Prioritization of biocides for Monitoring of Swiss surface waters

part of project “evaluation and sampling concept of micropolluants from diffuse sources”

I. Wittmer ,
C. Leu, C. Moschet, N. Munz, M. Junghans, H. Singer, C. Stamm

Content

- Prioritization method
- Results
- Comprehensive anaytical Screening
- Conclusions

Goal of compound selection for surface water monitoring (water phase)

- Compounds are measured or expected in **high concentrations**/loads and/or
- Compounds are **ecotoxicologycally relevant**
- most **important sources** on the national scale are represented

→ The selection of biocides is part of a much larger project, where all compounds from communal waste water and diffuse sources are considered (In total 80 compounds)

Selection of 10-15 biocides for which environmental quality standards are derived.

Approach

1. Identification of surface water relevant biocides (categorization)
   - Available measurement data,
   - Environmental fate
   - Toxicity data
   - ~~Consumption data~~ (not available)

2. Selection of surface water relevant biocides based on further criteria
   - Sources (product types)
   - Screening,
   - Authorization
   - Expert knowledge

3. Discussion and final selection with stakholders (federal offices, cantonal public authorities, industry)

1. Identification of surface water relevant biocides (categorization)

High measured environmental concentration	Input is likely and compound is toxic	Input is likely	Not stable in water	Inputs are unlikely

Surface water relevant **Not surface water relevant**

1. Identification of surface water relevant biocides (categorization)

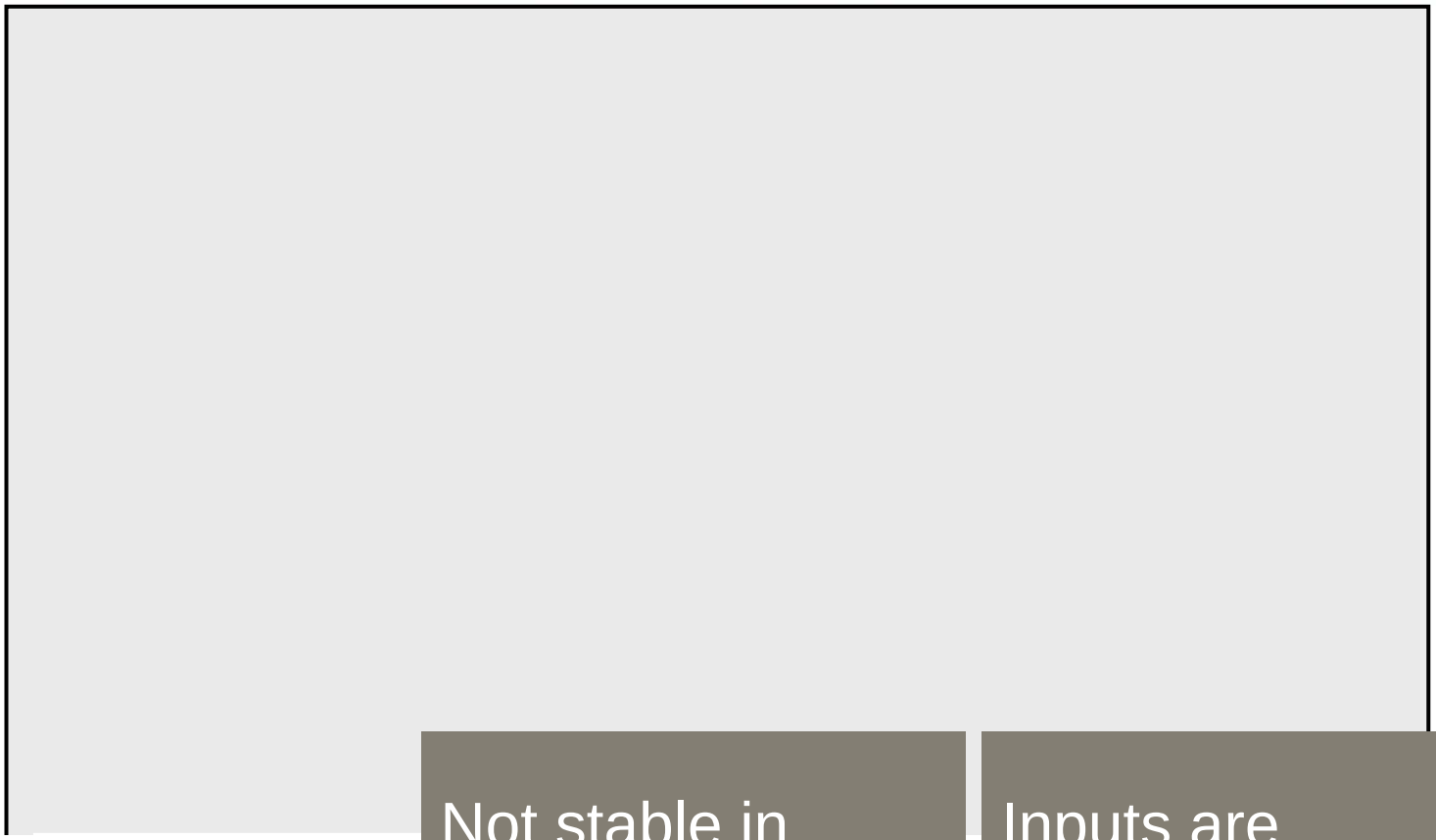
High measured environmental concentration

Inputs are likely and compound is toxic

Inputs are likely

Surface water relevant

1. Identification of surface water relevant biocides (categorization)



Not stable in water

Inputs are unlikely

Not surface water relevant

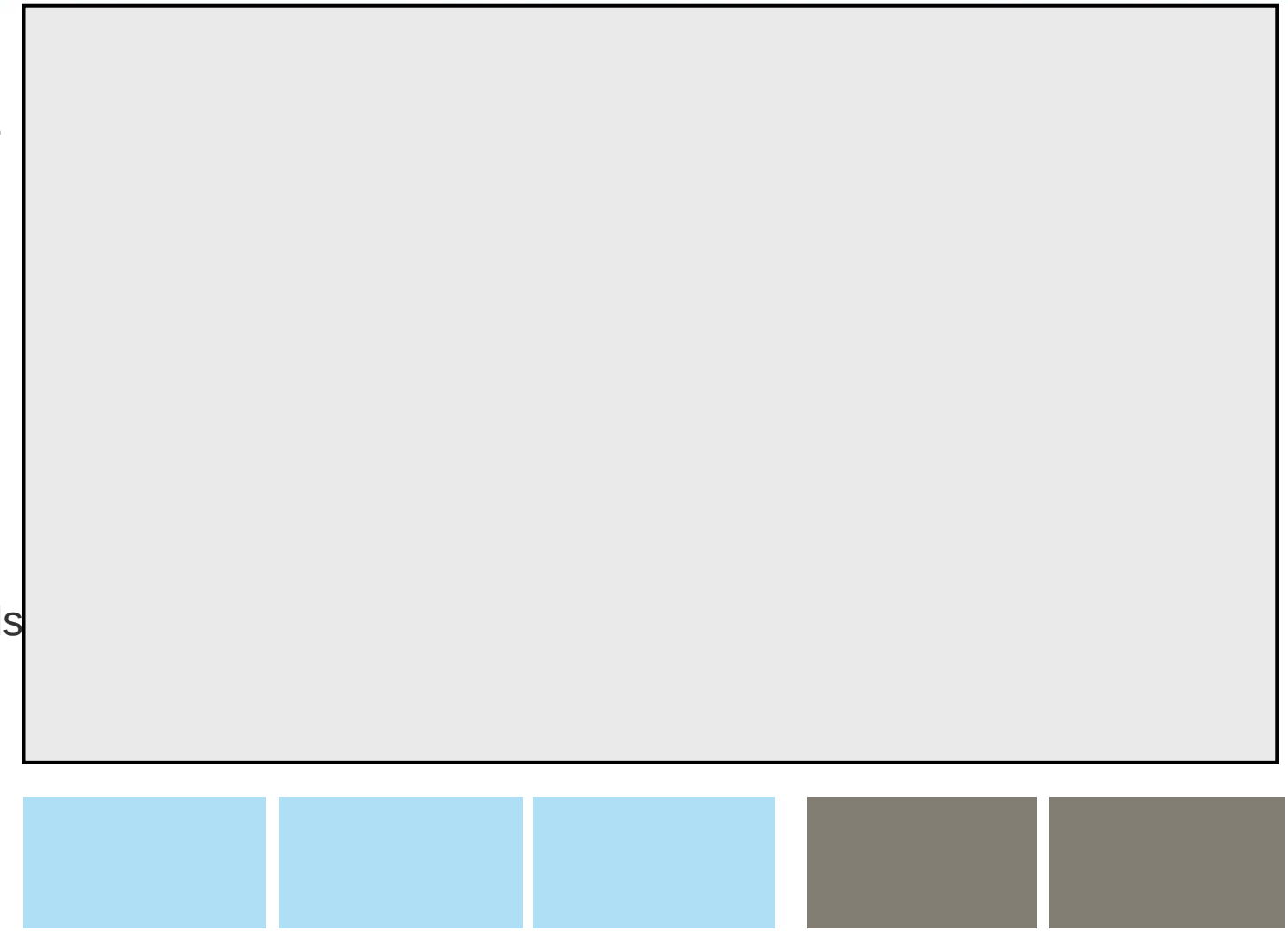
1. Identification of surface water relevant biocides (categorization)

Measured environmental concentrations

Estimated environmental occurrence

Prioritization environmental quality standards (prioUQW)

5 Categories



Surface water relevant

Not surface water relevant

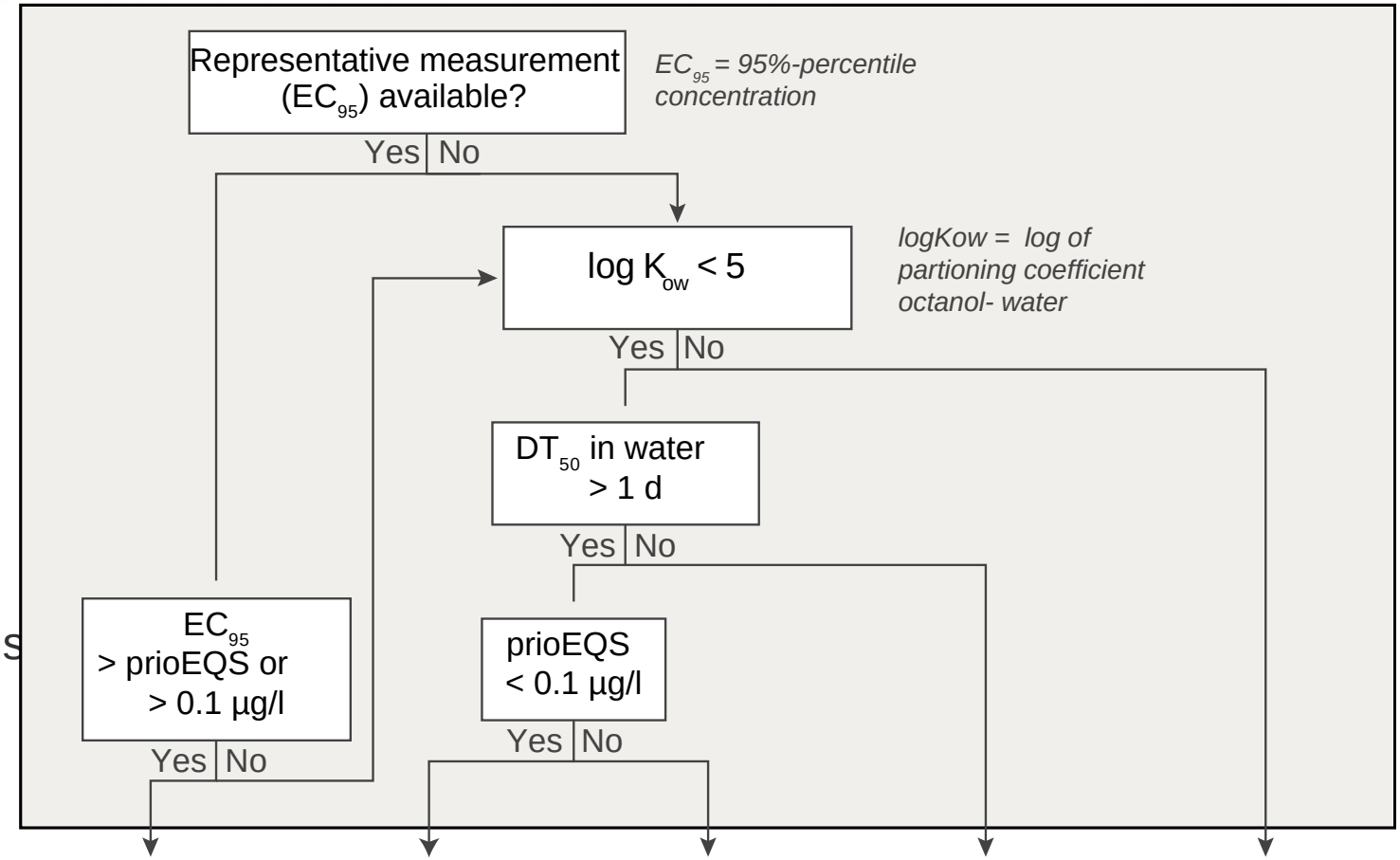
Categorization approach

Measured environmental concentrations

Estimated environmental occurrence

Prioritization environmental quality standards (prioEQS)

5 Categories



Surface water relevant

Not surface water relevant

Results

Number of compounds that are :

Notified (2012)	**381**
.. registered at least in 1 product + synthetic organic + no polymer + no QAC	**151**

QAC = quaternary ammonium compound

Measured in Swiss surface water samples	**46**
EC_{95} > LOQ	**13**
Measured and EC_{95} high	**2**

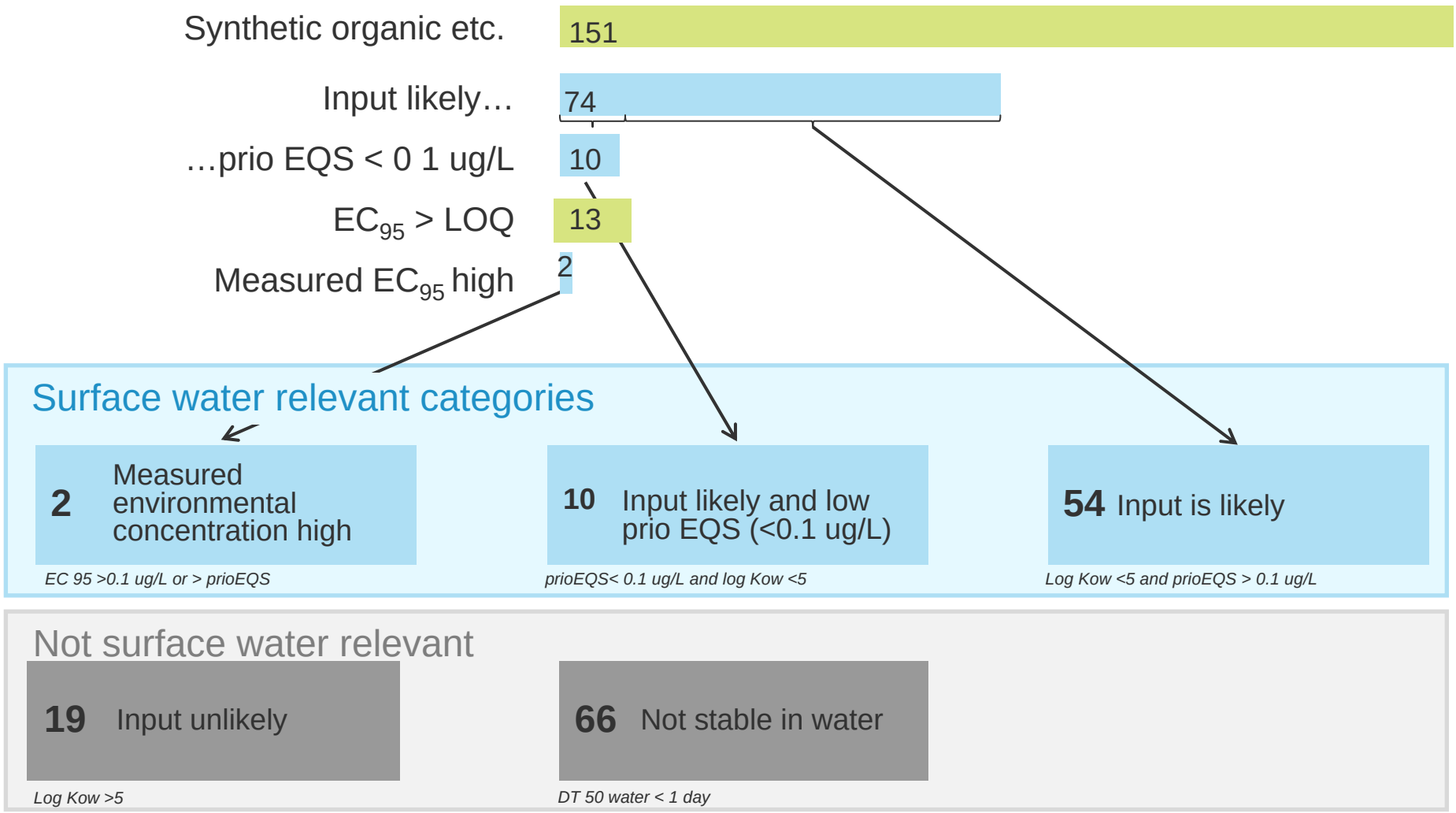
Measured environmental concentrations

Annual consumption data (2008-2010)	**???**
Input likely…	**74**
prio EQS < 0.1 ug/L	**10**

Estimated environmental occurrence

Results categorization of biocides

Number of compounds :



Selection of biocides I

A large proportion was not selected because they are :

33% (115) .. not synthetic organic

18% (66) .. not stable in water

25% (100) .. notified but were never allowed in any product

7% (26) .. quaternary ammonium compounds which are strongly sorbing

→ Only 66 (<20%) of all notified compounds have to be taken into account.

11 selected compounds are biocides but…

DEET	→ Insect repellent (MEC_{95} > 107 ng/l)	*(PT 19)*
Mecoprop[P]	→ Bitumen sheets, garden and agriculture (cereals)	*(not officially)*
Diuron[P]	→ Facades and fruit	*(PT 7,10)*
Carbendazim[P]	→ Film preservatives and agriculture (fruit, cereal, rape)	*(PT 7,9,10)*
Diazinon[P]	→ No longer registered as biocide or plant protection agent, only as veterinary pharmaceutical	*(forbidden)*
Triclosan	→ Disinfectant, human hygiene	*(PT 1,2,7,9)*
Thiamatoxam[P]	→ Wood protection, pest control and agriculture	*(PT 8,18)*
Tebuconazol[P]	→ Wood protection and agriculture	*(PT 7,8,9,10)*
Terbutryn	→ Film preservative	*(PT 7,9,10)*
Irgarol	→ Antifouling	(PT 21)
Isoproturon[P]	→ Facades but main use rather in agriculture	*(PT 7,10)*

P: also registered as plant protection product

Limitations for the selection

- Annual consumption data missing

  (Older (2007) rough estimations available (Biomik), new Estimations for PT 3,4,7,8,10,21 available soon)
- Registered in several product types and also used in agriculture
- The ten most toxic compounds belong mainly to pest control (PT 18) which probably have low consumption figures (Biomik)

Not represented product types:

- Veterinary preservatives (PT 3)
- Preservatives for processing systems (PT 11)

Project Biomik, *Friedli Partner, 2007*

Outlook- Biocide screening

- → Screening of 2-weekly water samples (March-July 2012)
- → 5 representative Swiss catchments
- → 151 (surface water relevant and not relevant compounds) are analyzed (Target an non-target screening)

Potentially relevant compounds to be approved by screening:

Chlorkresol → Different uses *(PT 1,2,3,9,6,13)*

Propiconazol [P] → Wood preservative (instead of Tebuconazole [P]) *(PT 7,8,9)*

pyrethroids →(Deltamehtrin, Tetramethrin) Analytical problems

…

Conclusions

- Only **66 of 381 (17 %)** notified biocides have been identified as potentially relevant for surface water (water phase) by the presented approach.
- **Consumption data** (as collect for plant protection agents) would improve identifying potentially relevant compounds
- Many potentially relevant biocides **are former or current plant protection agents.**
- **Quaternary ammonium compounds** are probably relevant but rather for the **sediment** and not the water phase.

Thank you for your attention!!

Questions?

Big Thanks to:

Christoph Moschet (Eawag)
Nicole Munz (Bafu)
Marion Junghans (Ökotoxzentrum)