

Germany – Design of inland water monitoring network

Workshop on surface waters monitoring networks

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Implementation of EU Water Framework Directive in Germany

Federal structure: 16 German States

- Federal Government: legislative framework competence
- State (Länder) level: Competence for water resource protection and management
- Administrative borders of the States and the Federal Republic are not coherent with the river basin approach of the Directive
- Co-operation procedures between the 16 States: Länder Working Group on Water (LAWA)
→ to designate competent authorities, set environmental objectives for river basins and design river basin management plans



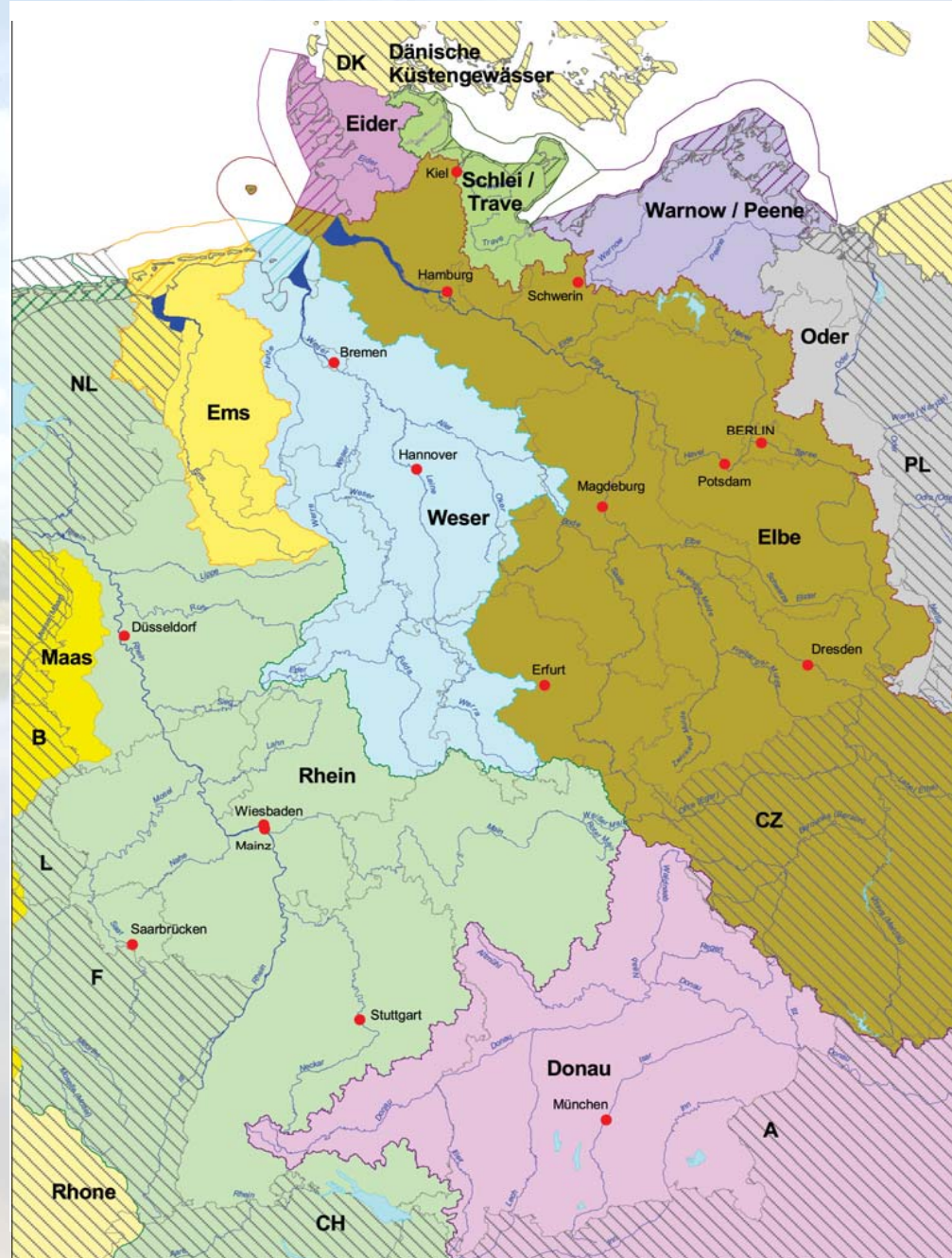
Source: German Federal Environment Agency

Inland water system of Germany

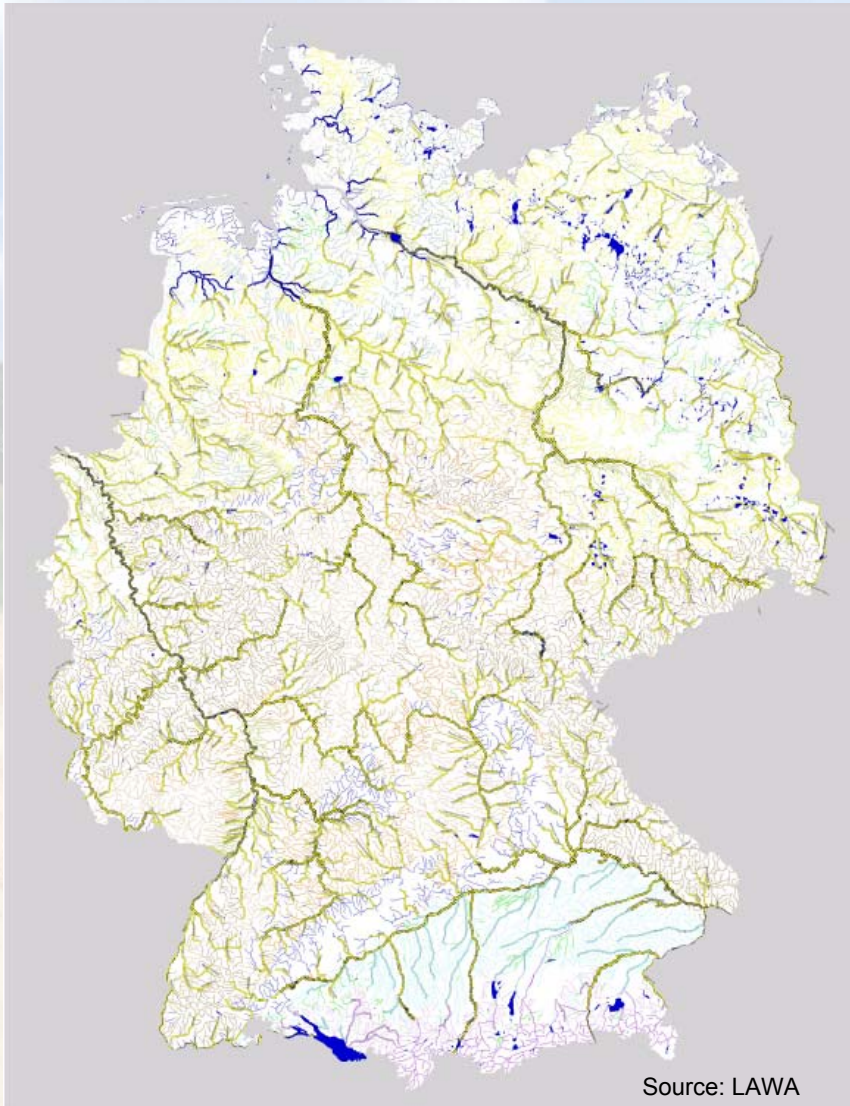
~ 400,000 km flowing waters

River Basin Districts:

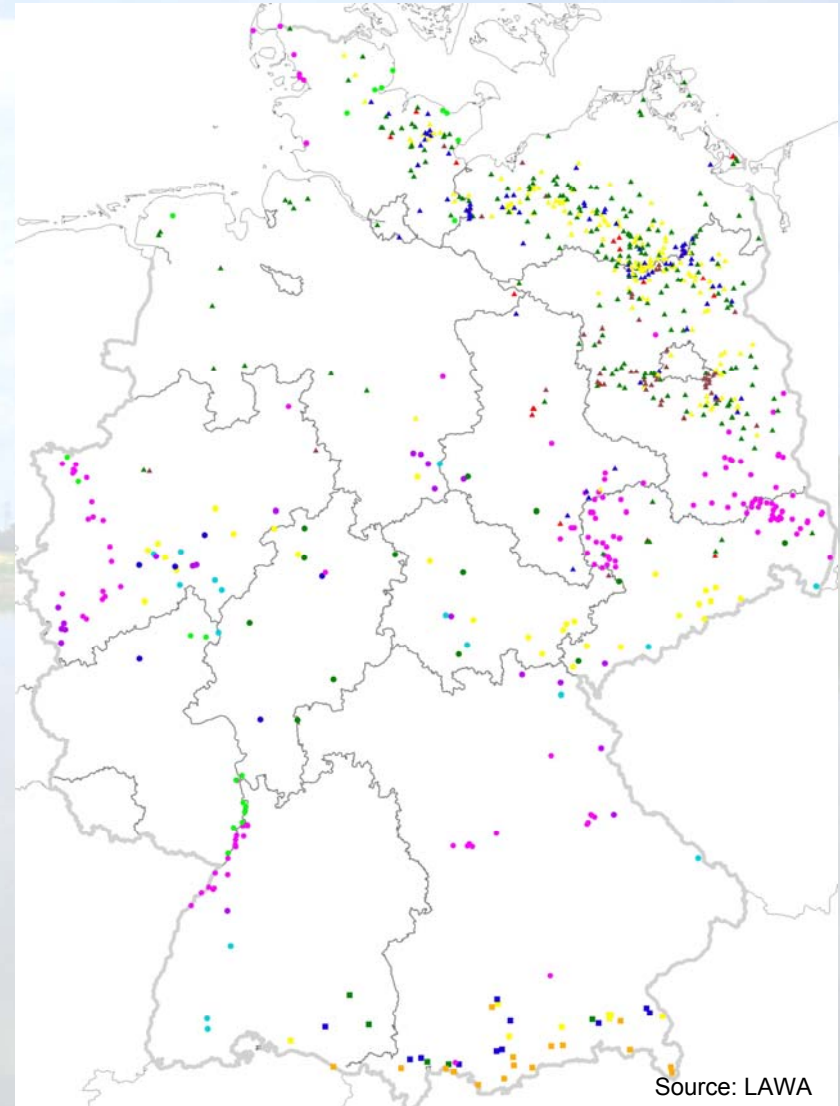
- Warnow/Peene
 - Weser
- 2 national**
- Maas
 - Rhine
 - Ems
 - Schlei/Trave
 - Elbe
 - Eider
 - Oder
 - Danube
- 8 international**



Water Body Delineation and Typology



~ 9000 River Water Bodies
→ 25 River types (+ subtypes)



~ 800 Lakes (> 0.5 km²)
→ 14 Lake types

Surveillance monitoring – selection of monitoring points

- Representative and important monitoring sites for the whole catchment area (rate of water flow significant, e.g. locaties in large rivers with a basin surface $> 2500 \text{ km}^2$)
- Volume of water present significant within the river basin district, including large lakes and reservoirs (lakes $> 10 \text{ km}^2$ and lakes with good status)
- Sites identified under the Information Exchange Decision 77/795/EEC
- Significant water bodies of water cross a Member State boundary
- Preferably basing on existing monitoring networks, which has been used for following EU-directives / purposes:
 - 76/464/EEC hazardous substances
 - 91/676/EEC Nitrate
 - LAWA/EEA
 - OSPAR / HELCOM

Surveillance monitoring quality elements and methods

Complete overview of all quality elements within waterbody:

- General physico-chemical components
- Specific synthetic / unsynthetic pollutants
- Priority list substances
- Biological quality elements
 - Macroinvertebrates
 - Fishfauna
 - Macrophytes / Phytobenthos
 - Phytoplankton

Biological assessment methods for rivers

	Macro-invertebrates	Phytoplankton (just in plankton carrying rivers)	Phytobenthos	Macrophytes	Fishfauna
Sampling time	between February and August	April until October at least 6 times	between July and September	between July and September	August until September
Assessment	Multimetric assessment system three modules: organic pollution, acidification, general degradation	Multimetric assessment system consists of three to five modules depending on the type: biomass, taxonomic composition: Type specific potamoplankton index, pennales index, chlorophyceae index, cyanoprokaryota index	diatoms: multimetric assessment system consists of four modules: reference index and trophic index or saprobic index, acidification, halobien index phytobenthos without diatoms: reference index; based on indicator taxa	reference index, type specific taxagroups	Multimetric assessment system consists of 6 modules: inventory of species and guilds, abundance of species and guilds, age structure, migration, fish region, dominant species
Status	Worst result determines the status	Average of at least three modules	Average of the three modules		Average of the modules

Biological assessment methods for lakes

	Macroinvertebrates	Phytoplankton	Phytobenthos (diatoms)	Macrophytes	Fishfauna
Sampling time	Middle of March until the end of May	Between April and October; 6 times	Between July and September	Between July and September	<i>Under development</i>
Assessment	Typespecific multimetric index three to seven metrics, depending on the type	Multimetric assessment system consists of three metrics: biomass, algal class, PTSI (phytoplankton taxa lake index) and in some lake types DIPROF (profundal diatom index)	Multimetric assessment system consists of two modules: reference index and trophic index	Reference index: species composition (based on indicator taxa)	<i>Under development</i>
Status	Average of the metrics	Average of the metrics	Average of the modules		<i>Under development</i>

Surveillance monitoring network

~ 250 monitoring stations for rivers

~ 65 monitoring stations for lakes

(provisional data, January 2007)

▲ lakes ● rivers



Source: German Federal Environment Agency (January 2007)

Operational Monitoring

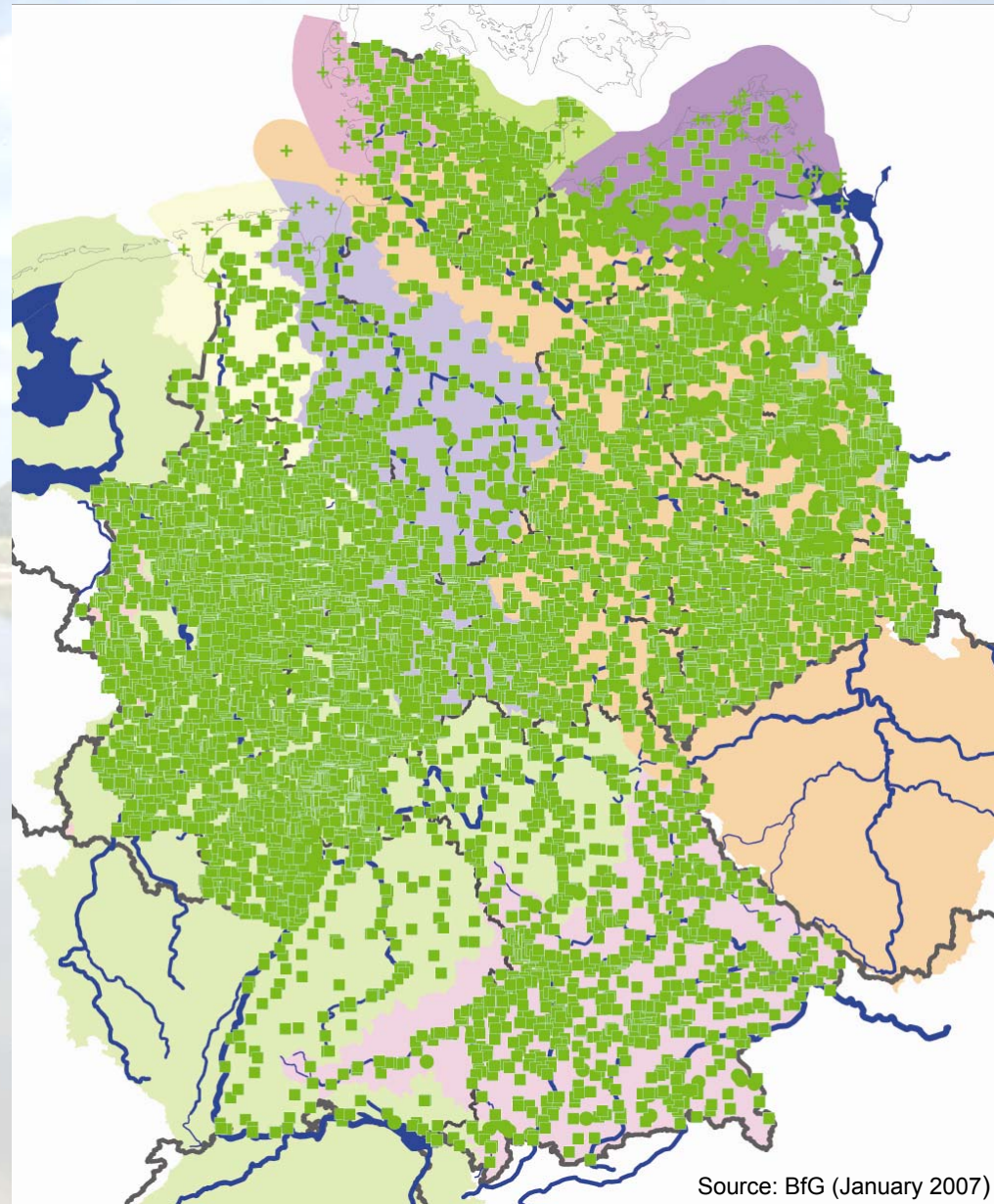
- Limited to waterbodies which (probably) fail the good status
- Investigated Parameters are limited to problematic aspect(s) (and most sensitive indicators therefore)
- Spatial and temporal monitoring density according to demands for reliability and accuracy of the assessment

Operational Monitoring network

~ 8000 monitoring stations for rivers

~ 590 monitoring stations for lakes

(provisional data, January 2007)



Source: BfG (January 2007)

Example:

Monitoring programme of the River Basin Community Elbe

(German part of the River Basin District Elbe)

Elbe river

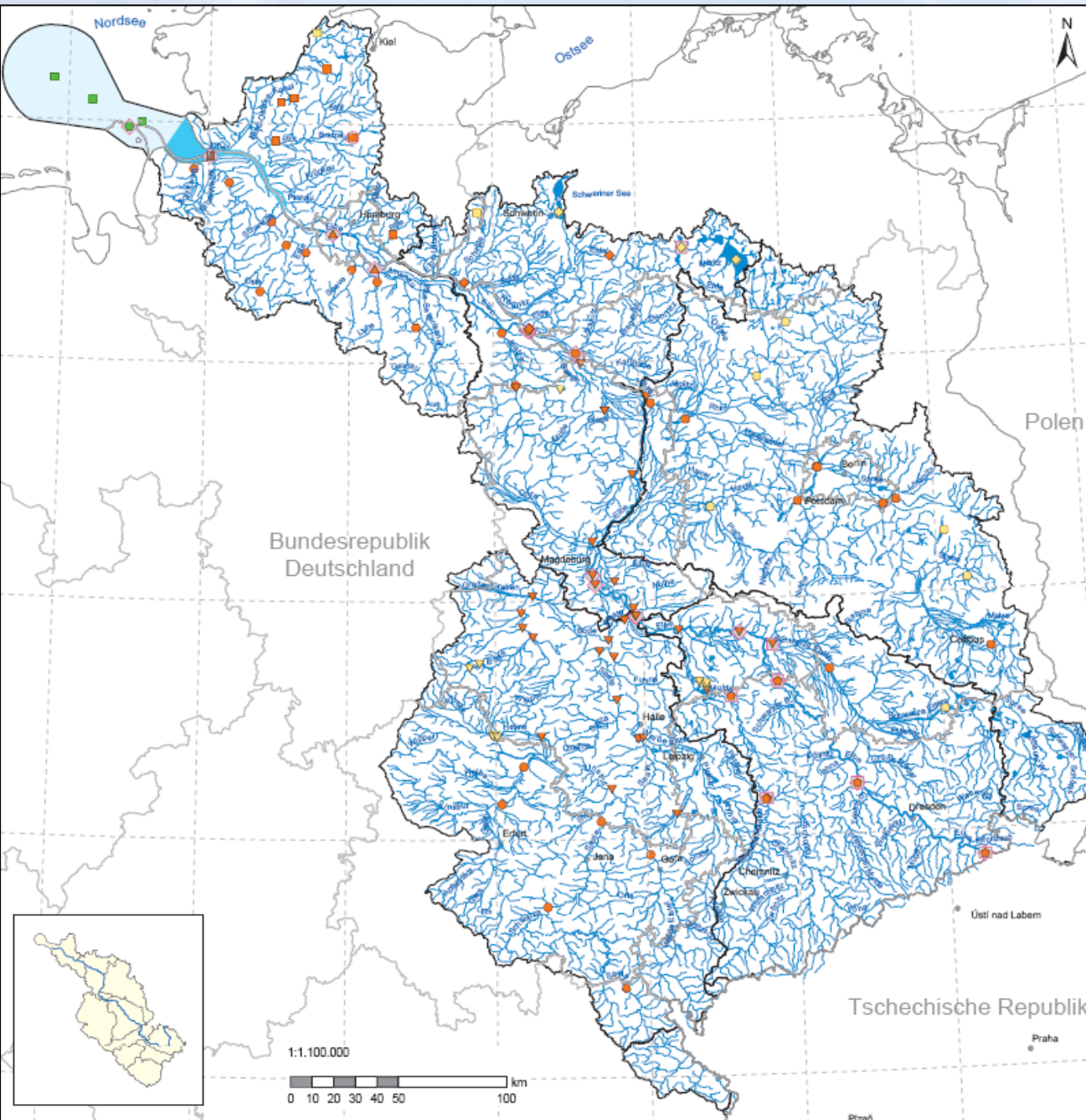
- Originates in Giant Mountains (Czech Republic) and finally flows into North Sea
- Total length: 1,091 km
- River basin district: 148,286 km² (65.4% Germany, 33.8% Czech Republic, 0.2% Poland, 0.6% Austria)

River Basin Community Elbe (FGG Elbe): Cooperation of 10 German Federal States and Federal Government – Implementation of WFD for German part of international River Basin District Elbe



Surveillance monitoring - surface water -

- - River (51 sites)
- - Lake (19 sites)
- - Transitional water (2 sites)
- - Coastal water (4 sites)



River Basin Community
Elbe (Draft: 28.10.2005)

Surveillance monitoring - River

- 51 stations

Quality element		Frequency (and sampling time)
Biology	Phytoplankton	6-7x/year, every 3 years (April until October)
	Macrophytes/ Phytobenthos	1x/year, every 3 years (between July and September)
	Macroinvertebrates	1x/year, every 3 years (between February and August; type-specific)
	Fish	3 times in 6 years (August until September)
Hydromorphology	Hydrological regime	Continuously
	River continuity	Once every 6 years
	Morphological conditions	Once every 6 years
Physico-chemistry		At least 12x/year, yearly
Other relevant pollutants (Annex VIII 1-9)		4 or 12x/year, at least once every 6 years; dependent on significant emissions (half environmental quality standard) and on the parameter
Substances (Annex IV)		4x/year; at least once every 6 years; if exceeding of the half environmental quality standard → yearly
Priority substances (Annex V)		12x/year; yearly only by discharge
Pollutants in other EU-Directives (Nitrate)		12x/year; at least once every 6 years

Surveillance monitoring - Lakes

- 19 stations

(Lakes > 10 km² & Volume > 50 Mio. m³)

Quality element		Frequency (and sampling time)
Biology	Phytoplankton	6x/year, every 3 years (April until October)
	Macrophytes/ Phytobenthos	1x/year, every 3 years (July until September)
	Macroinvertebrates	1x/year, every 3 years (middle of March until end of May)
	Fish	Under development
Hydromorphology	Hydrological regime	Continuously
	Morphological conditions	Once every 6 years
Physico-chemistry		6x/year, every 3 years
Other relevant pollutants (Annex VIII 1-9)		4 or 12x/year; at least once every 6 years; dependent on significant emissions
Substances (Annex IV)		4x/year; every 6 years; if exceeding of the half environmental quality standard → yearly
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Operational monitoring

- Rivers: about 1600 stations
- Lakes: about 230 stations
- No central coordination of the operational monitoring (selection of monitoring sites, quality elements and frequency of monitoring)
- Design of the operational monitoring site-specific: dependent on local pressure situation of the water body and the planned mitigation measures
- Frequency of monitoring: provide sufficient data for reliable assessment of the status of the relevant quality element; normally in accordance with the frequencies in Annex V
Section 1.3.4 WFD



Thank you for your attention!