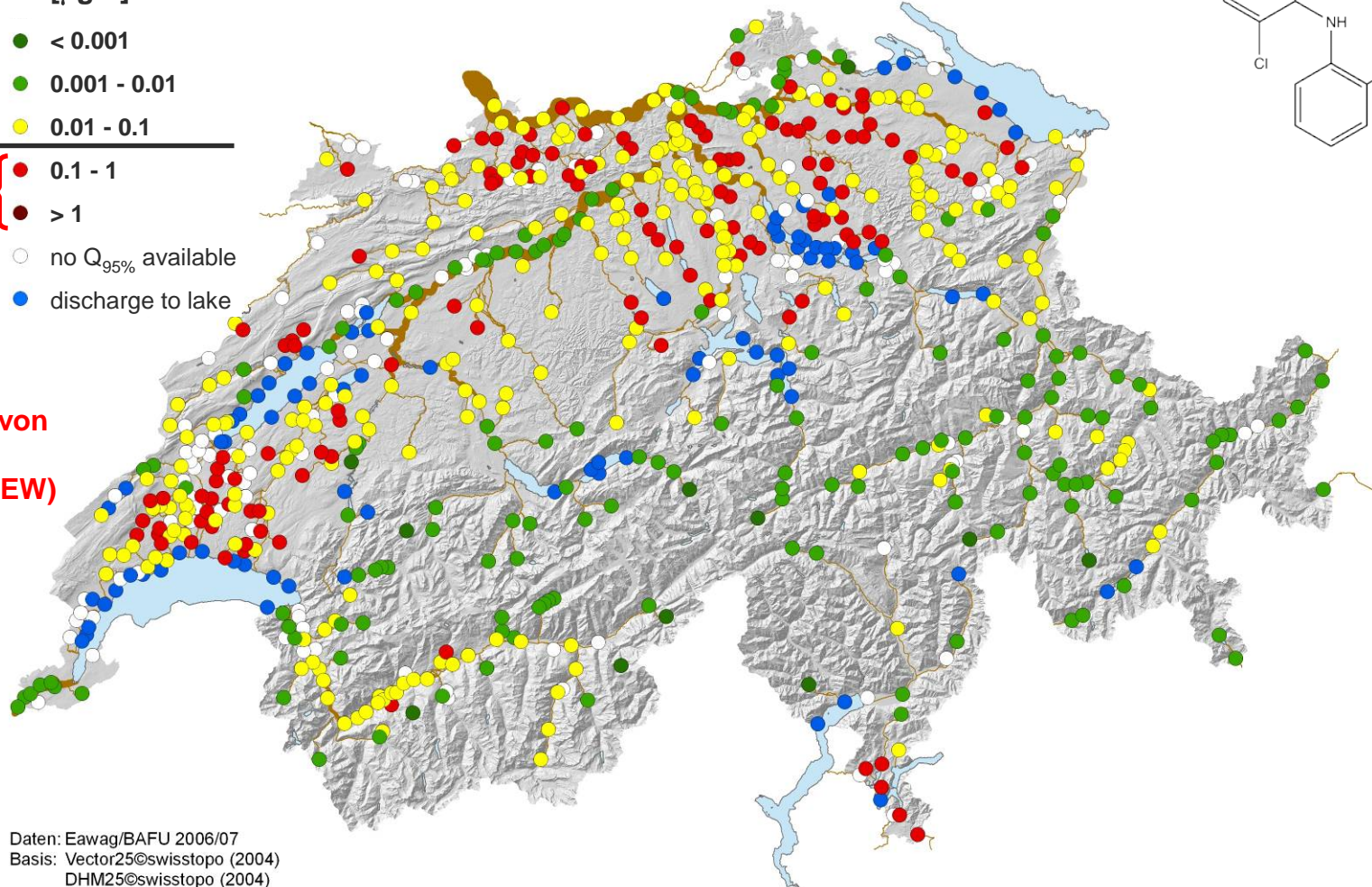
Motivation

Emissions from wastewater treatment plant



unterhalb von
125 KA
(15% aller EW)

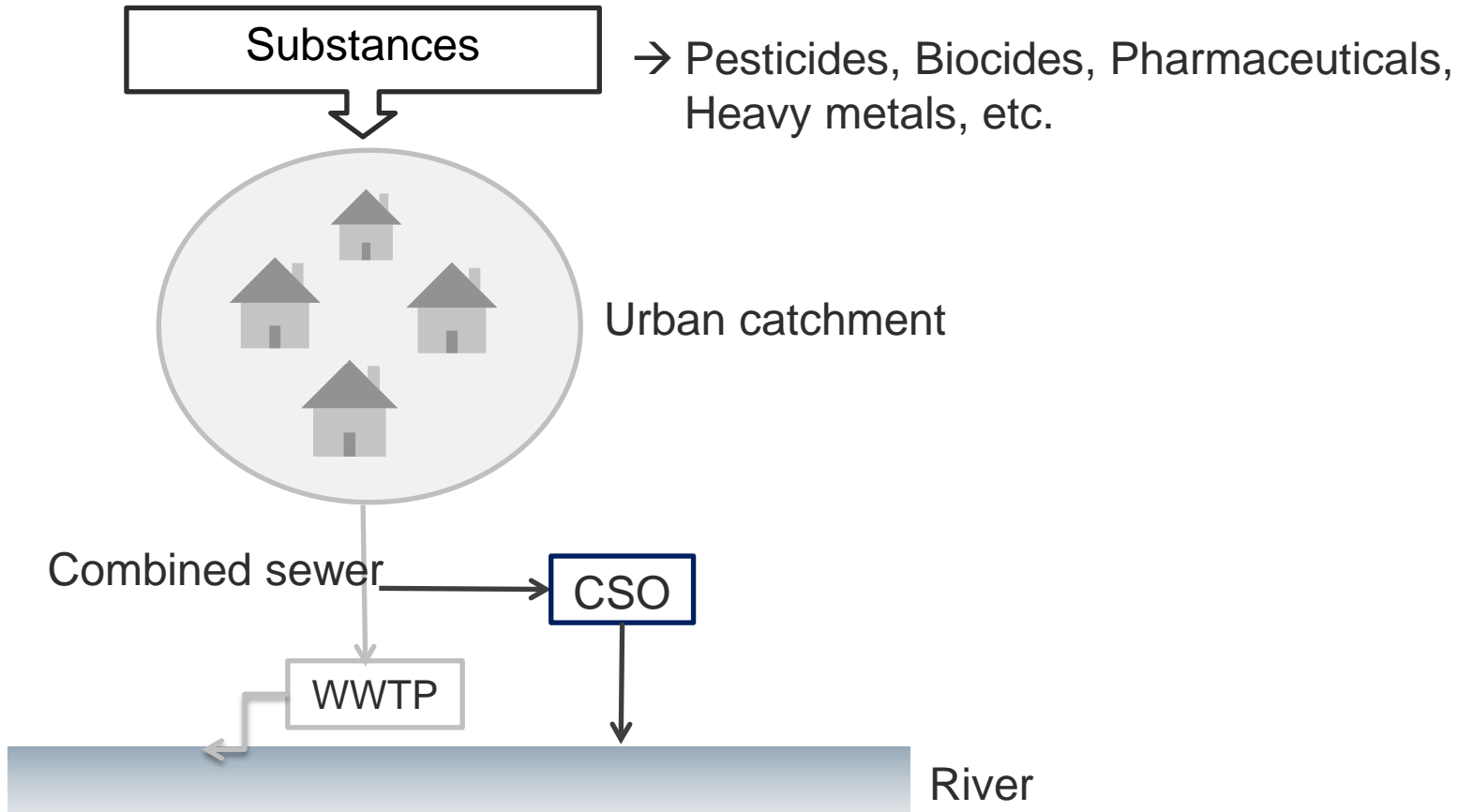
Ort et al. 2009



Daten: Eawag/BAFU 2006/07
Basis: Vector25@swisstopo (2004)
DHM25@swisstopo (2004)

Micropollutants in settlements

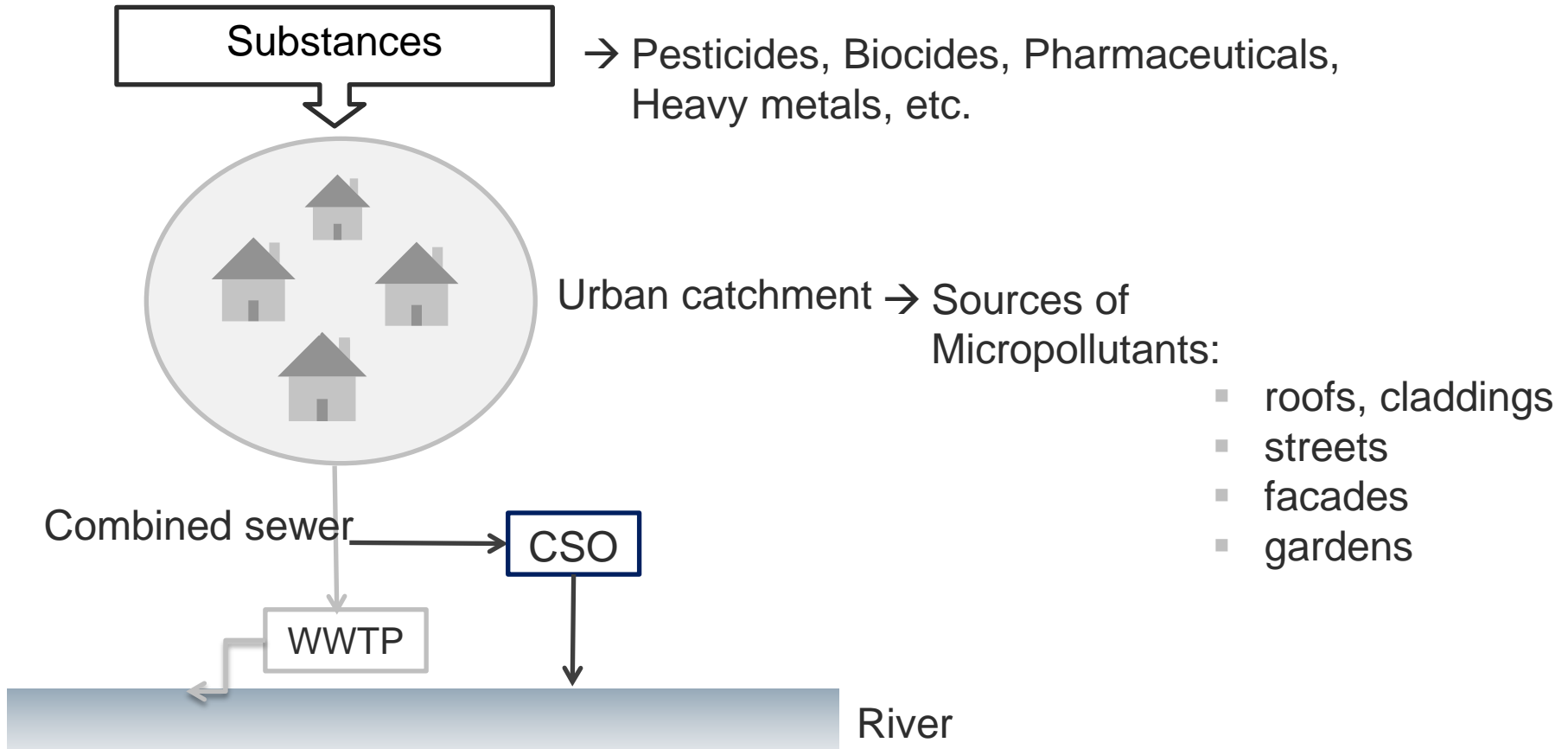
Nonpoint source (NPS-) pollution



Focus: Urban Sources, combined sewer overflows

Micropollutants in settlements

Nonpoint source (NPS-) pollution

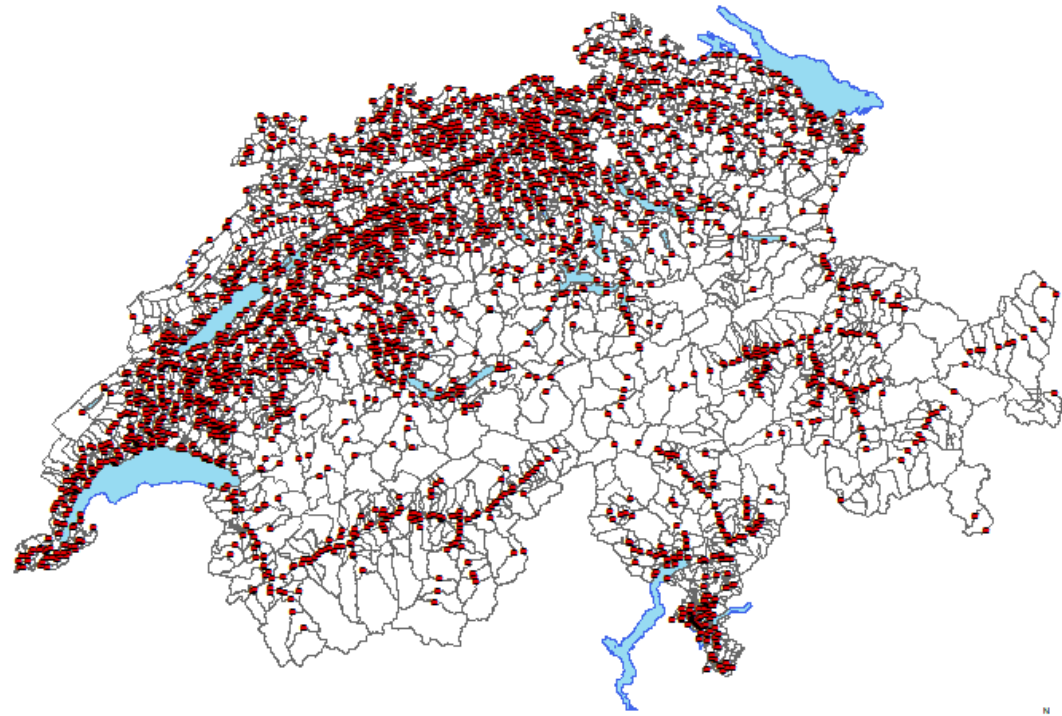


Focus: Urban Sources, combined sewer overflows

Goals

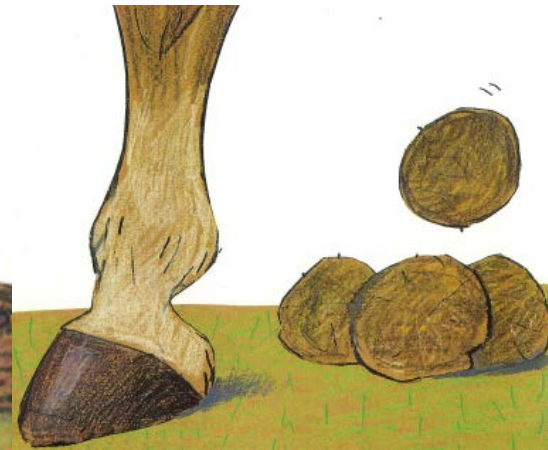
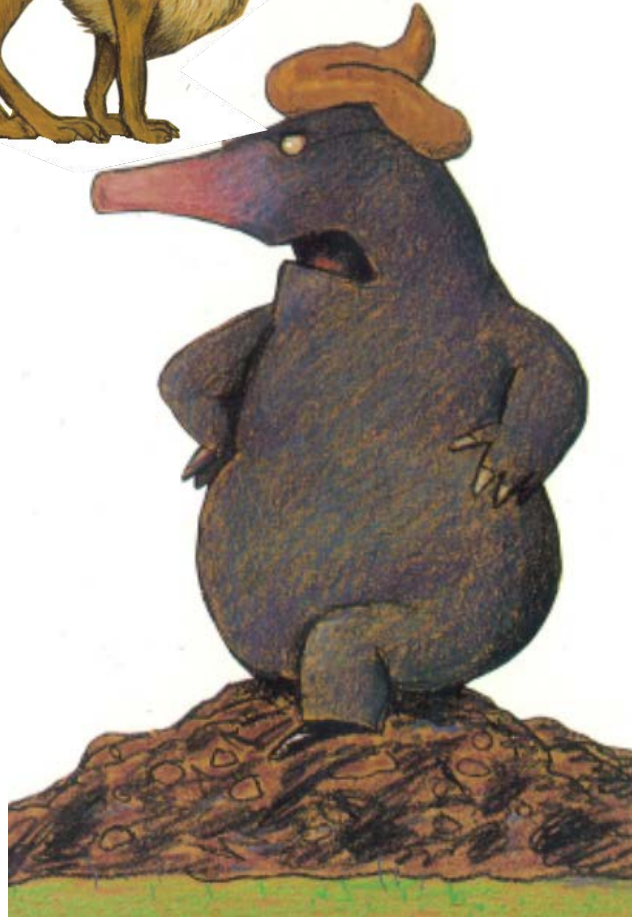
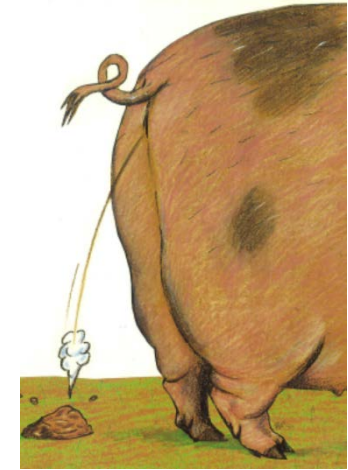
Ausgangsfragen

- 1) What relevancy does NPS-micropollution carry?
- 2) Can we identify most critical places?



Transdisziplinäre «Literaturstudie»

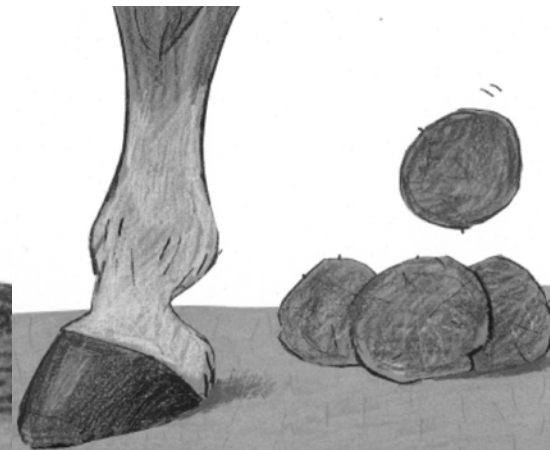
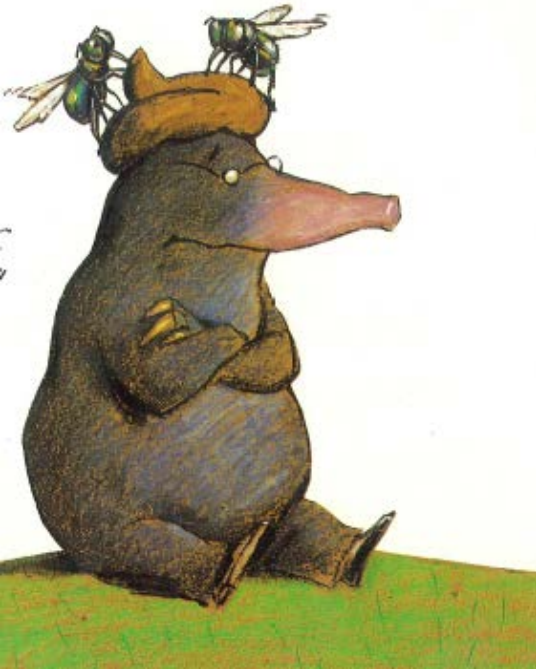
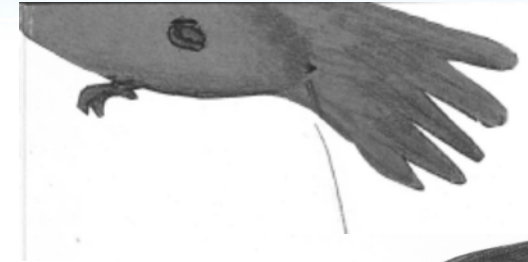
Motivation



Holzwarth, W. and Eribbruch, W. (2001): Vom kleinen Maulwurf, der wissen wollte, wer ihm auf den Kopf gemacht hat, Peter Hammer Verlag

Transdisziplinäre «Literaturstudie»

Motivation



Methods

Substance flow analysis

one CSO per municipality

«dynamic»
SFA

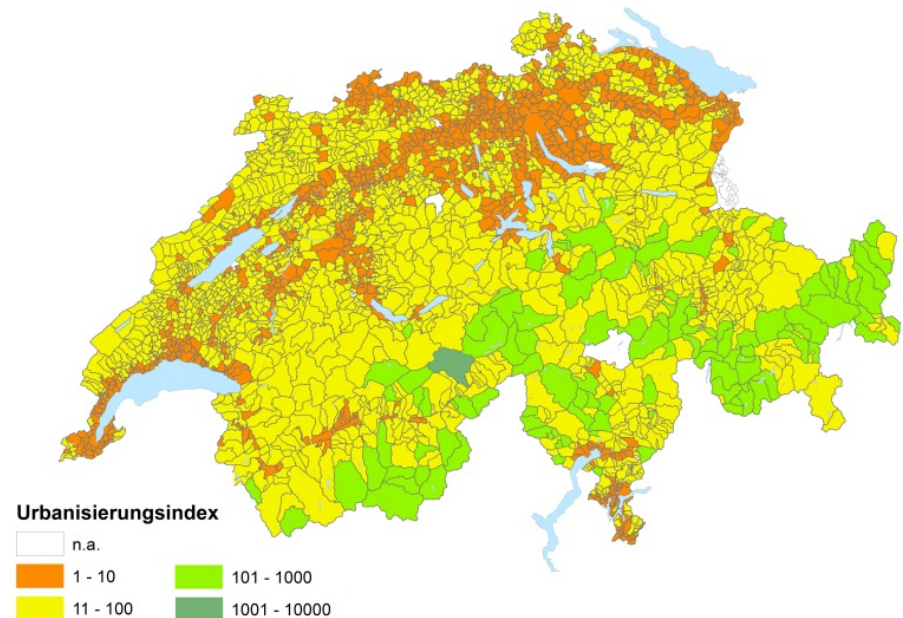
continuous
simulation

entry
pathways

4 substances

dynamic SFA

- load variation at the source
- seasonality of usage, e.g. pesticides
- variability in rainfall



Methods

Substance flow analysis

one CSO per
municipality

«dynamic»
SFA

continuous
simulation

entry pathways
4 substances

1 hr
resolution
Toxic unit

Index of
urbanization
HOTSPOTS

dynamic SFA

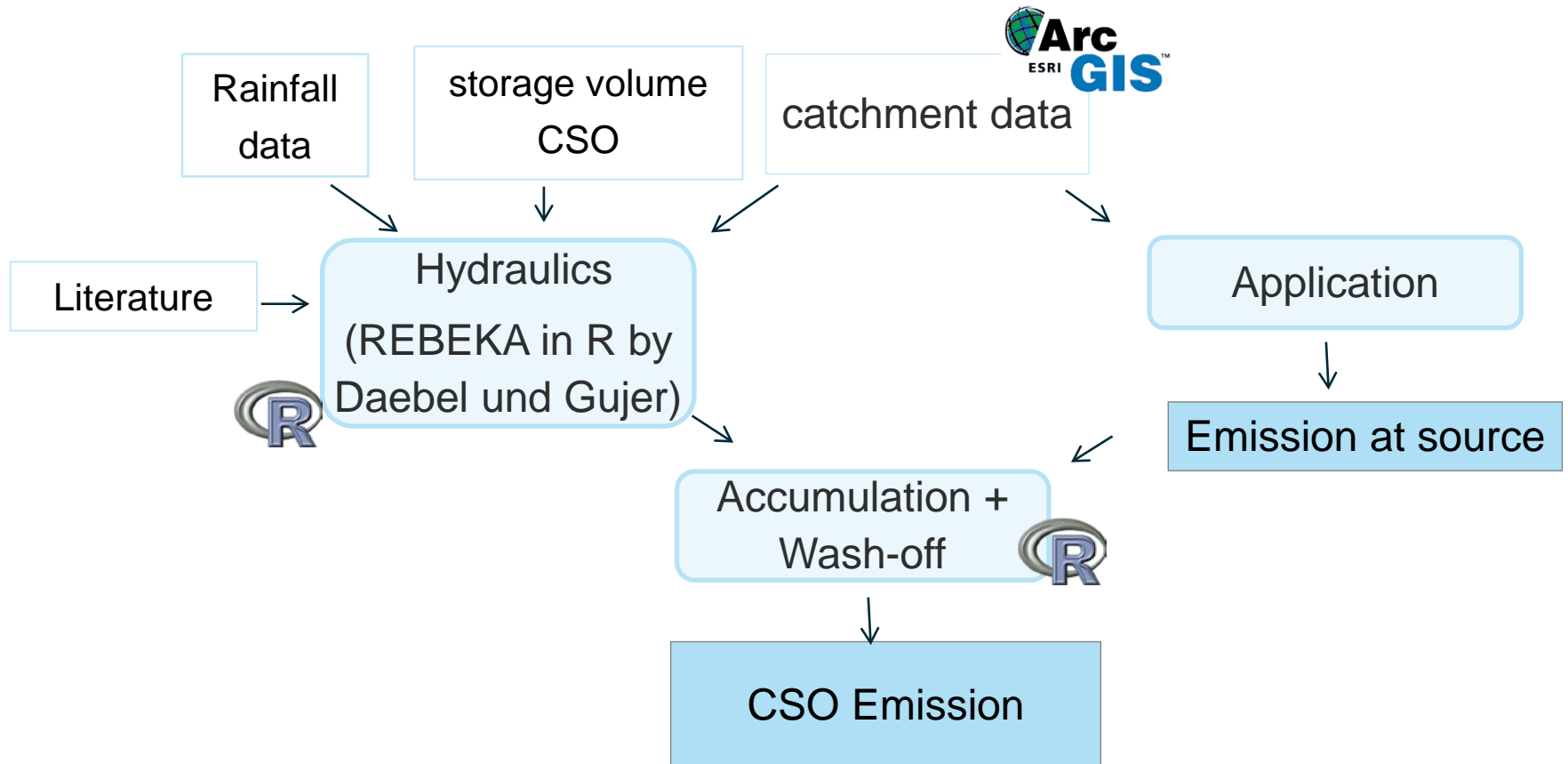
- annual loads
- meta-data analysis
- loss-rates



dynamic SFA

Basis

- o Basic model structure



dynamic SFA

Basis

- NPS-micropollution

Source	Substance	Triclosan	Glyphosate	Mecoprop	Copper
Household		●		●	●
Garden			●		●
Facades					●
Roofs				●	●
Streets					●

dynamic SFA

Results

- Emission from different sources (in kg/a)

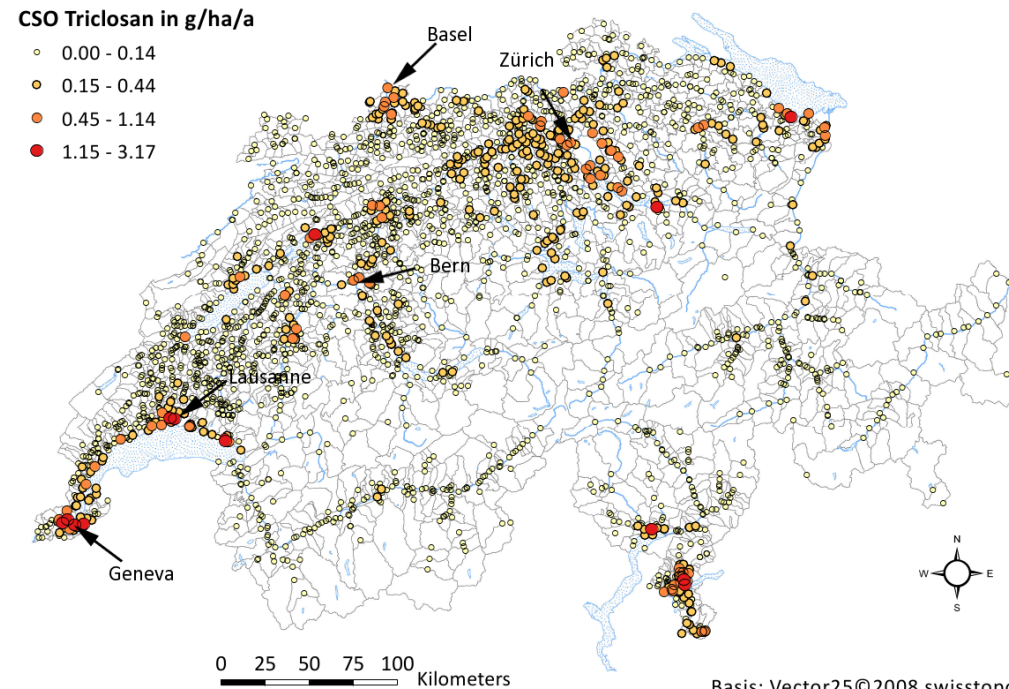
substance	household	buildings	street	garden	total	rainfall-mobilized part
Triclosan	5'148				5'148	0%
Glyphosate				4'798	4'798	100%
Mecoprop	203	47		568	818	76.2%
Copper	62'140	50'542	7'043	250	119'975	49.2%

dynamic SFA

Results

- CSO - sewage

substance	Loss rates
Triclosan	3.3
Glyphosate	65
Mecoprop	50
Copper	34



dynamic SFA

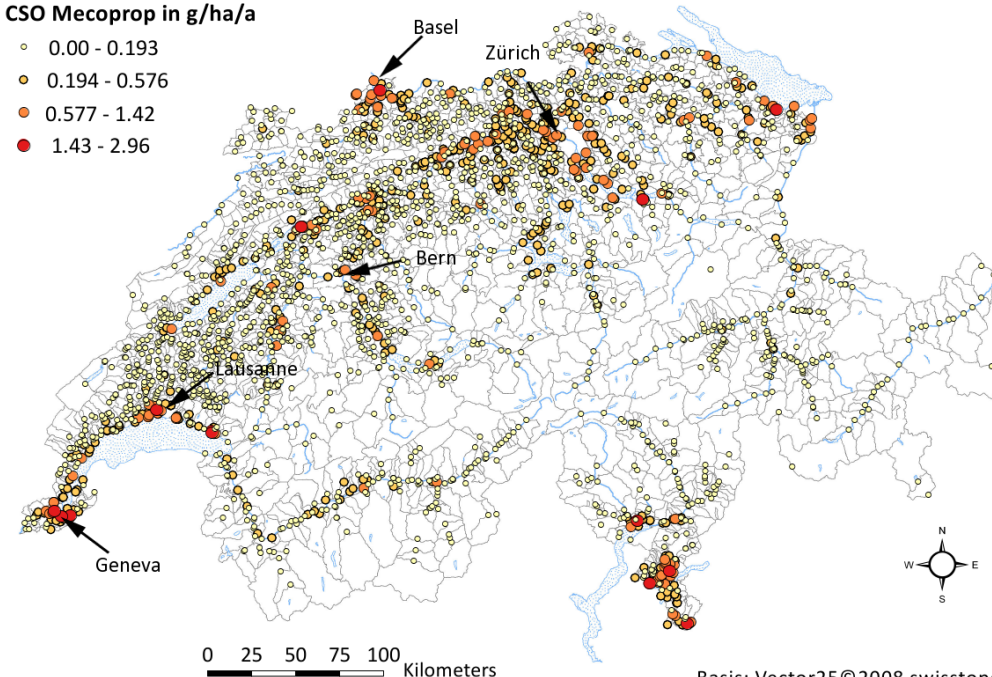
Results

- CSO: rainwater and sewage

substance	Loss rates
Triclosan	3.3
Glyphosate	65
Mecoprop	50
Copper	34

CSO Mecoprop in g/ha/a

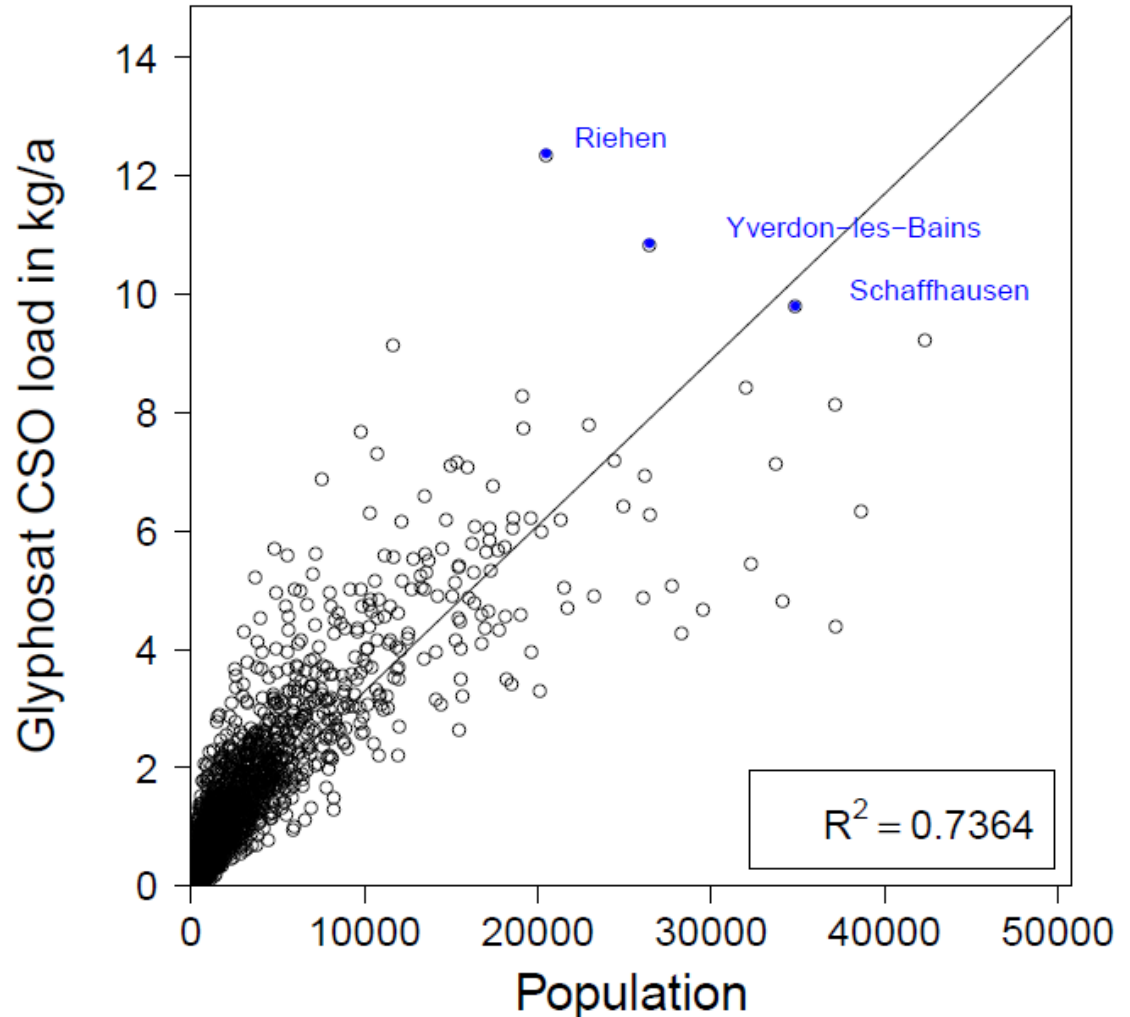
- 0.00 - 0.193
- 0.194 - 0.576
- 0.577 - 1.42
- 1.43 - 2.96



Identification of Hotspots

Results

- Indicator: Population



Summary

Substance flow analysis

1) What relevancy does NPS-micropollution carry?

- for many wastewater-borne MP concentrations in combined sewer are lower than environmental quality standards
- loss-rates of rainfall-mobilized substances
 - Glyphosate: 65%
 - Mecoprop: 50%

2) Can we identify most critical places?

- Even for rainfall-mobilized micropollutants population (< 50.000cap) is an good indicator for annual loads



Thank you for your attention !

ありがとう ございます。

merci beaucoup

Vielen Dank

cum Gratiae

شكران

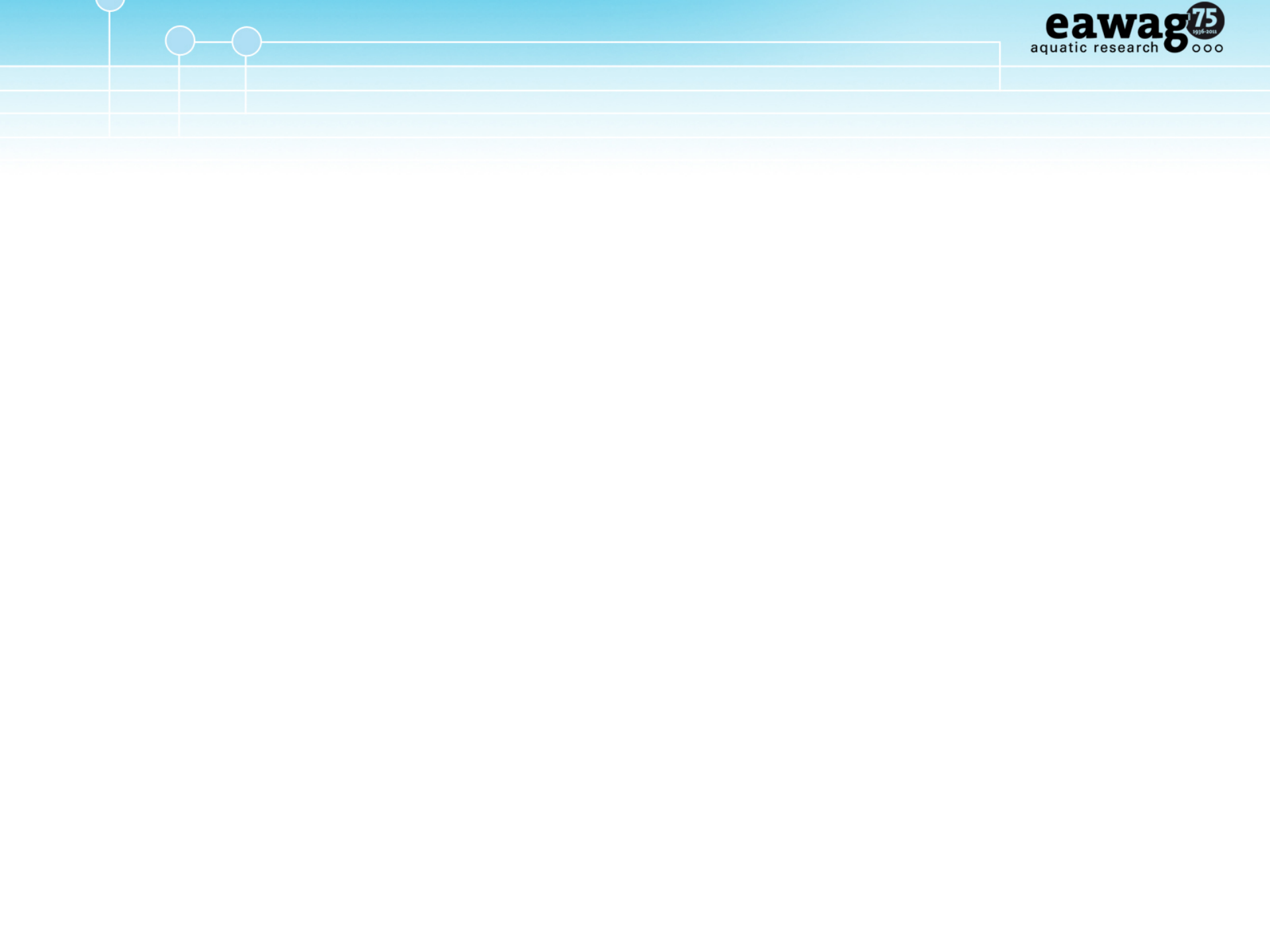


Blumensaat, F., P. Staufer, et al. (2012). "Water quality based assessment of urban drainage impacts in Europe – where do we stand today?" Water Science and Technology **66**(2): 304–313.

Staufer, P., L. Mutzner, et al. (2012). Dynamic Substance Flow Analysis of rainfall-mobilized Micropollutants. 9th Int. Conf. on Urban Drainage Modelling, Belgrade, Serbia.

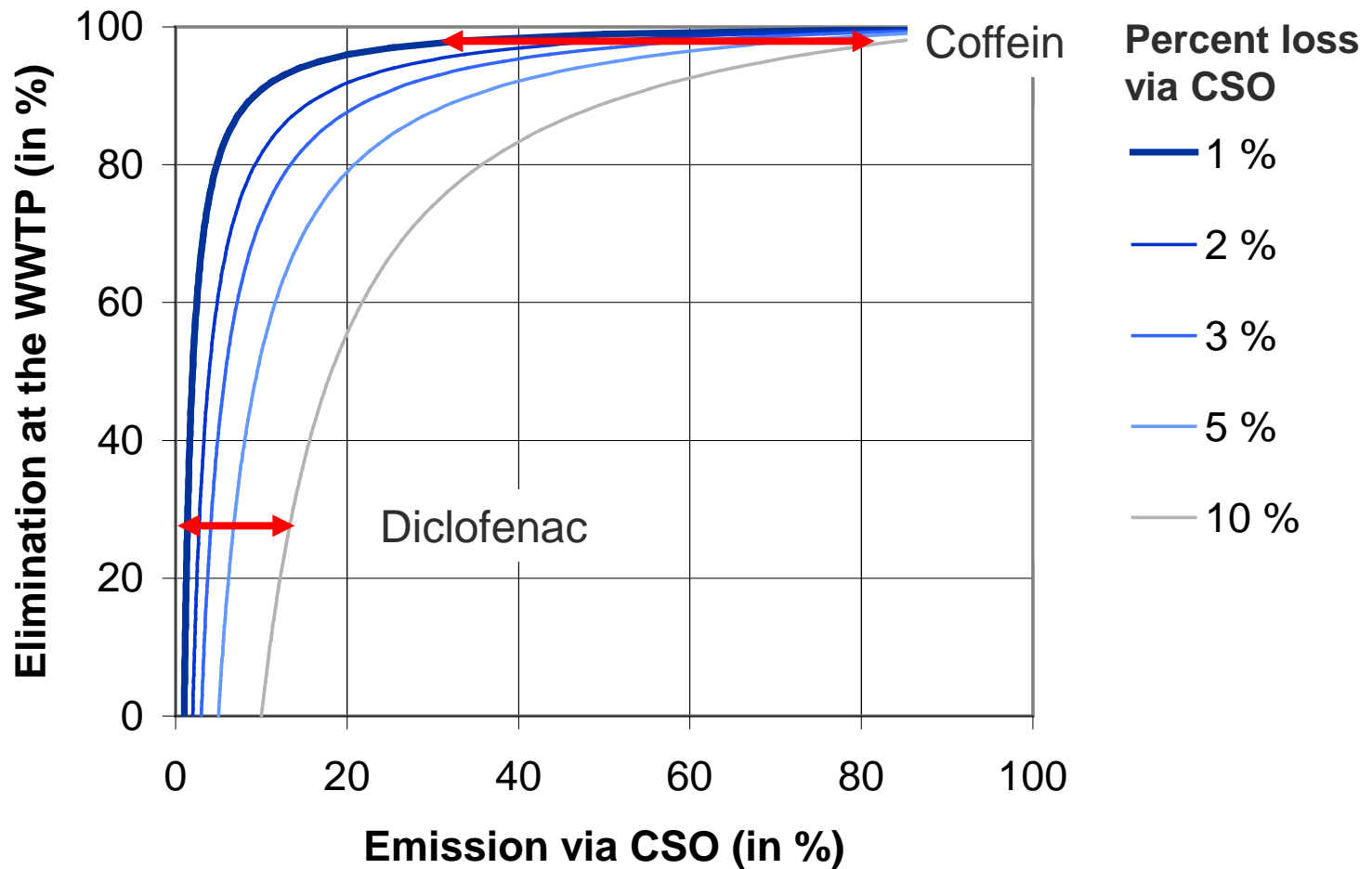
Staufer, P. and C. Ort (2012). Schweizweite Bilanzierung der Einträge von Mikroverunreinigungen aus Mischwasserentlastungen. Aqua Urbanica T. Schmitt and I. Alves. Kaiserslautern, Schriftenreihe des Fachgebietes für Siedlungswasserwirtschaft der TU Kaiserslautern: I1 - I22.

Ort, C., J. Hollender, et al. (2009). "Model-Based Evaluation of Reduction Strategies for Micropollutants from Wastewater Treatment Plants in Complex River Networks." Environmental Science & Technology **43**(9): 3214-3220.



Emissionen aus Mischwasserentlastungen

Framework



Emissionen aus Mischwasserentlastungen

Framework

