Sediment management concept of the River Elbe (Germany) – implementation status and an example for supporting research

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BfG Federal Institute of Hydrology

FGG ELBE

Sediment management concepts (SeMC) of the River Elbe

- RBC Elbe and ICPER identified the need to develop a sediment management concept (first River Basin Management Plan for the WFD, 2009)
  - relevant for achieving the objectives of the European WFD
  - published 2013 and 2014
- Central aim: suggestions for good sediment management practice in the Elbe catchment area in order to achieve supra-regional action goals
- Specific recommendations for action and management options were formulated based on an integral consideration (aspects sediment quality, quantity and hydromorphology as well as navigation)

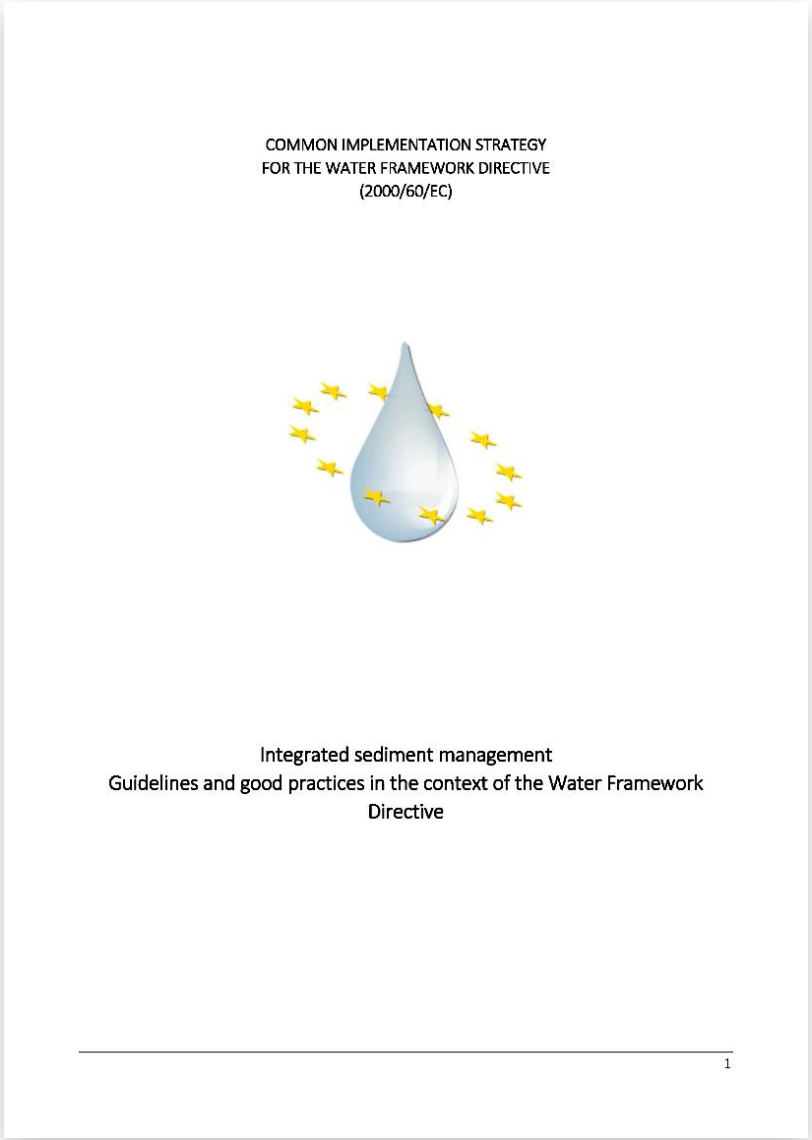
Elbe River Basin Community (RBC Elbe, Germany)

International Commission for the Protection of the Elbe River (ICPER)

International perception of the SeMC RBC Elbe / ICPER

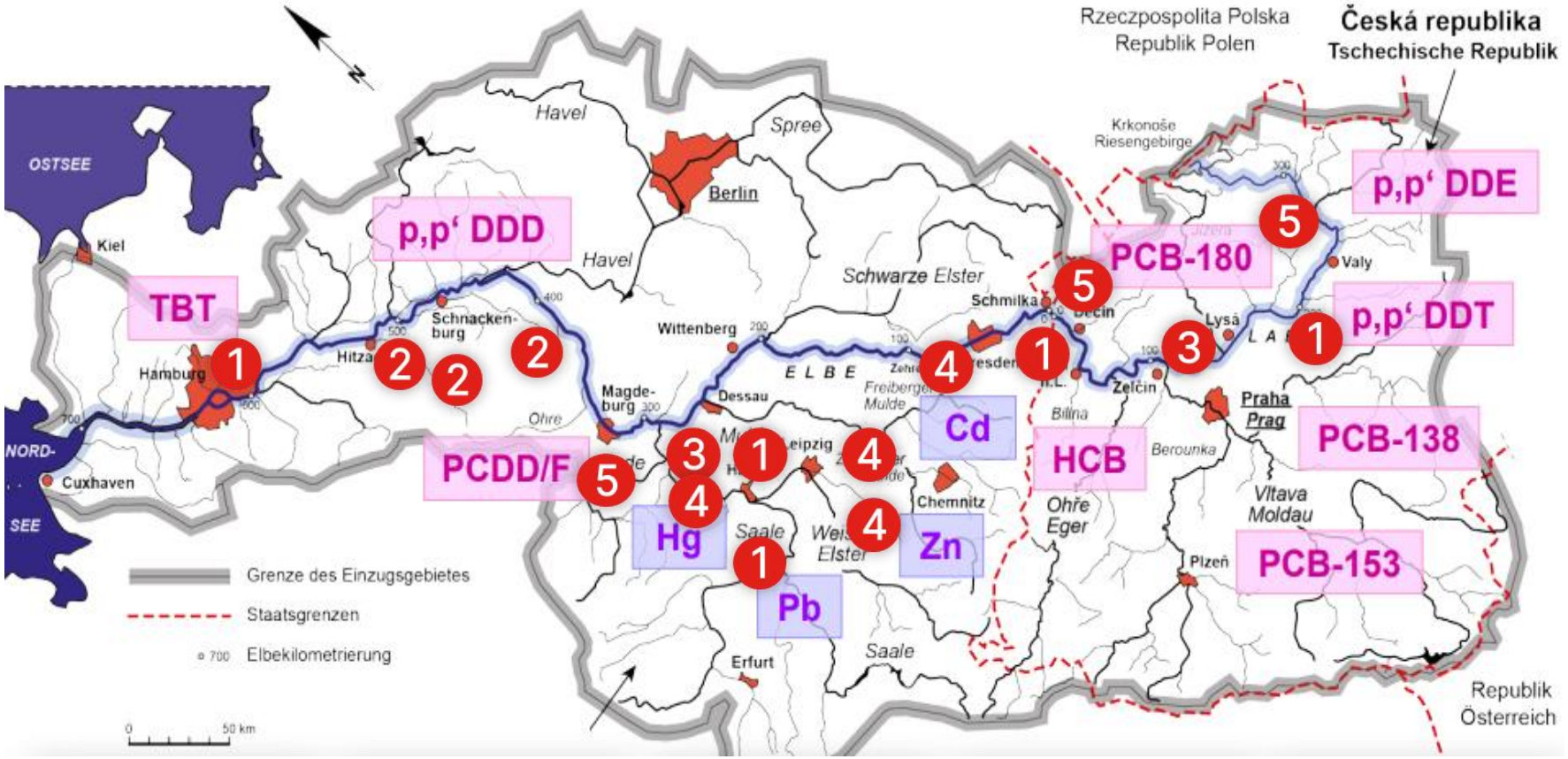
Inspired and influenced

Highlighted as „best practice“



published 2022

Main sources of dominant sediment-related pollution – secondary sources have emerged



industry

side structures

weirs / dams / locks

old mining sites

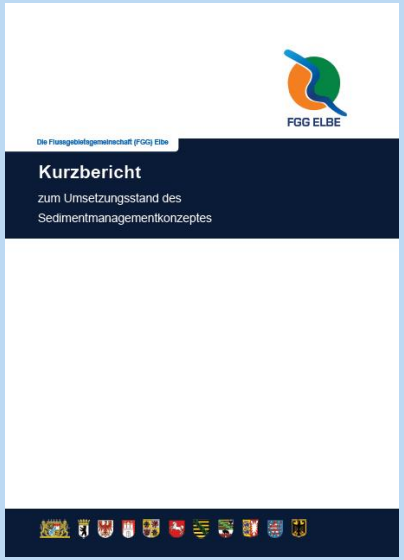
legacy pollution

Sediment management concept RBC Elbe - implementation steps taken so far

2014 – Planning of measures

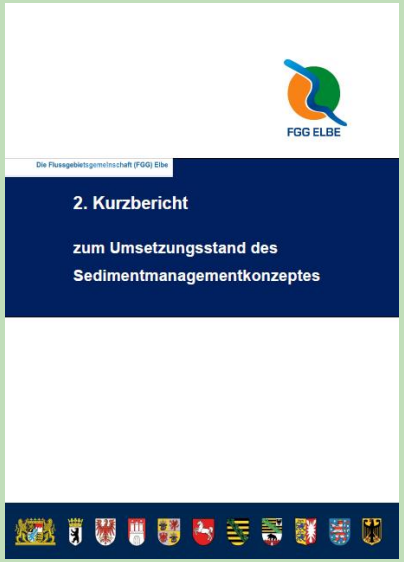
Short report on planning of sediment management (SeM) measures of the Länder (German federal states) for the second management period WFD

2018 – 1. short report



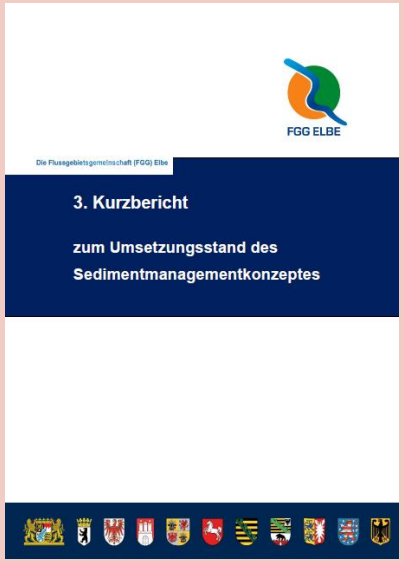
Content e.g.
- SeM-measures / questionnaire
- monitoring / introduction SQI
- specific examples of measures and actions

2020 – 2. short report



Content e.g.
- SeM-measures / fact sheets
- monitoring / update SQI
- work Ad-hoc AG Um-SeMK
- workshop and position paper (Federal Government and Länder)

2023 – 3. short report



Content e.g.
- SeM-measures / fact sheets
- monitoring / update SQI
- work Ad-hoc AG Um-SeMK
- pilot projects WSV

Sediment management concept RBC Elbe - further implementation steps taken so far

2019

Workshop Federal Government and Länder in Hamburg, Germany

- „acting together“
- pilot projects WSV
- Ad-hoc AG Um-SeMK (Working group implementation SeMC)

2020 – Position paper

Position paper of the Federal Government and the Länder
-> 5 fields of action identified

2023

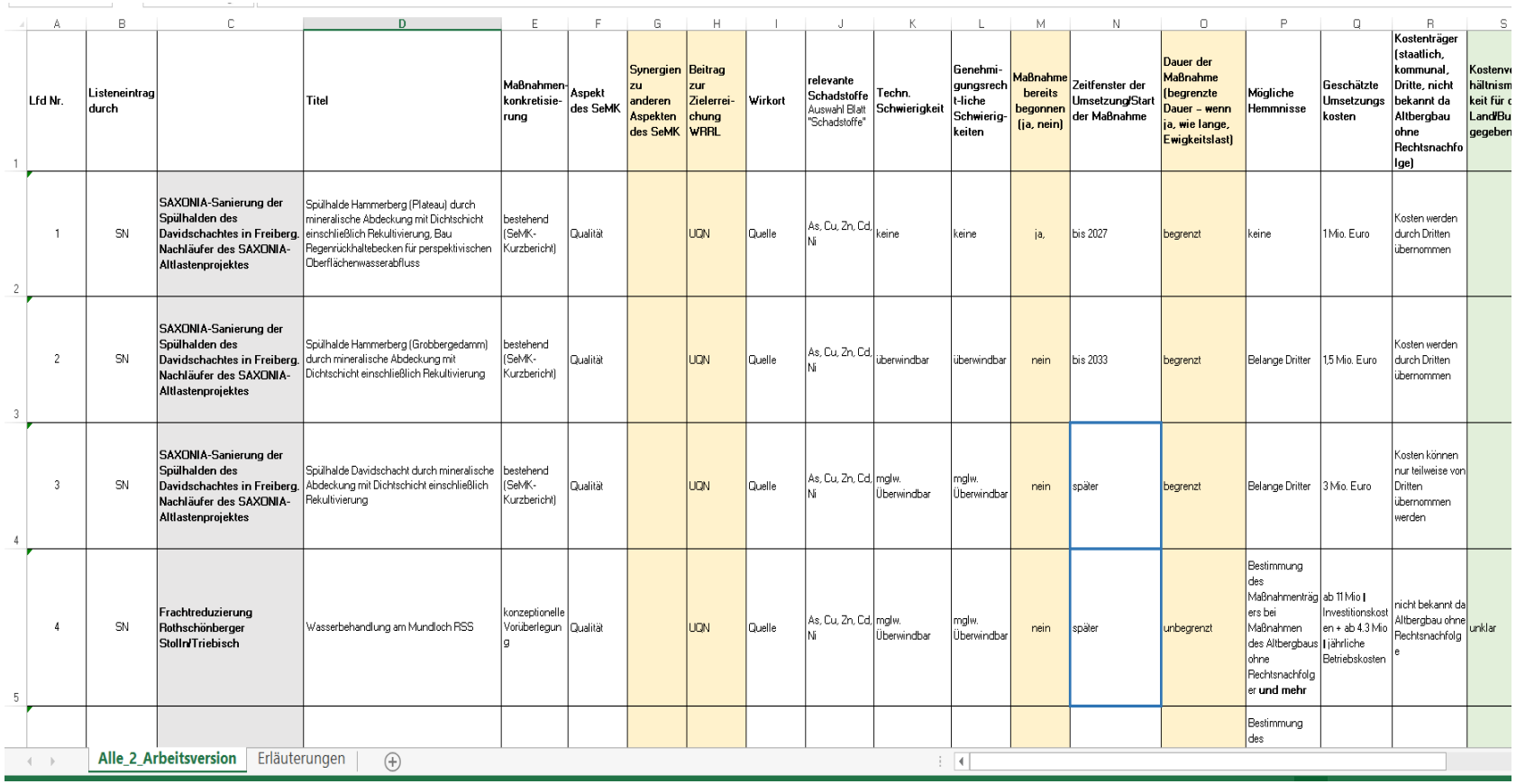
Workshop Federal Government and Länder in Magdeburg, Germany

- follow-up workshop to 2019
- EG SeM as permanent expert group following the Ad-hoc AG Um-SeMK

2024 – Declaration of intent

Declaration of intent of the Federal Government and the Länder as an update to the position paper

List of measures / prioritisation – working status EG SeM



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Lfd Nr.	Listeneintrag durch		Titel	Maßnahmen-konkretisie-rung	Aspekt des SeMK	Synergien zu anderen Aspekten des SeMK	Beitrag zur Zielerrei-chung WRRL	Wirkort	relevante Schadstoffe Auswahl Blatt "Schadstoffe"	Techn. Schwierigkeit	Genehmi-gungsrech t-liche Schwierig-keiten	Maßnahme bereits begonnen (ja, nein)	Zeitfenster der Umsetzung/Start der Maßnahme	Dauer der Maßnahme (begrenzte Dauer – wenn ja, wie lange, Ewigkeitslast)	Mögliche Hemmnisse	Geschätzte Umsetzungs kosten	Kostenträger (staatlich, kommunal, Dritte, nicht bekannt da Altbergbau ohne Rechtsnachfo lge)	Kostenv hältnism keit für Land/Bu gegeben
2	1	SN	SAXONIA-Sanierung der Spülhalden des Davidschachtes in Freiberg. Nachläufer des SAXONIA-Altlastenprojektes	Spülhalde Hammerberg (Plateau) durch mineralische Abdeckung mit Dichtschicht einschließlich Rekultivierung, Bau Regenrückhaltebecken für perspektivischen Oberflächenwasserabfluss	bestehend (SeMK-Kurzbericht)	Qualität		UQN	Quelle	As, Cu, Zn, Cd, Ni	keine	keine	ja,	bis 2027	begrenzt	keine	1 Mio. Euro	Kosten werden durch Dritten übernommen	
3	2	SN	SAXONIA-Sanierung der Spülhalden des Davidschachtes in Freiberg. Nachläufer des SAXONIA-Altlastenprojektes	Spülhalde Hammerberg (Grobbergedamm) durch mineralische Abdeckung mit Dichtschicht einschließlich Rekultivierung	bestehend (SeMK-Kurzbericht)	Qualität		UQN	Quelle	As, Cu, Zn, Cd, Ni	überwindbar	überwindbar	nein	bis 2033	begrenzt	Belange Dritter	1,5 Mio. Euro	Kosten werden durch Dritten übernommen	
4	3	SN	SAXONIA-Sanierung der Spülhalden des Davidschachtes in Freiberg. Nachläufer des SAXONIA-Altlastenprojektes	Spülhalde Davidschacht durch mineralische Abdeckung mit Dichtschicht einschließlich Rekultivierung	bestehend (SeMK-Kurzbericht)	Qualität		UQN	Quelle	As, Cu, Zn, Cd, Ni	mglw. Überwindbar	mglw. Überwindbar	nein	später	begrenzt	Belange Dritter	3 Mio. Euro	Kosten können nur teilweise von Dritten übernommen werden	
5	4	SN	Frachtreduzierung Rothschönberger Stolln/Triebisch	Wasserbehandlung am Mundloch RSS	konzeptionelle Vorüberlegun g	Qualität		UQN	Quelle	As, Cu, Zn, Cd, Ni	mglw. Überwindbar	mglw. Überwindbar	nein	später	unbegrenzt	Bestimmung des Maßnahmenträg ers bei Maßnahmen des Altbergbaus ohne Rechtsnachfolg er **und mehr**	ab 11 Mio I Investitionskost en + ab 4,3 Mio I jährliche Betriebskosten	nicht bekannt da Altbergbau ohne Rechtsnachfolg e	unklar
																Bestimmung des			

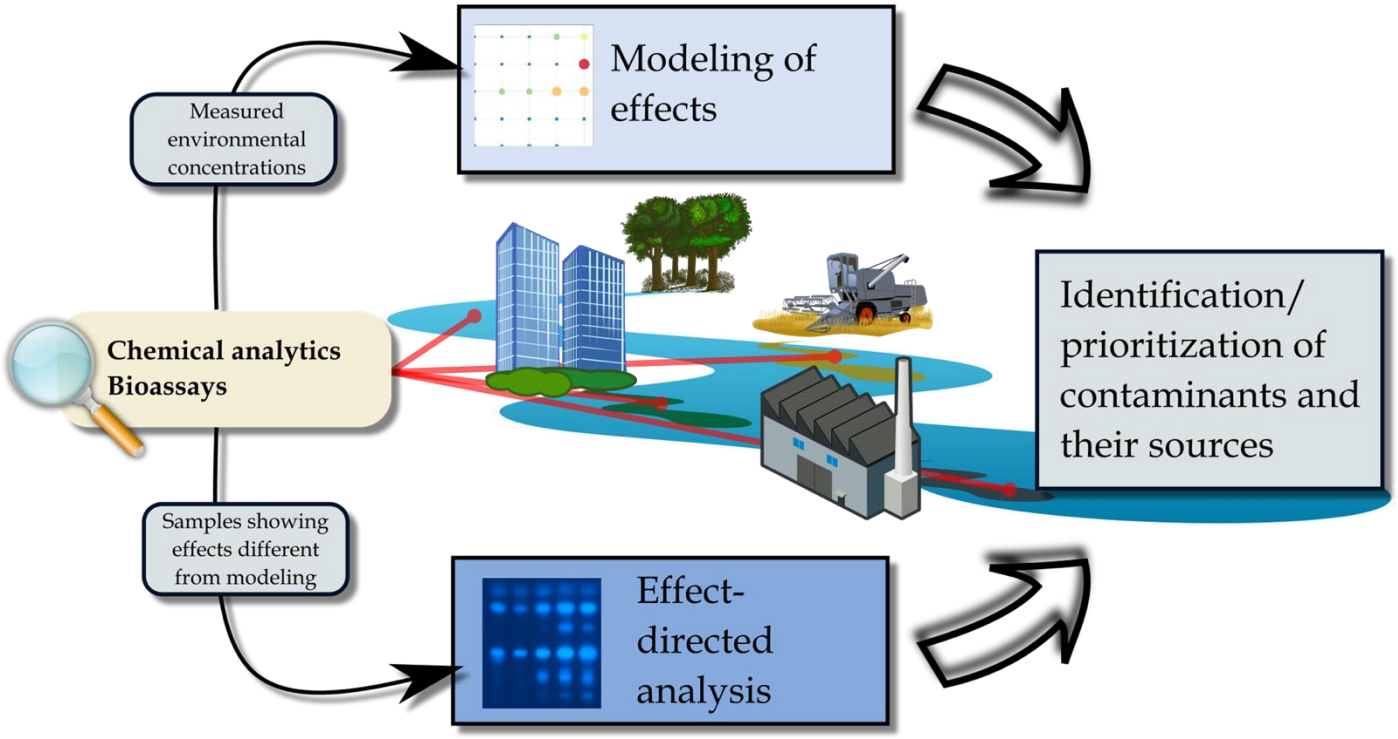
Alle_2_Arbeitsversion | Erläuterungen

- measures not only taken from the fact sheets of the short reports (new enquiry Länder / Federal Government, directly derived from SeMC)
- first attempt prioritisation / categorisation
  - currently rather based on formal criteria
  - effectiveness of measures only described qualitatively, mainly due to lack of data
- **effectiveness of measures (achievement supra-regional action goals)?**
  - ➢ **tool required for quantitative prediction**

The research project SOURCE (2023-2026)

Possibilities for prediction of effectiveness of measures?

- **Aim:** development methodological framework to identify
  - pollutants responsible for ecotoxicological effects
  - their sources of input into federal waterways (focus on River Elbe and its tributary River Saale)
- **Approach:** combining chemical analytical procedures, modelling of toxic effects and effect-based methods
- For this purpose, cause-effect relationships between observed ecotoxicological effects and the pollutant load of waterways are considered



TG02-R&D project conducted at the BfG and funded by the German Federal Ministry for Transport (BMV)

The research project SOURCE (2023-2026) – sele

Bioassay (Ah-receptor)

β- naphthoflavone equivalents [ng/g dry weight]

- 120- 140
- 100 – 120
- 80 - 100
- 60 - 80
- 40 - 60
- 20 - 40
- 0 - 20

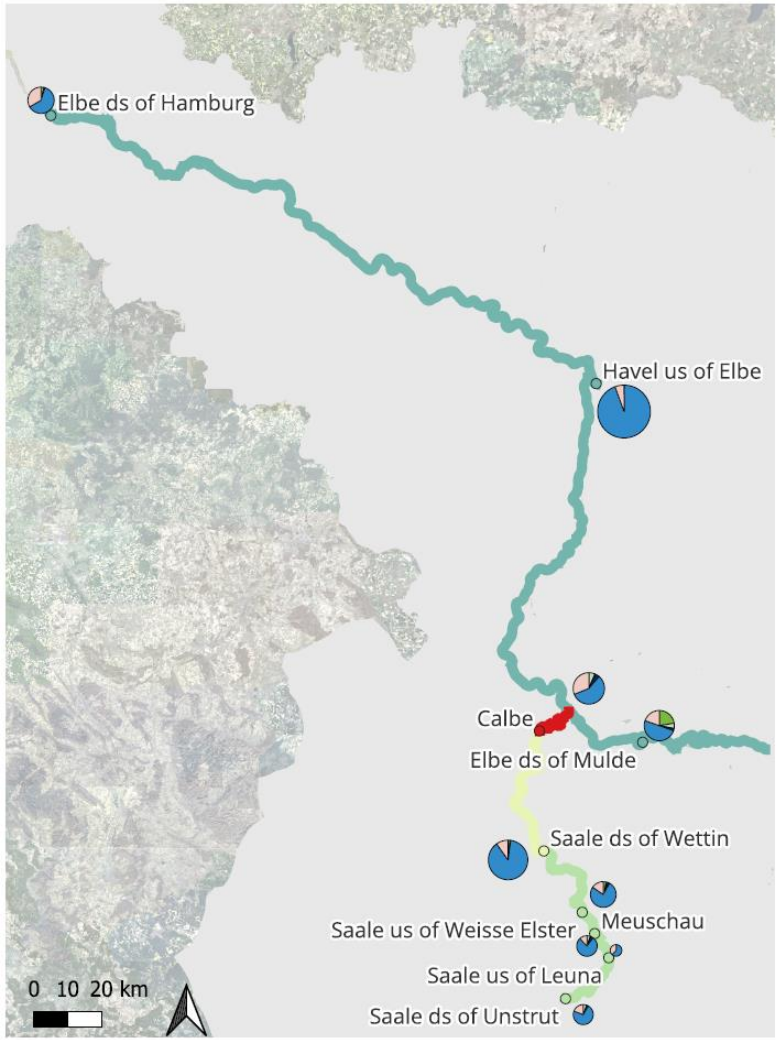
Chemical analysis

Quantitative LCMS analytics of Ah-receptor agonists

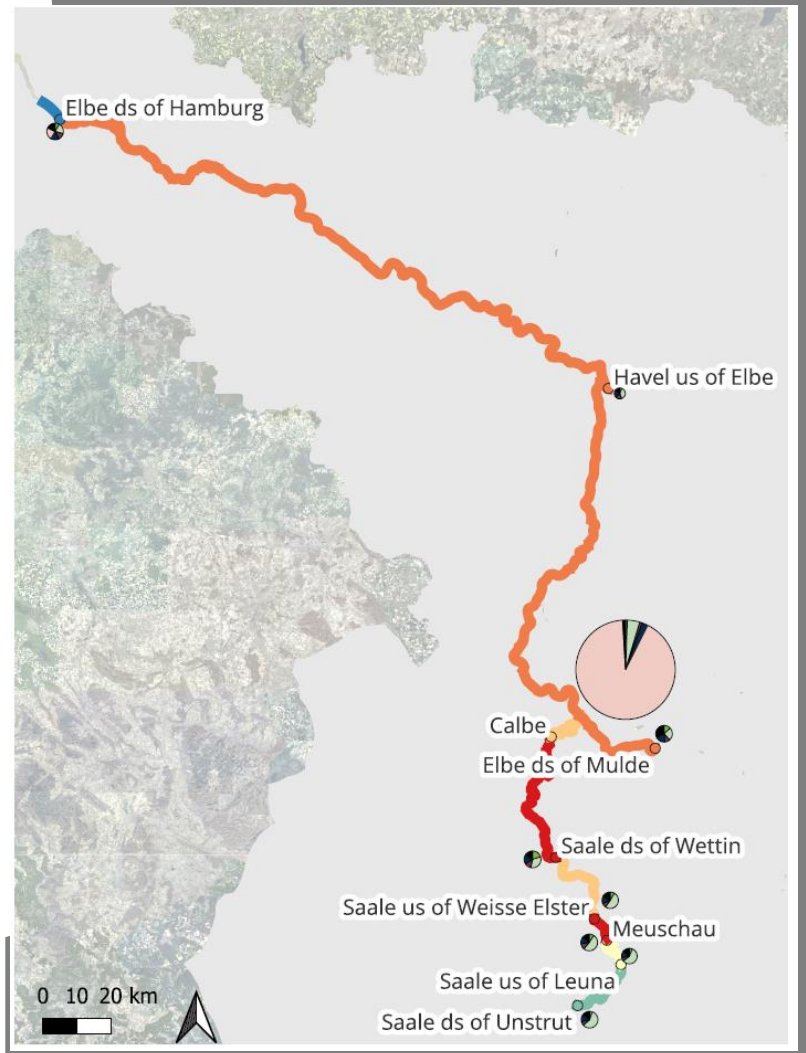
- Carbanilide
- Carbendazim
- Diuron
- Isoproturon
- Climbazole
- Metamitron
- Propiconazole

Total concentration of agonists

sediment



surface water Bioassay (Ah-receptor)



Source Orthophotos

The research project SOURCE (2023-2026) – potential use

- **Support for identification and prioritisation of sediment management measures?**
  - Gradients of contamination based on chemical analysis and effect-based measurements
  - Indication of hot spots and possible sources of contamination
  - Alignment of chemical analysis and effects is challenging → effect-directed analysis (EDA) for compound identification

- **Prediction of the effectiveness of sediment management measures?**

  Calculation of pollutant load – compound concentrations and effect-based equivalence concentrations

  - Quantification of the absolute pollutant-removal potential by a measure
  - Quantification of removed percentage of total pollution
    - e.g. in relation to a reference measuring point -> supra-regional effectiveness in terms of pollutant load reduction
    - Uncertainties: potential for sediment remobilization, impact of downstream sedimentation, …

Conclusion on the current implementation SeMC / objectives of the declaration of intent

Significant improvement in terms of pollutants typical for the Elbe in the period after 1990

- Nevertheless, the recommendations of the sediment management concept of the RBC Elbe and ICPER have only been implemented to a limited extent to date

Objectives and agreements for solution in declaration of intent (2024) – the way forward:

Conclusion on the current implementation SeMC / objectives of the declaration of intent

Key objectives of the declaration of intent

- Continue to realise all necessary, proportionate, sediment-related and near-source measures to achieve the requirements of the WFD and MSFD (sustainable reduction of pollutant loads)

- The required reduction of pollutant discharges and displacements can only be achieved,
  - if identification and realisation of the most effective and cost-efficient measures together possible.
    - ‘together’ on national and international level
    - targeted within a 10-year period
  - if reduction of pollutant loads is given the necessary environmental policy weight.

Conclusion on the current implementation SeMC / objectives of the declaration of intent

Selected specific objectives of the declaration of intent

- Exploit existing and examine new financing options – especially joint ones

- Clarification of key issues relating to the reuse and disposal of contaminated sediments in line with the circular economy (‘sediment as a ressource’)

- Consistently continue to prioritise measures (work expert group) / cost-benefit analysis

Study on ‘joint financing options for Elbe sediment remediation’ in the federal republic Germany

Study on ‘legal options, obstacles and prospects for dealing with sediments and dredged material on land’ (focus reuse / beneficial use)

How can the effectiveness / benefit of measures be (quantitatively) predicted?

Thank you for your attention.

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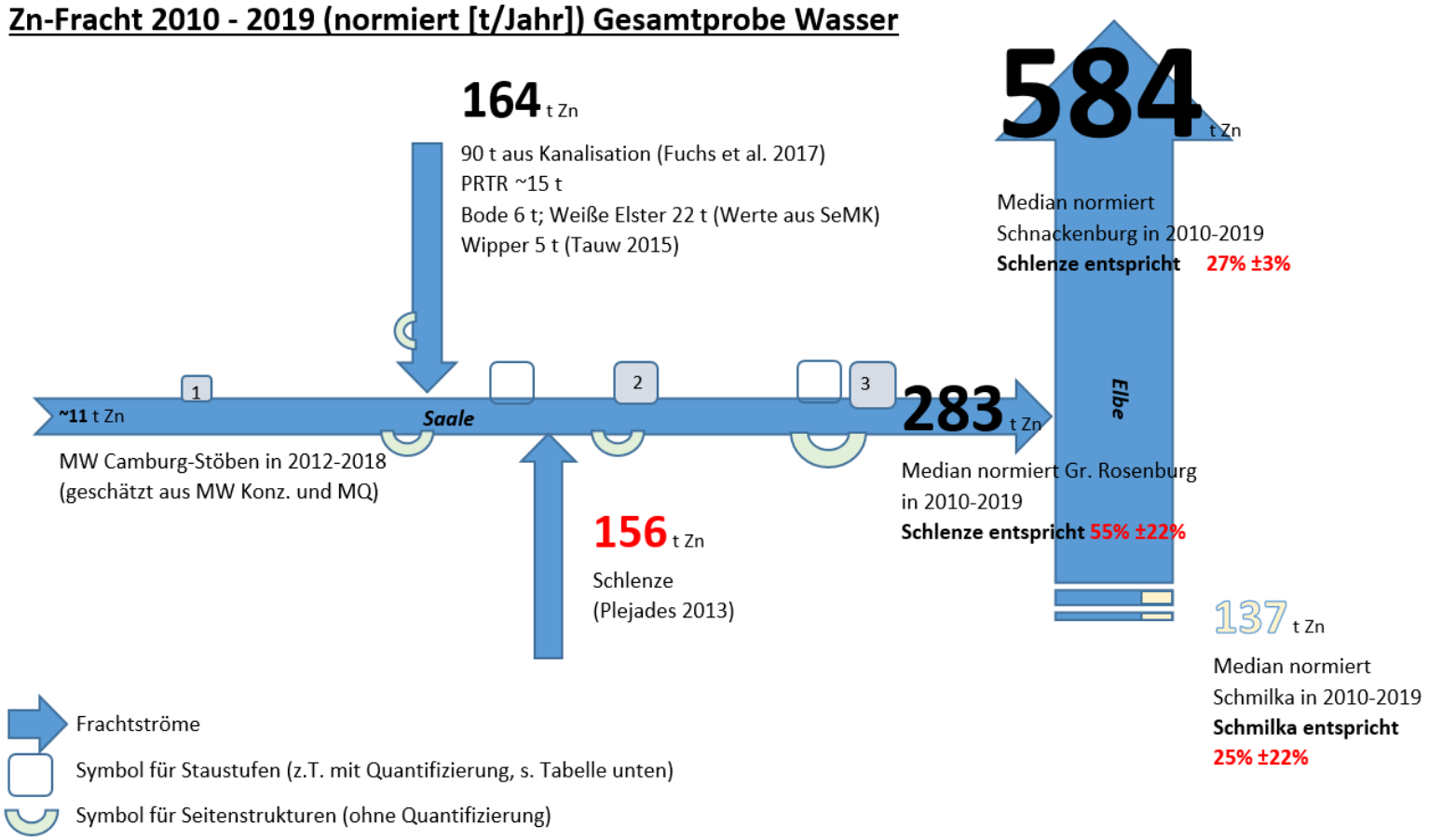
Available on the website of the RBC Elbe's Liaison Office (in German):

- SeMC RBC Elbe
- Short reports Implementation SeMC
- FG-/L-Position paper
- FG-/L-Declaration of intent

https://www.fgg-elbe.de/dokumente/fachberichte.html (subitem „Sedimentmanagement“)

SeMC ICPER available here: https://www.ikse-mkol.org/publikationen (subitem „Wasserrahmenrichtlinie“)

Effectiveness of measures? – „Prüfschema“ (only sediment load analysis, example River Saale and zinc)



1 Rischemühle 0,36t ; 0,12 % der Jahresfracht Groß Rosenburg
2 Rothenburg 28,7 t; 10 % der Jahresfracht Groß Rosenburg
3 Calbe 26,9 - 31,5 t; ~10 % der Jahresfracht Groß Rosenburg
Weitere, z. B. Wettin Summe ~60 t; ~20 % der Jahresfracht Groß Rosenburg

- Working status EG SeM
- Estimation of the removal potential of a measure (e.g. quantity of pollutants removed)

  -> Assessment of their supra-regional effectiveness in terms of pollutant load reduction (in relation to a reference measuring point)
- Often insufficient data for measures and catchment area (pollutants)