



Managing water safety - Water quality assessment framework and tools for risk assessment

Challenges of water quality assessment

Requires specific knowledge and tools:

- Assessment of potential contamination of source
- Assessment of treatment efficiency
- Assessment of treated water
- Knowledge on system hydrology and dynamics

(All above have to be related to the intended use, regulatory framework or water quality guidelines, more detail is given in [Deliverable 4.2](#))

Water quality assessment framework

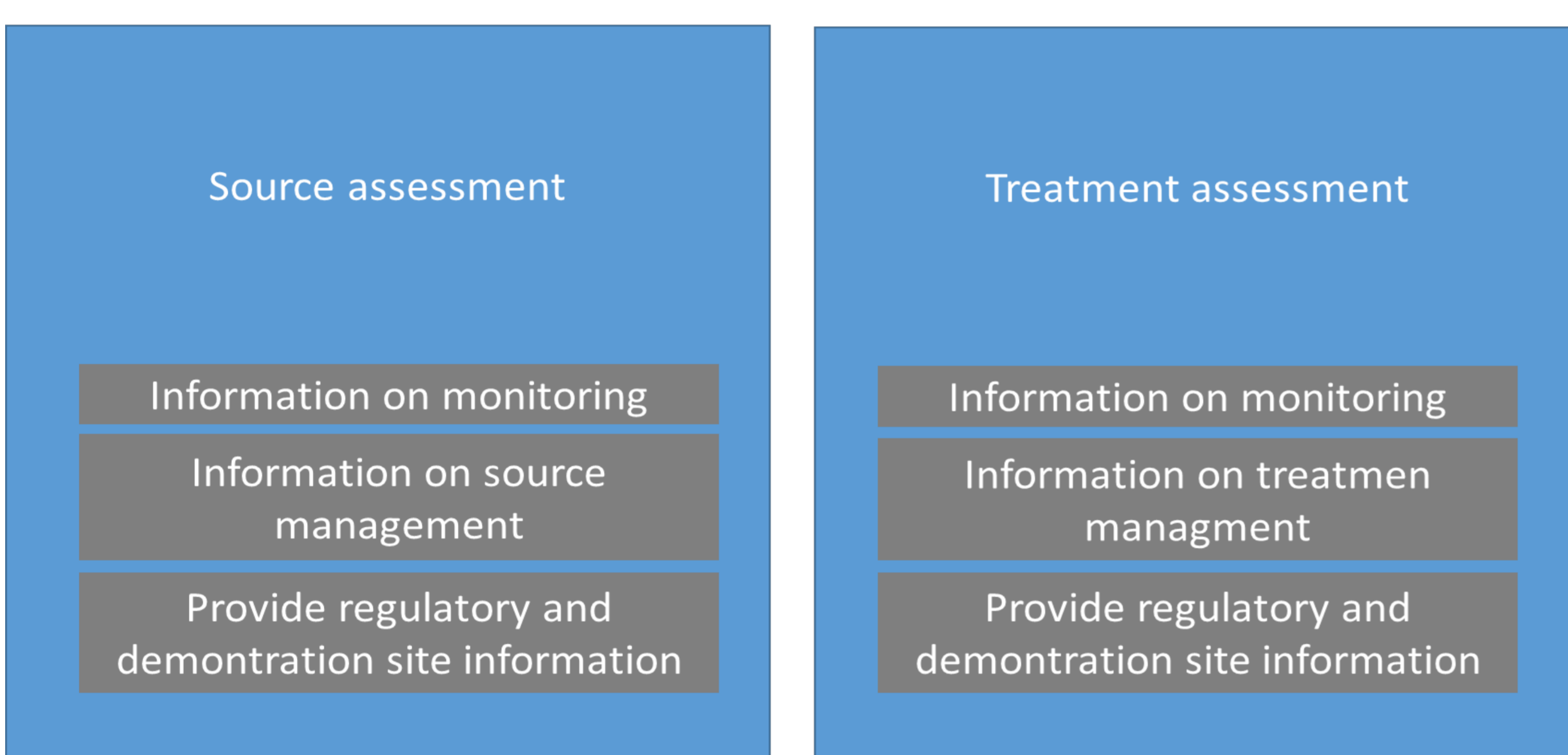


Figure 1: Water Quality Assessment Framework

Knowledge of the chemical, microbiological and hydrological status and dynamics are essential for designing monitoring efforts and provide input for source management (or dialogue with external source managers) and treatment evaluation or design

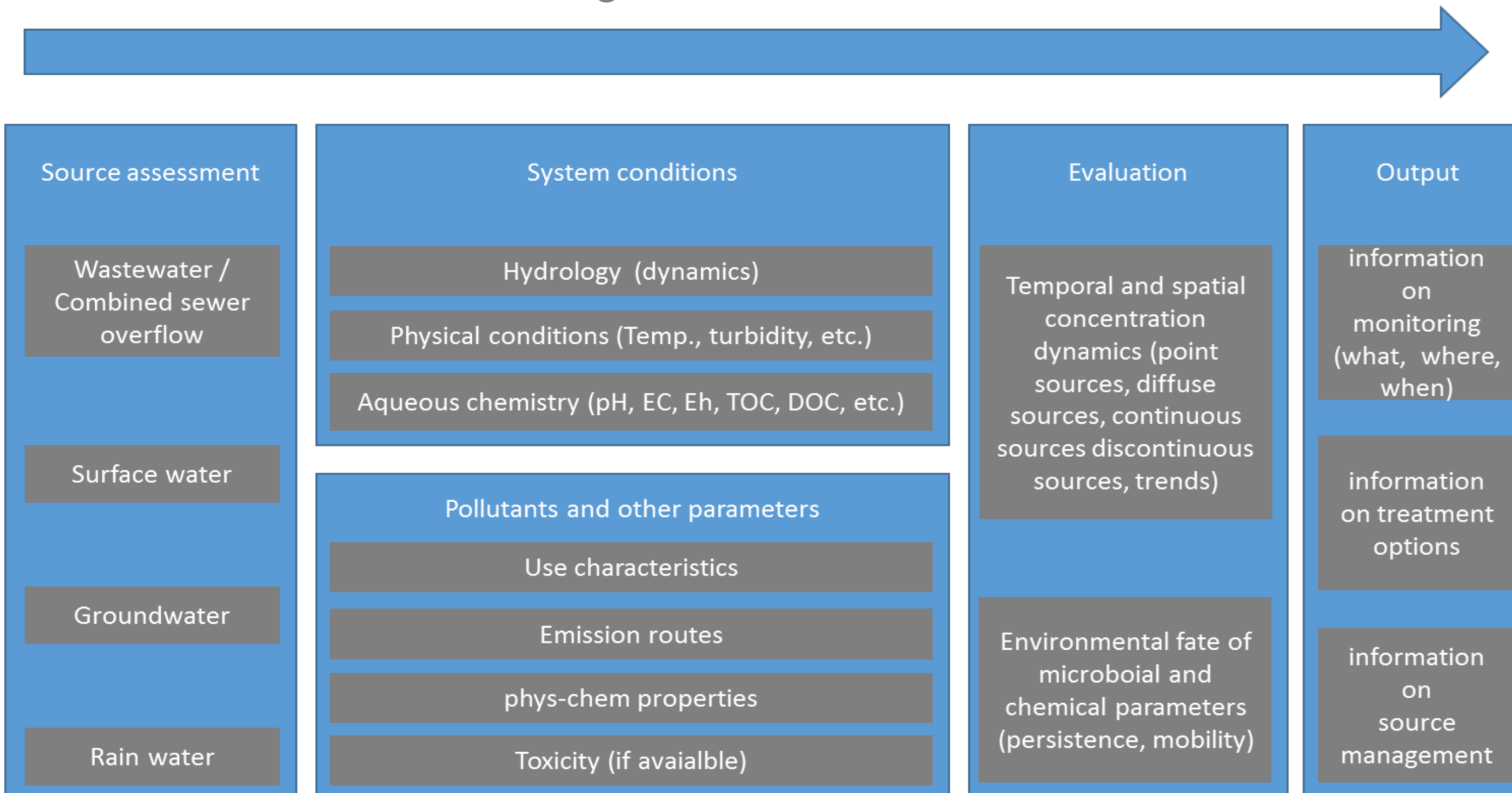


Figure 2: Source Assessment

Knowledge on treatment efficiency for chemical and microbial contamination in source water supports treatment monitoring design, treatment management and potential adaptation of treatment(trains)

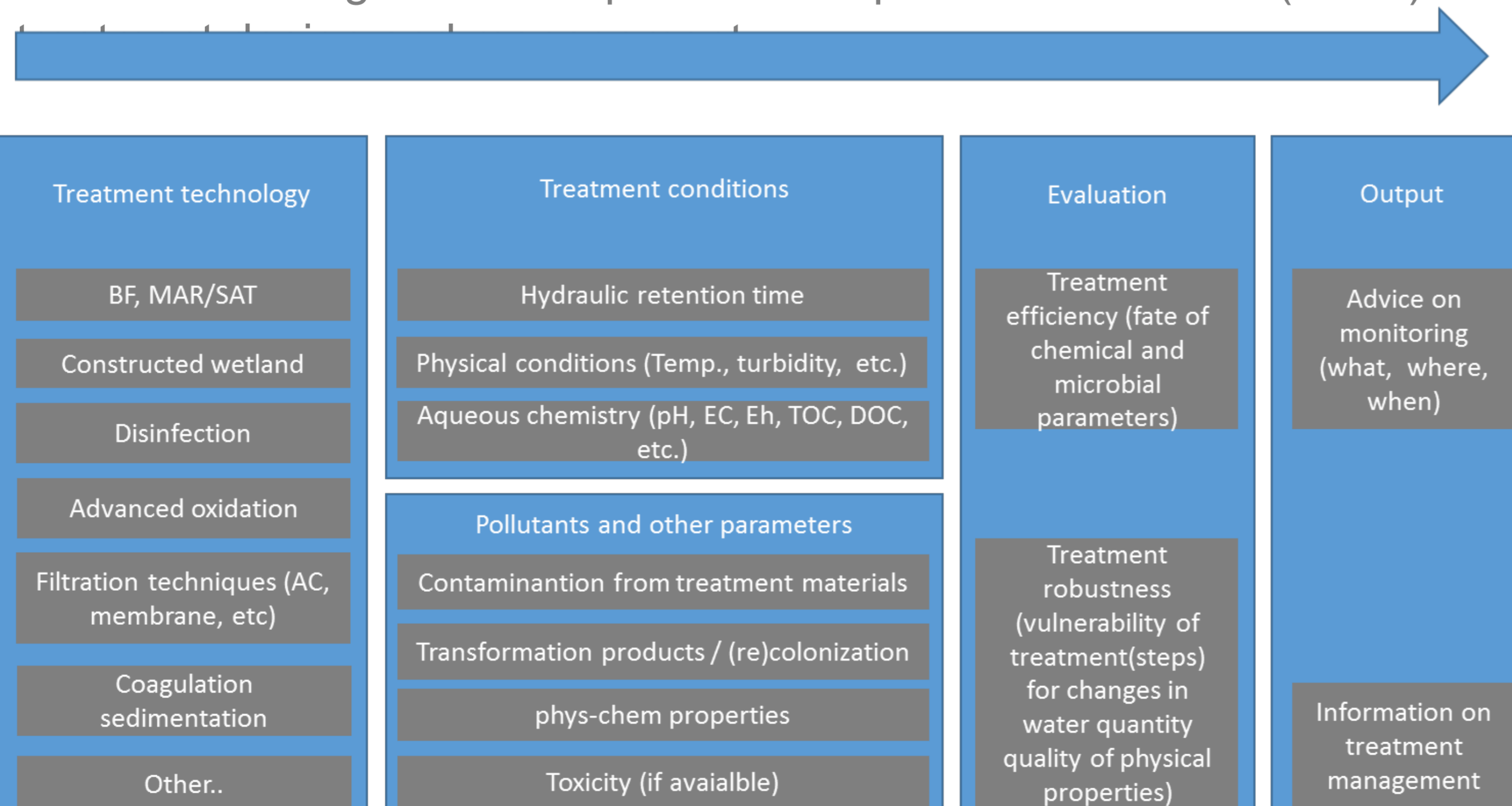


Figure 3: Treatment Assessment

Regulatory standards, and non-regulatory quality criteria

- Evaluate systems / contamination sources and potential threats and customize water quality assessment accordingly
- Look beyond regulatory frameworks and its water quality criteria, as risks are not solely determined by regulated parameters. Emerging issues of today might be regulated tomorrow. Non-governmental water quality guidelines are available [1, 2]

Solutions (for cNES applications)

- Use reference data of similar systems and situations (e.g. demonstration sites, data on treatment techniques or source contamination).
- Build a community with parties using similar techniques to enable first hand data and knowledge transfer (<http://www.aquan-es-h2020.eu/>, <https://www.watershare.eu/>)
- Define key treatment processes and evaluate its robustness
- Use innovative tools if they provide additional and relevant information or have advantages in efficiency or speed. See: [Deliverable 4.3](#).
- Use tiered approaches and event specific monitoring in order to use funds and capacity efficiently
- Use data processing tools for better data interpretation
- Apply gathered information for Water Safety Planning or scenario studies to test system resilience

Tools and reference data

- Interpretation of (on line) monitoring data of water quality or treatment operation can be difficult. Data visualization and interpretation software supports operators and managers to gather useful information for decisions making. Open source software (R) is an affordable solution. This is described in [Deliverable 4.1](#)
- The assessment of microbial water contamination in water treatment systems is challenging because. 1) Microbial contamination has a very dynamic character. 2) Water quality criteria are often below practical detection limits. An interactive web based tool is developed that estimates microbial loads and removal efficiencies through water treatment schemes.

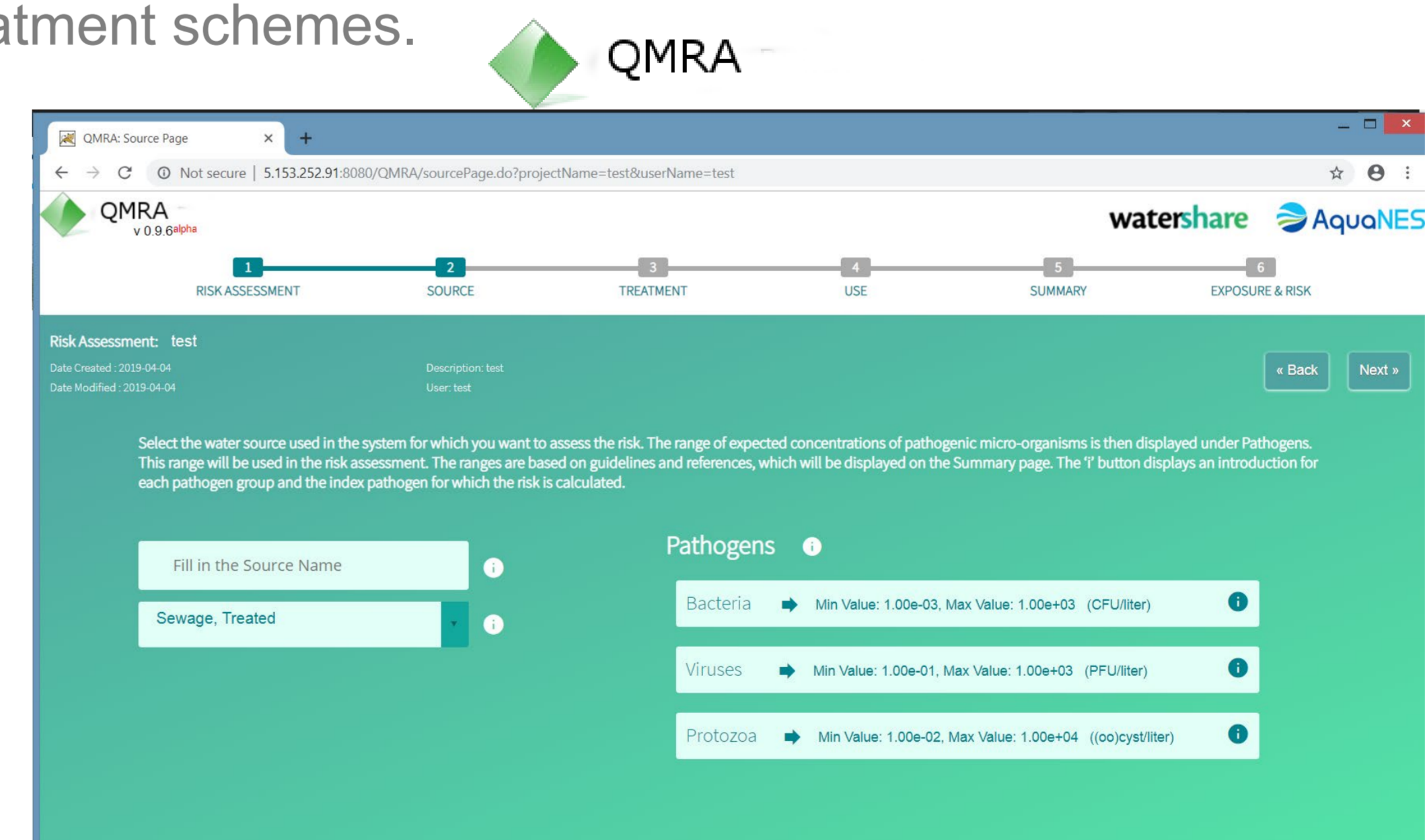


Figure 4: web based interactive QMRA tool

- The assessment of chemical water quality is challenging due to the wide array of chemicals present and sophisticated analytical techniques required to measure them. An interactive web based provides chemical contamination loads and removal efficiencies through water treatment technologies

Literature

- [1] WHO Guidelines for drinking-water quality - 4th ed.; World Health Organisation: Geneva, Switzerland, 2011; p 568.
- [2] Baken, K.; Sjerps, R. The Threshold of Toxicological Concern (TTC): refinement of the concept and application to drinking water; BTO 2016.069; KWR Watercycle Reserach Institute: Nieuwegein, The Netherlands, 2016; p 50.