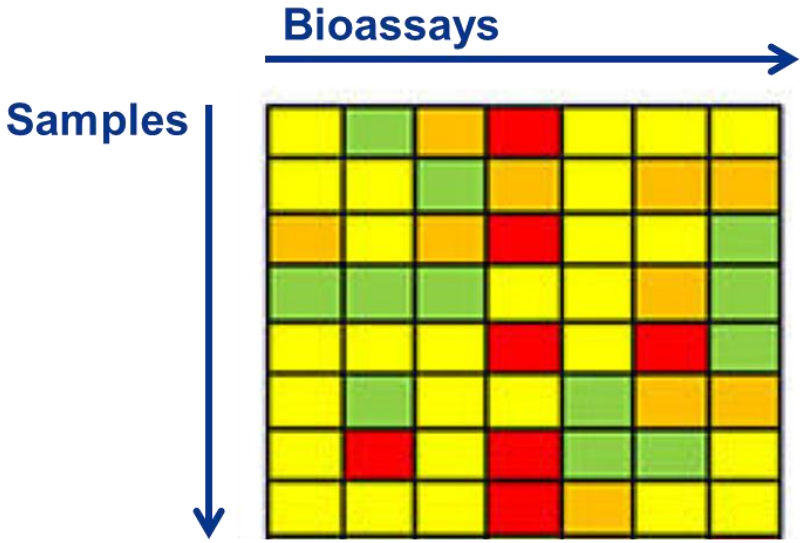
Time-Integrative Passive sampling combined with Toxicity Profiling (TIPTOP)

an effect-based strategy for cost-effective chemical water quality assessment



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TIPTOP hypotheses

Hypothesis 1:

Risk assessment based on toxicity profiles of complex mixture is:

- toxicologically more relevant
- ecologically more relevant
- thereby more protective

than RA based on individually, target-analyzed compounds

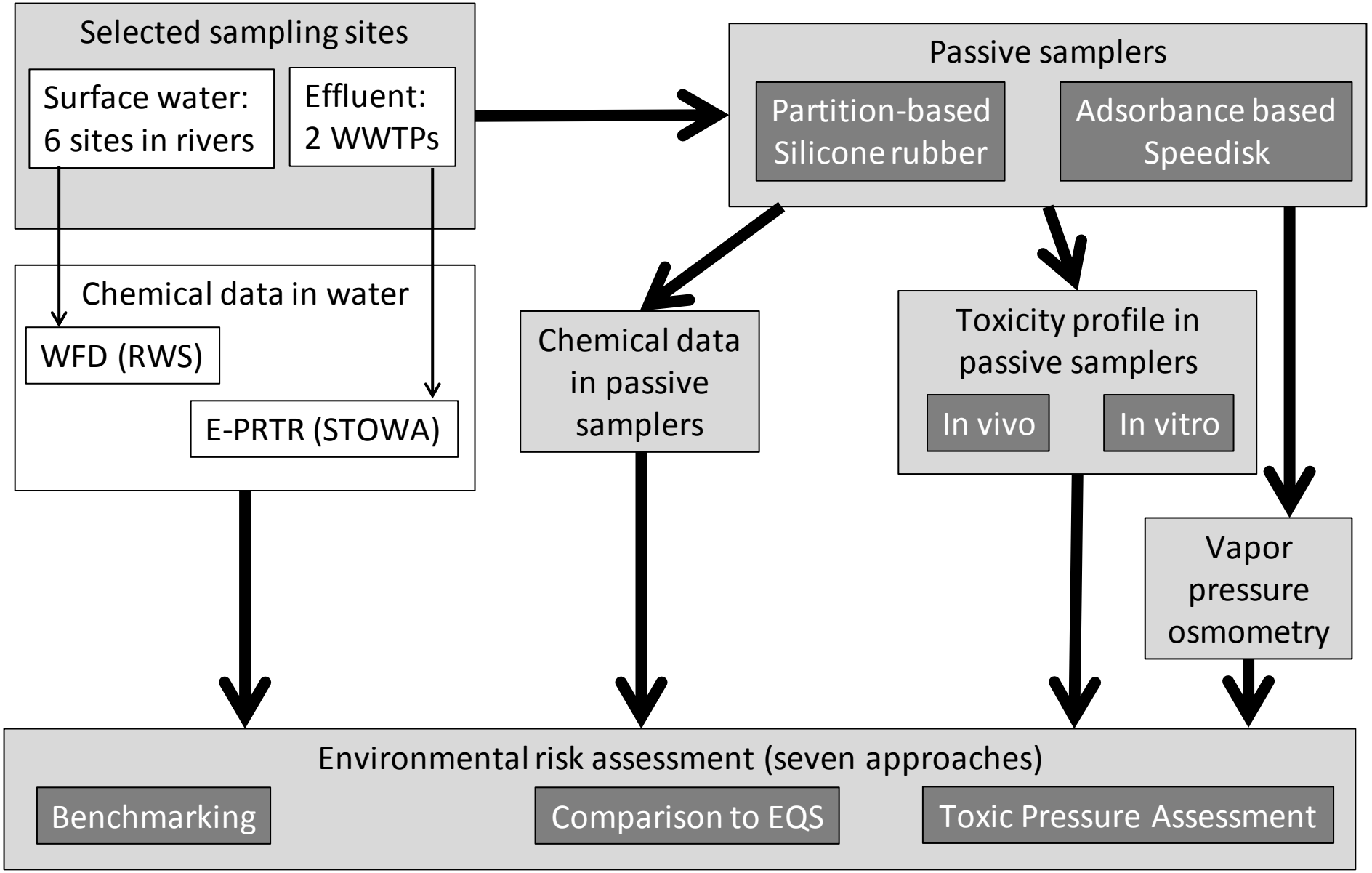
Hypothesis 2:

For chemical status monitoring, a combination of

- time-integrative passive sampling
- toxicity profiling

is more cost-effective than target-analysis of a continuously expanding suite of individual compounds in grab-samples

Set-up of the TIPTOP study



Seven different approaches

1. Benchmark toxicity profiles of surface water to WWTP effluent
2. Compare water concentrations to EQS
3. Compare *in vitro* results to “trigger values”
4. Determine toxic pressure based on measured concentrations
5. Determine toxic pressure based on in vivo bioassay results
6. Determine toxic pressure for narcotic compounds
7. Determine toxic pressure based on specific in vitro bioassay results

Conclusions (general)

- Surface water and WWTP effluent is clean!
  - Due to regulatory policies as REACH and WFD?
  - Hampers testing of toxicological and ecological relevance and of protectiveness (Hypothesis 1)
- Analyzing many chemicals <LOD is not cost-effective (but current WFD practice!)
- Testing time-integrated, concentrated water samples in bioassays is more cost-effective (hypothesis 2)
  - Margin of exposure to toxicity threshold values (Hypothesis 1)
  - Useful for prioritizing sampling locations

Outlook – Four step alternative monitoring strategy

Estimated annual cost reduction from k€40 to k€16 per WFD sampling site

1. Determine distribution of time-integrated concentrations in water
   - Individual compounds
   - Total molar sum
   - Equivalent concentration (specific in vitro bioassay)
2. Determine distribution of effect concentrations
   - Generic acute EC50s or chronic NOECs
   - In vivo bioassay results
   - Mechanism-specific chronic NOECs
3. Calculate toxic pressure
   - Generic acute/chronic toxic pressure
   - Mechanism-specific toxic pressure (including narcotic action)
4. Compare toxic pressure to maximum acceptable toxic pressure
   - Standard to be set
   - 5% seems to be fairly acceptable

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