

Assessment of dredged sediments in the light of the WFD-EQS. Justified trouble due to advanced assessment tools?

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BfG Bundesanstalt für
Gewässerkunde

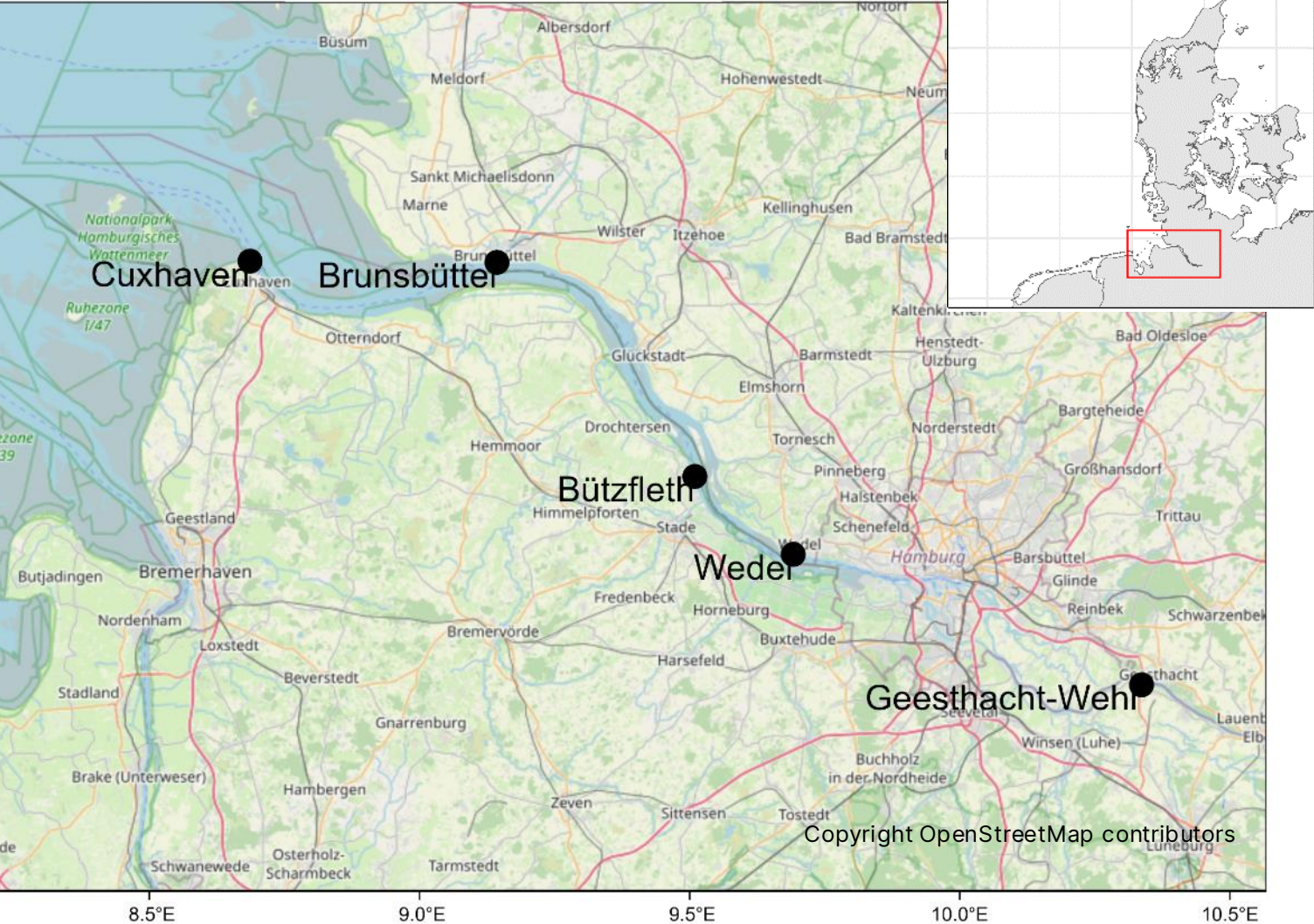
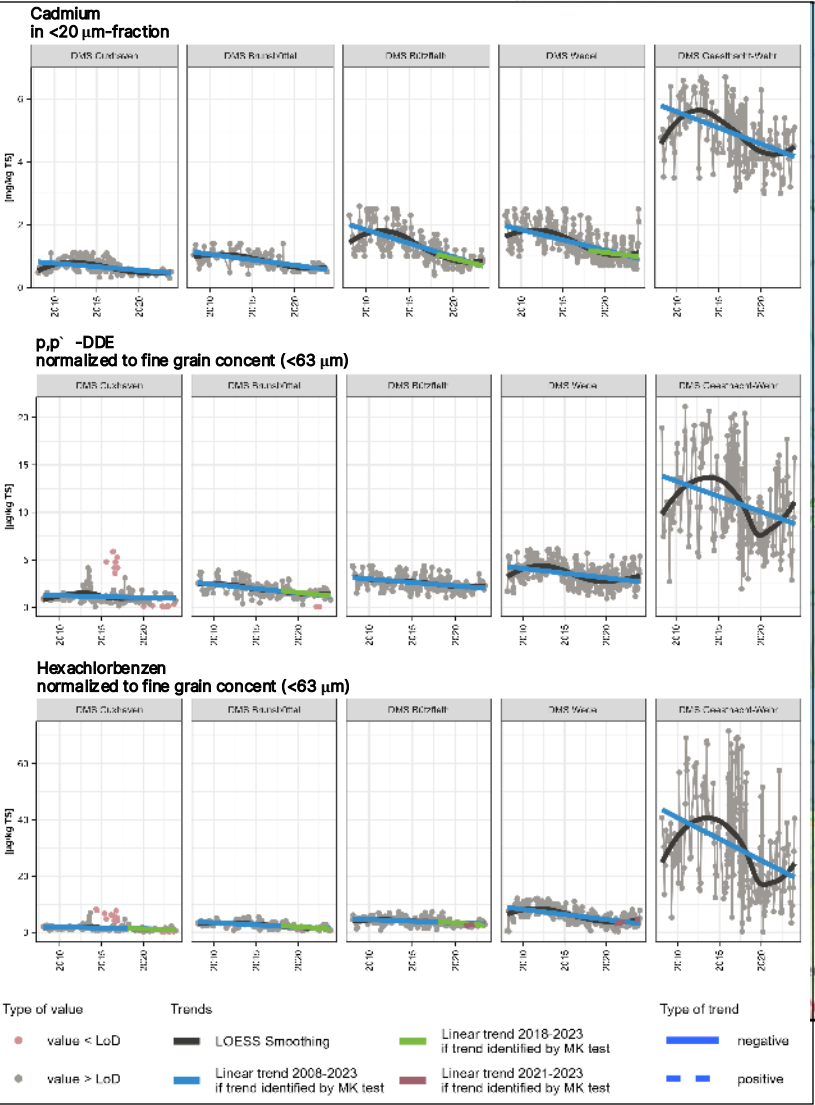


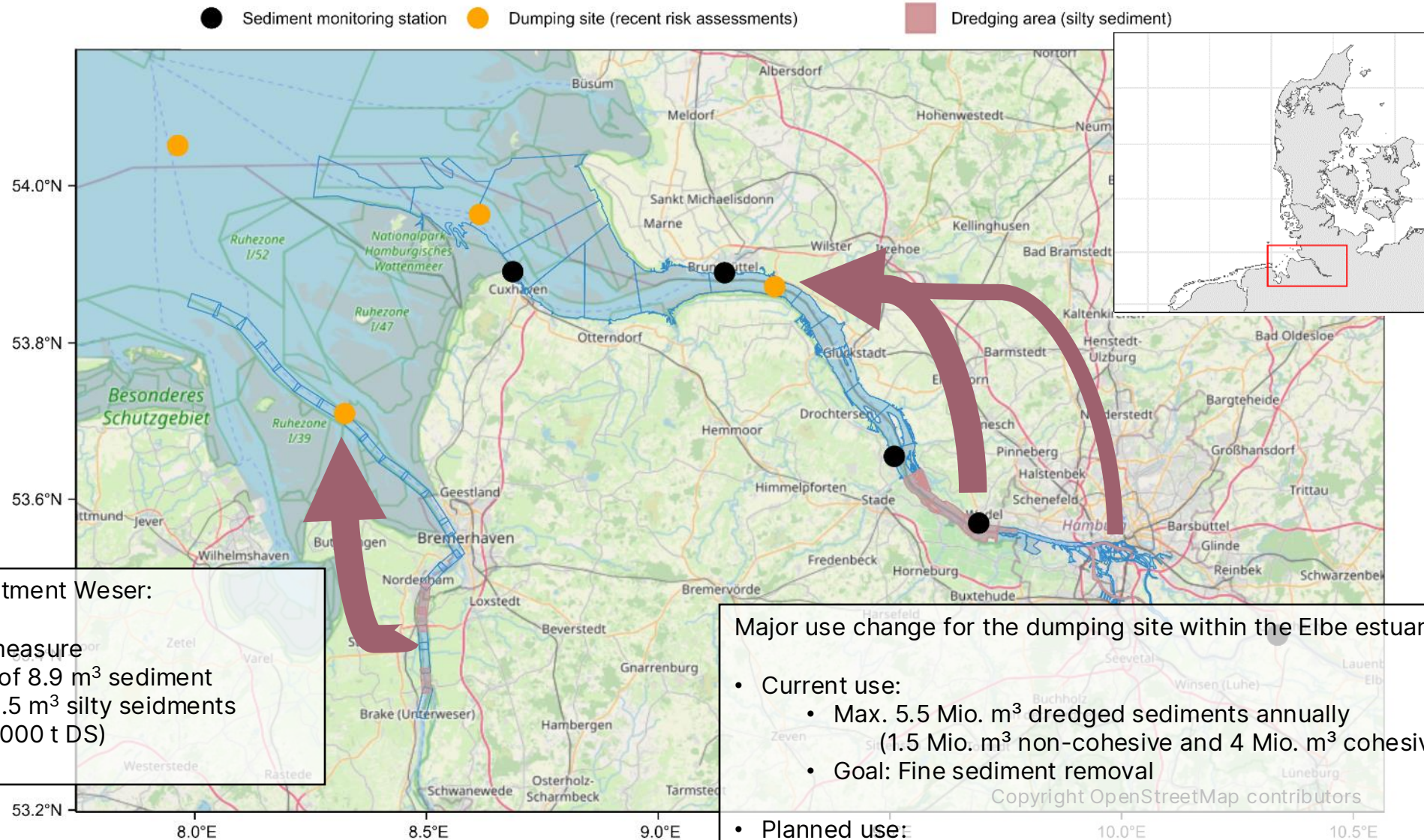
Introduction - working area



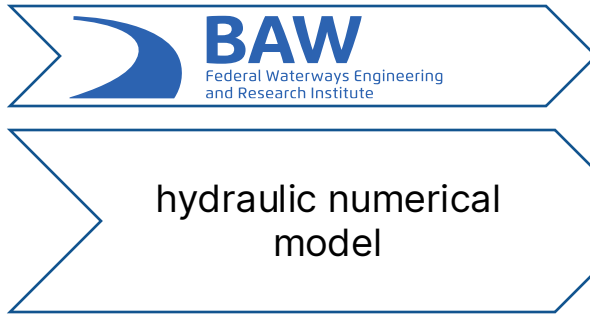
Introduction – contamination Elbe estuary

● Sediment monitoring station





Risk assessment - methodology



UnTrim:

- Finite difference / finite volume methods for simulating flow and transport processes in water bodies

SediMorph:

- Simulation of three-dimensional sedimentological processes at the sediment surface

Example risk assessment Elbe 686/690

Input:

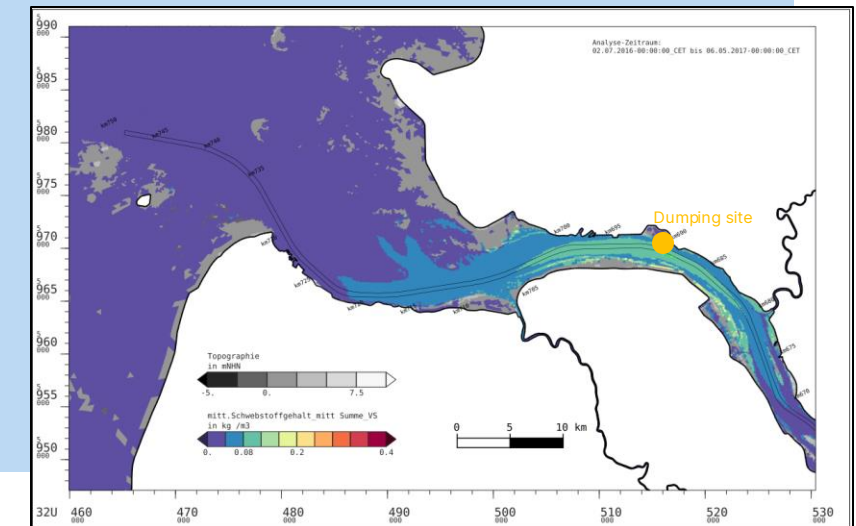
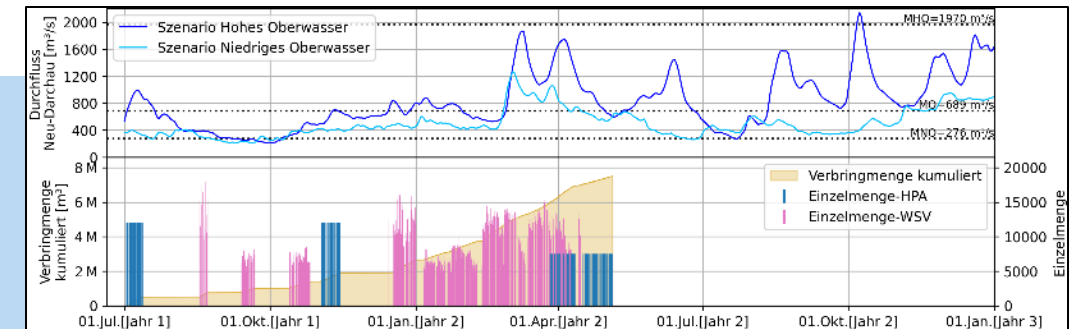
Hydrological parameters

Information on dumping of dredged sediments

Output:

Detailed prediction of

- dumping induced SPM increase
- Distribution of dredged material on the sediments

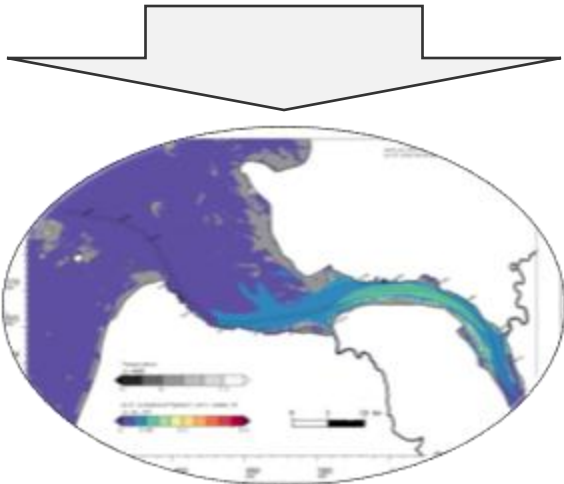
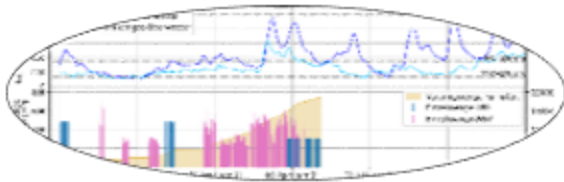


Risk assessment - methodology

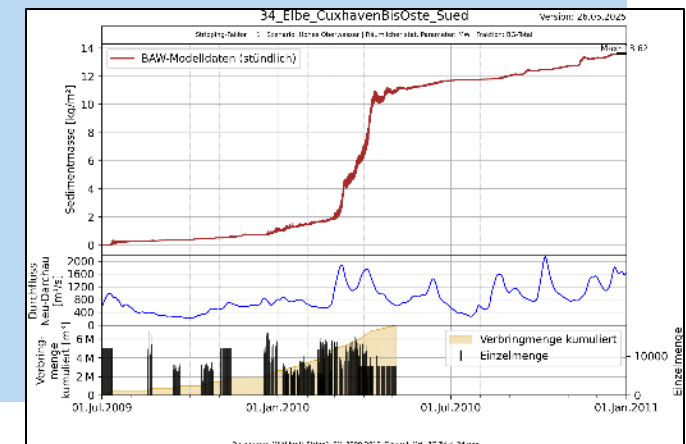
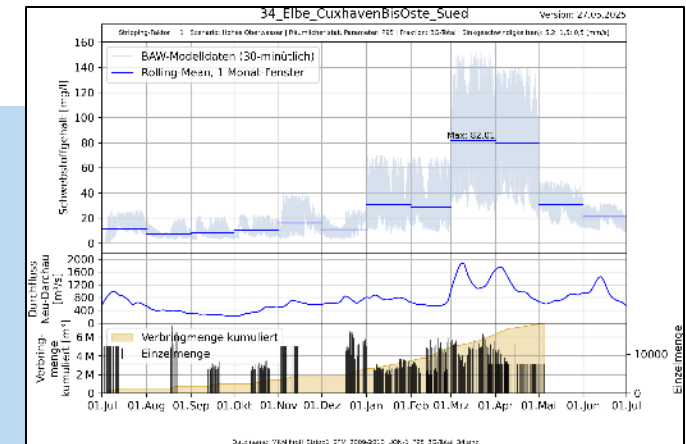
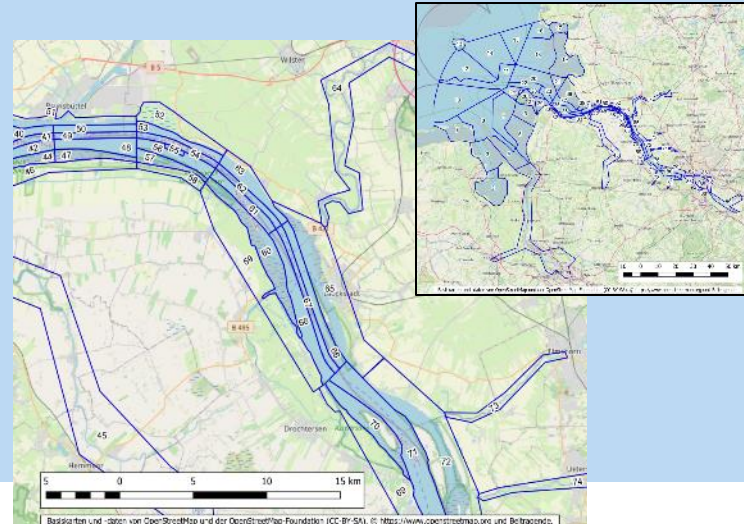


hydraulic numerical
model

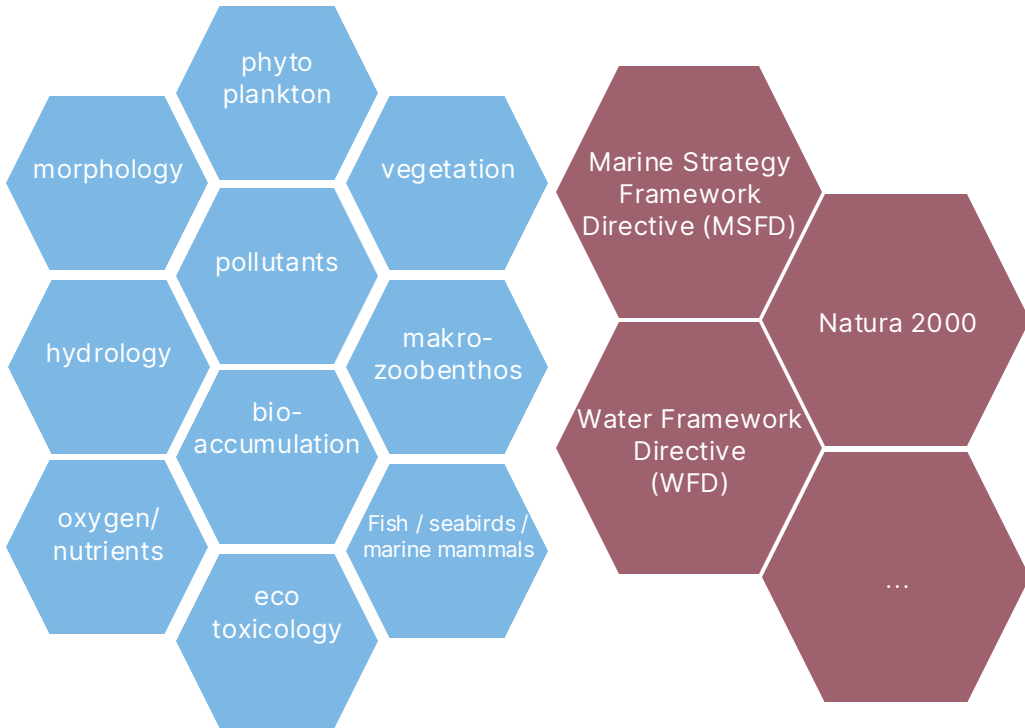
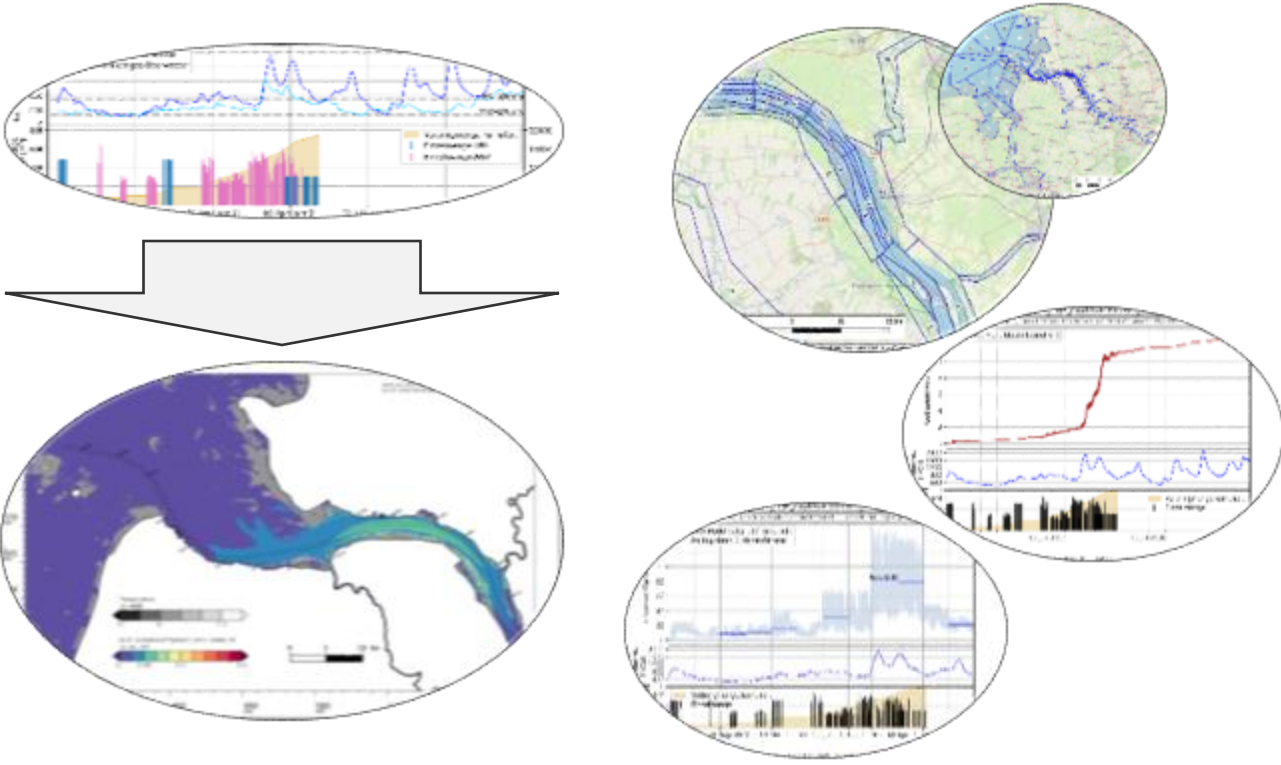
post processing



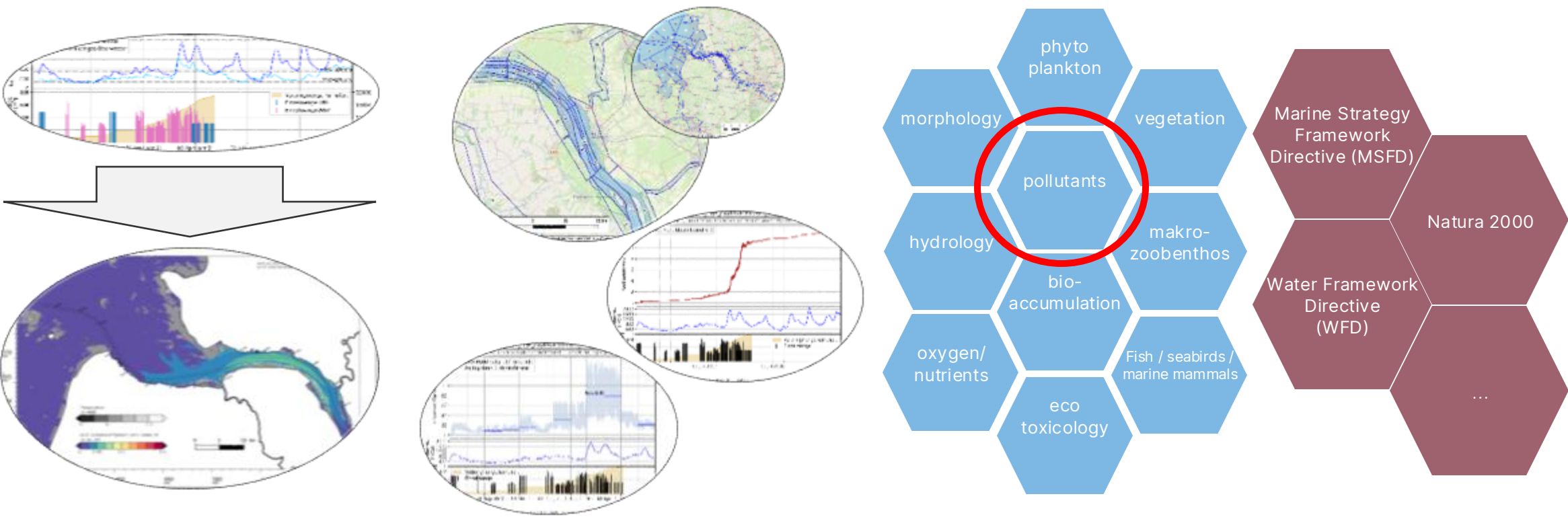
- Aggregation and summary of model results
- defined spatial units (balancing areas)
- Calculation of statistical parameters
- Time series



Risk assessment - methodology



Risk assessment - methodology



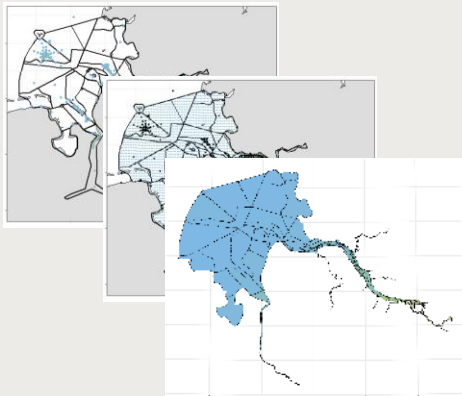
Risk assessment – methodology

Evaluation of potential contaminant inputs into surface sediments:

$$Conc. prog. = \frac{C1 * M1 + M2 * C2}{M1 + M2}$$

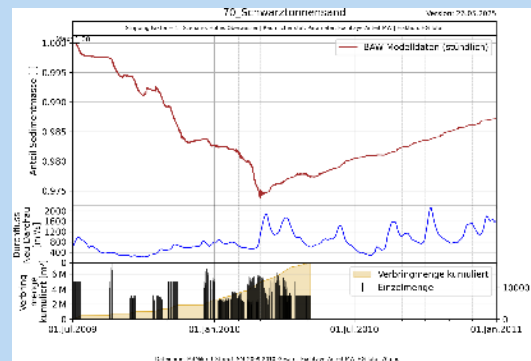
Initial concentrations

- “Characteristic” pollutant concentration for the sediments of each balancing area
- Geostatistical processing of available measured values



Proportion of initial sediment

- Predicted proportion of initial sediment in the surface sediments at the end of the model run



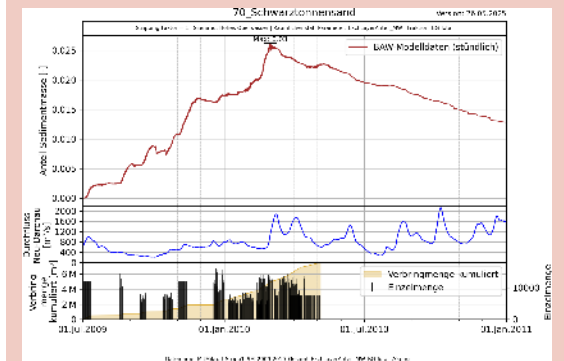
Conatminant load of dredged material

- weighted average contaminant load in the dredging areas

[illegible]

Proportion of dredged material

- Statistical value of the predicted proportion of dredged material in the surface sediment at the end of the model run



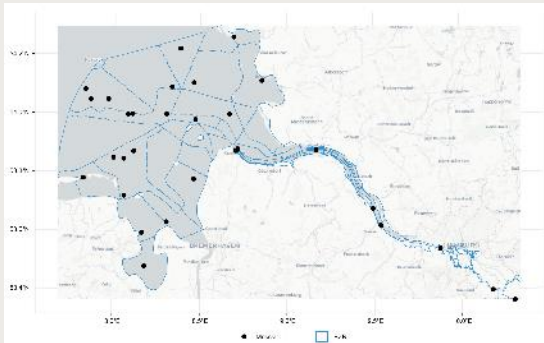
Risk assessment – methodology

Evaluation of potential contaminant inputs into surface waters:

$$C_{prog} = C_{initial} + C_{dredged\ material} * SPM_{increase}$$

Initial concentration

Average measured concentration at a measuring point 2016-2021 (2nd WFD management cycle)



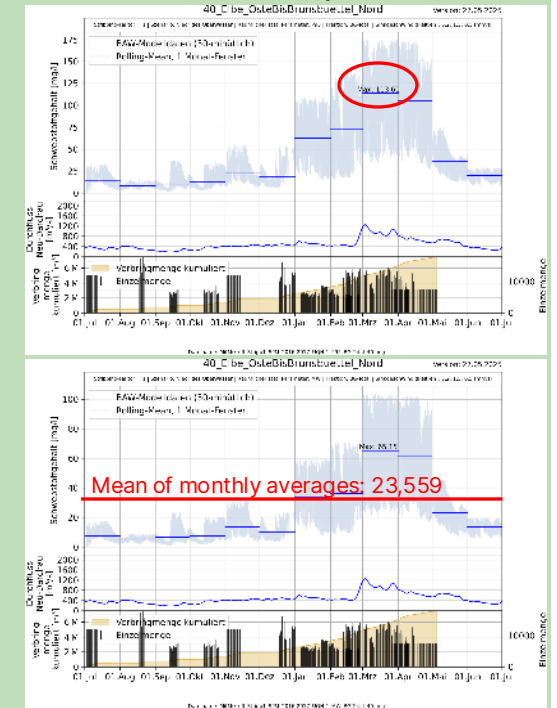
Conatminant load of dredged material

- Mean contaminant contaminations of the dredged sediments

[illegible]

Predicted SPM increase (numeric model results)

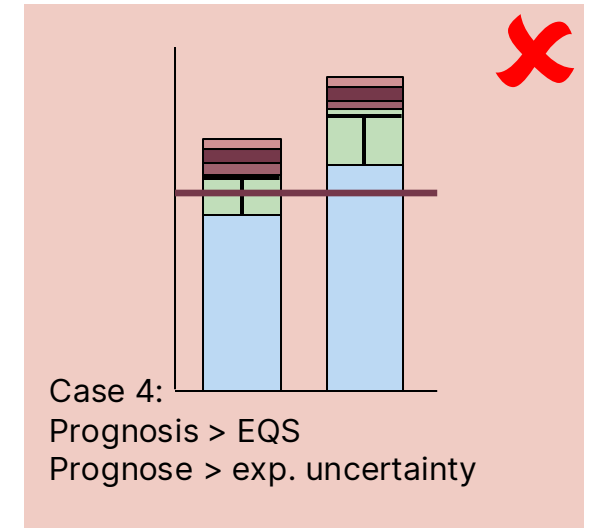
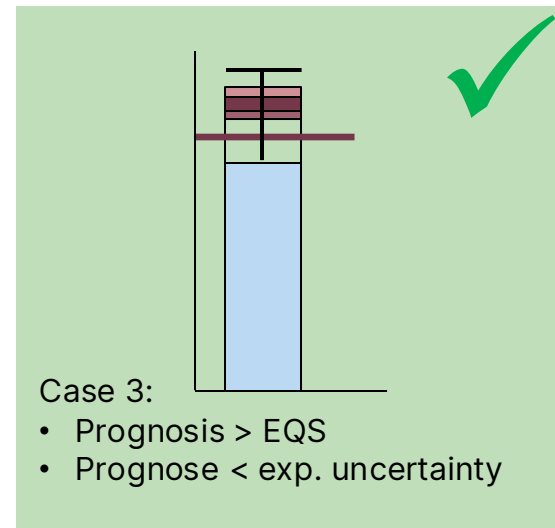
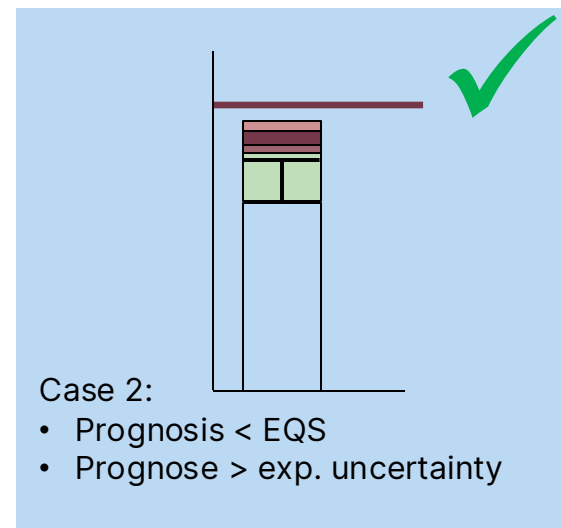
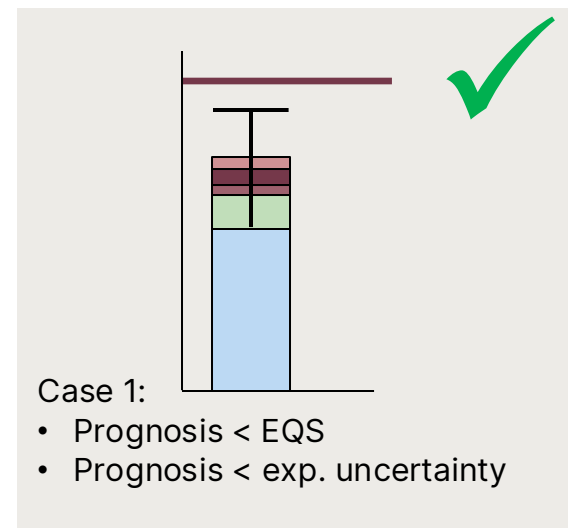
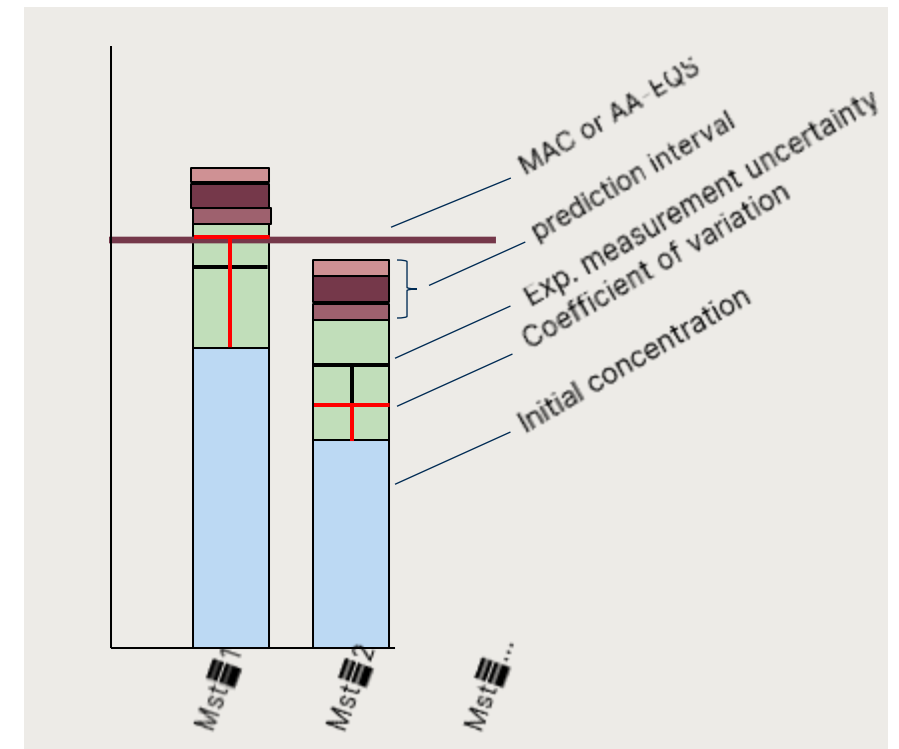
- Predictions for annual average concentrations and maximum expected concentrations
- Maximum contaminant inputs calculated from maximum predicted suspended matter inputs
- Average contaminant inputs calculated from average predicted suspended matter inputs



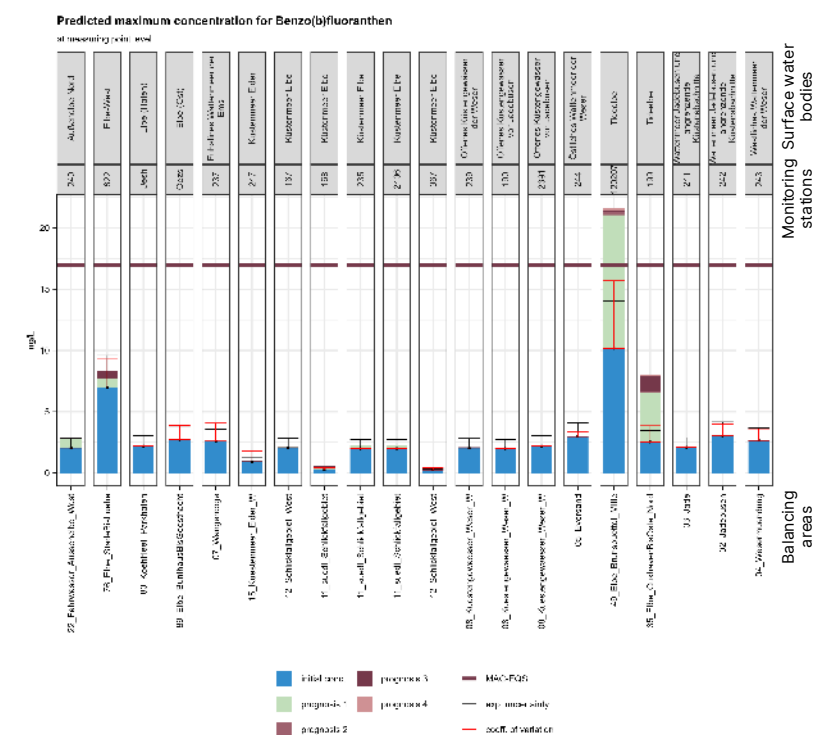
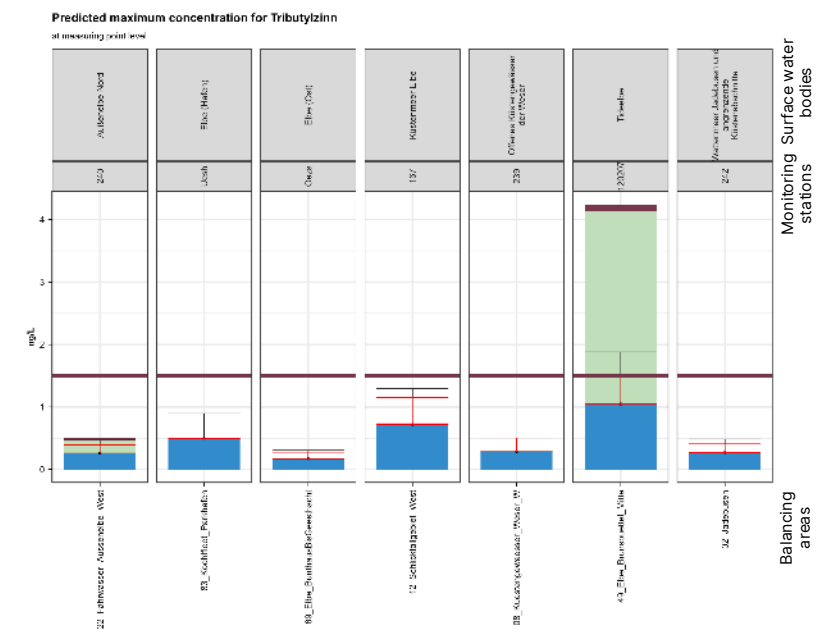
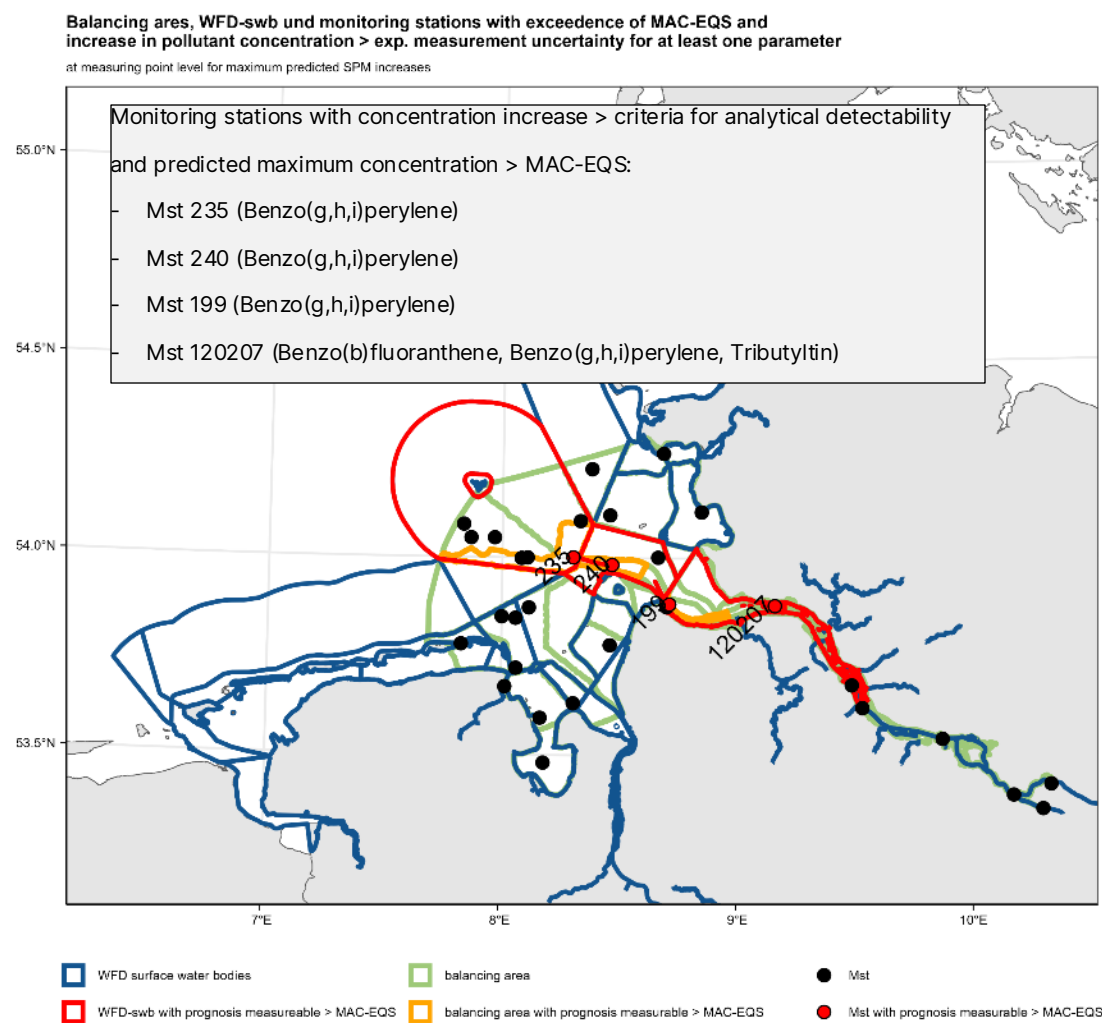
Risk assessment – methodology

Assessment criteria

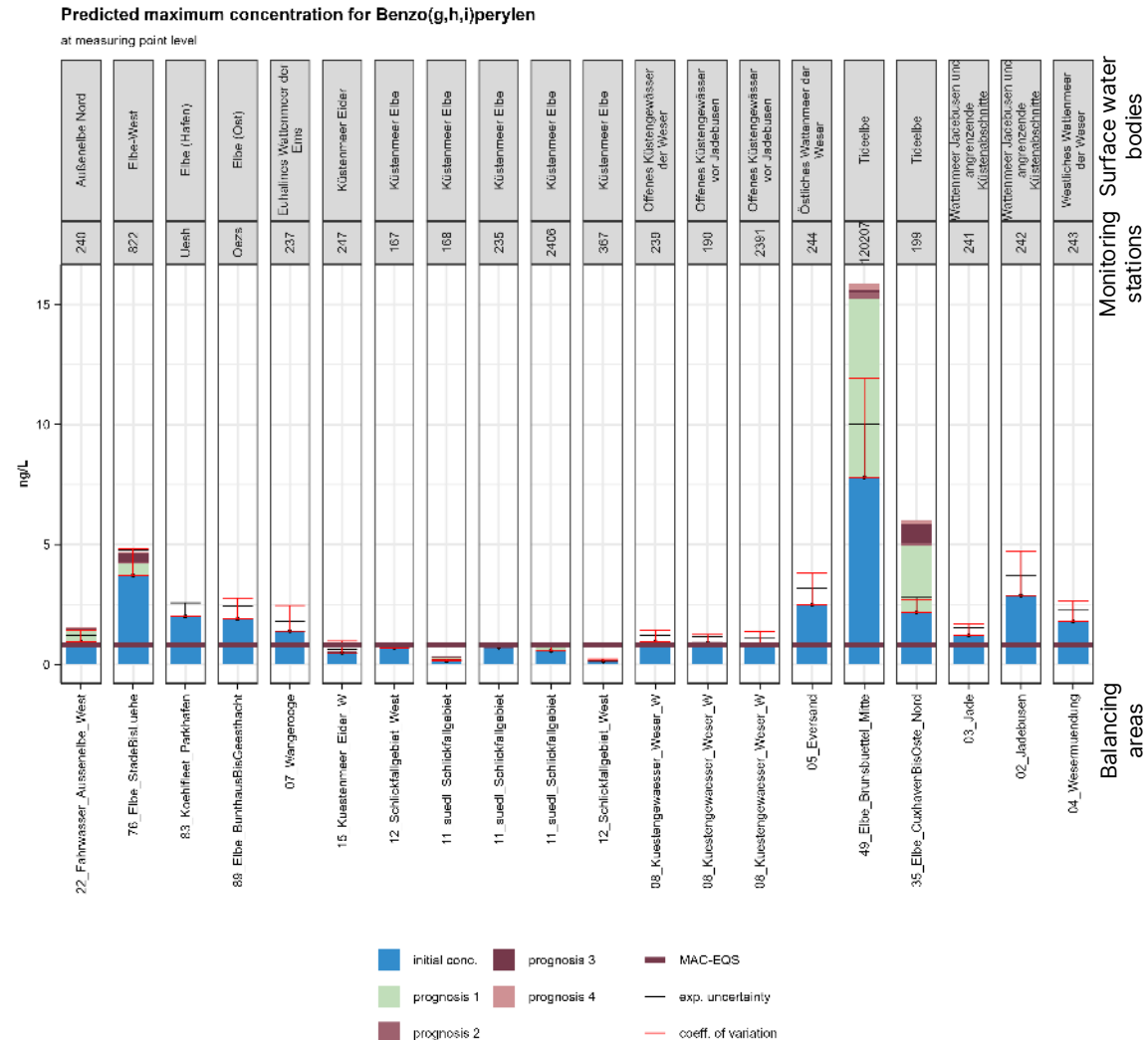
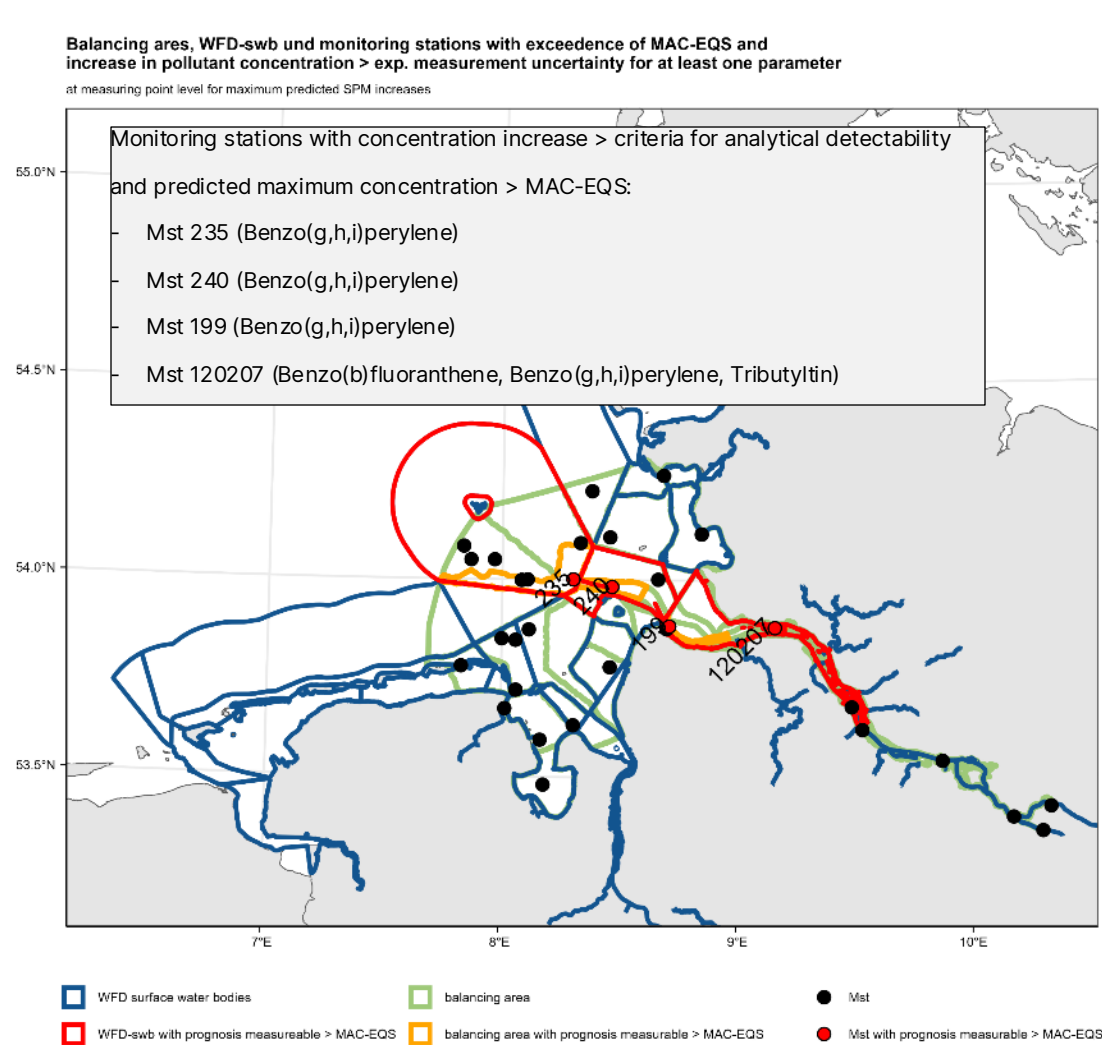
- AA-EQS for evaluation of predicted annual average concentration
- MAC-EQS for evaluation of predicted maximum concentration
- Criteria for evaluation of measurability and observability
 - Expanded measurement uncertainty
 - Coefficient of variation of the measured values of a measuring point



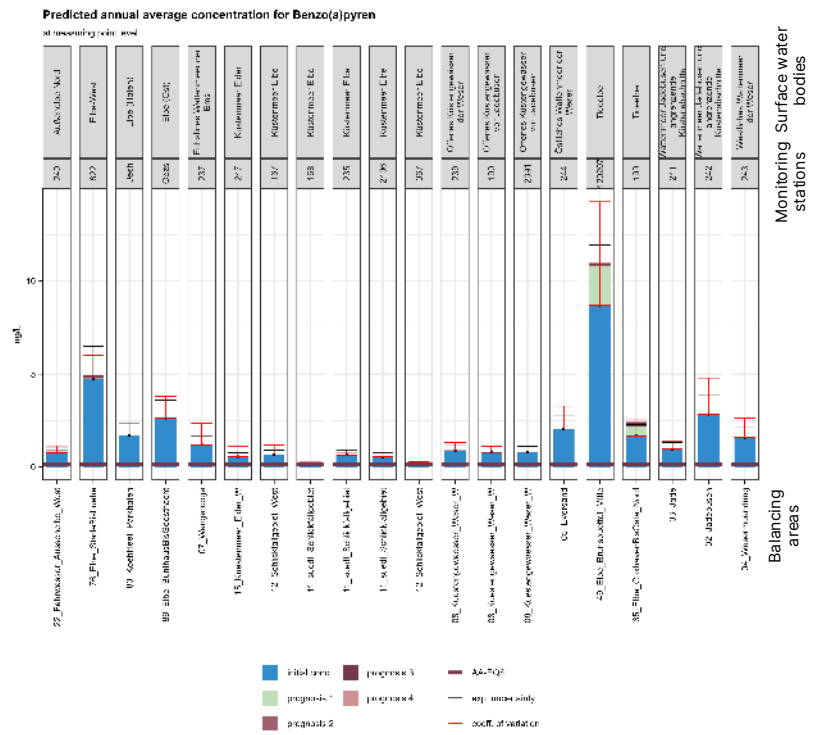
Results Elbe dumping site within the Elbe estuary – Predicted maximum concentrations



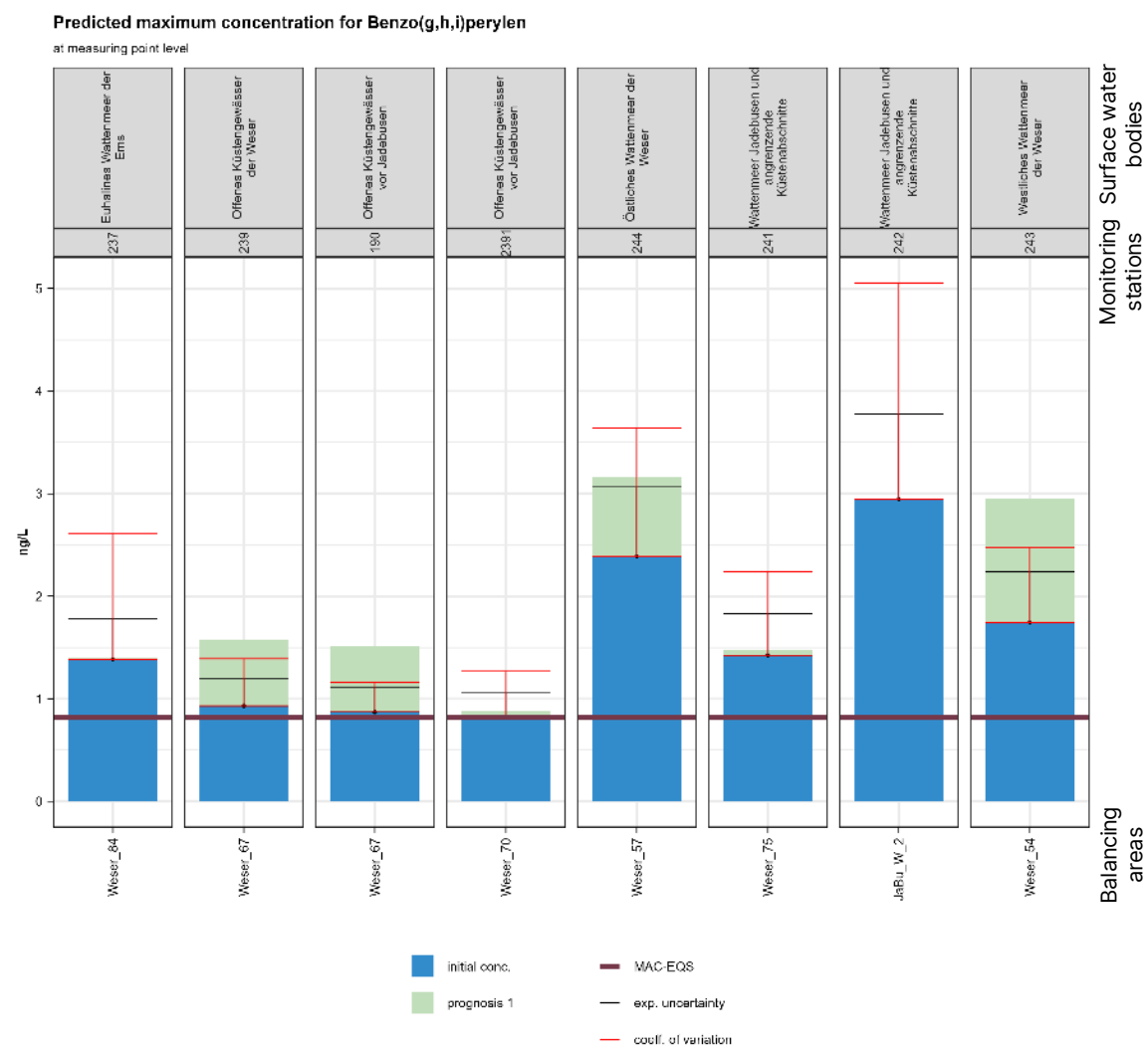
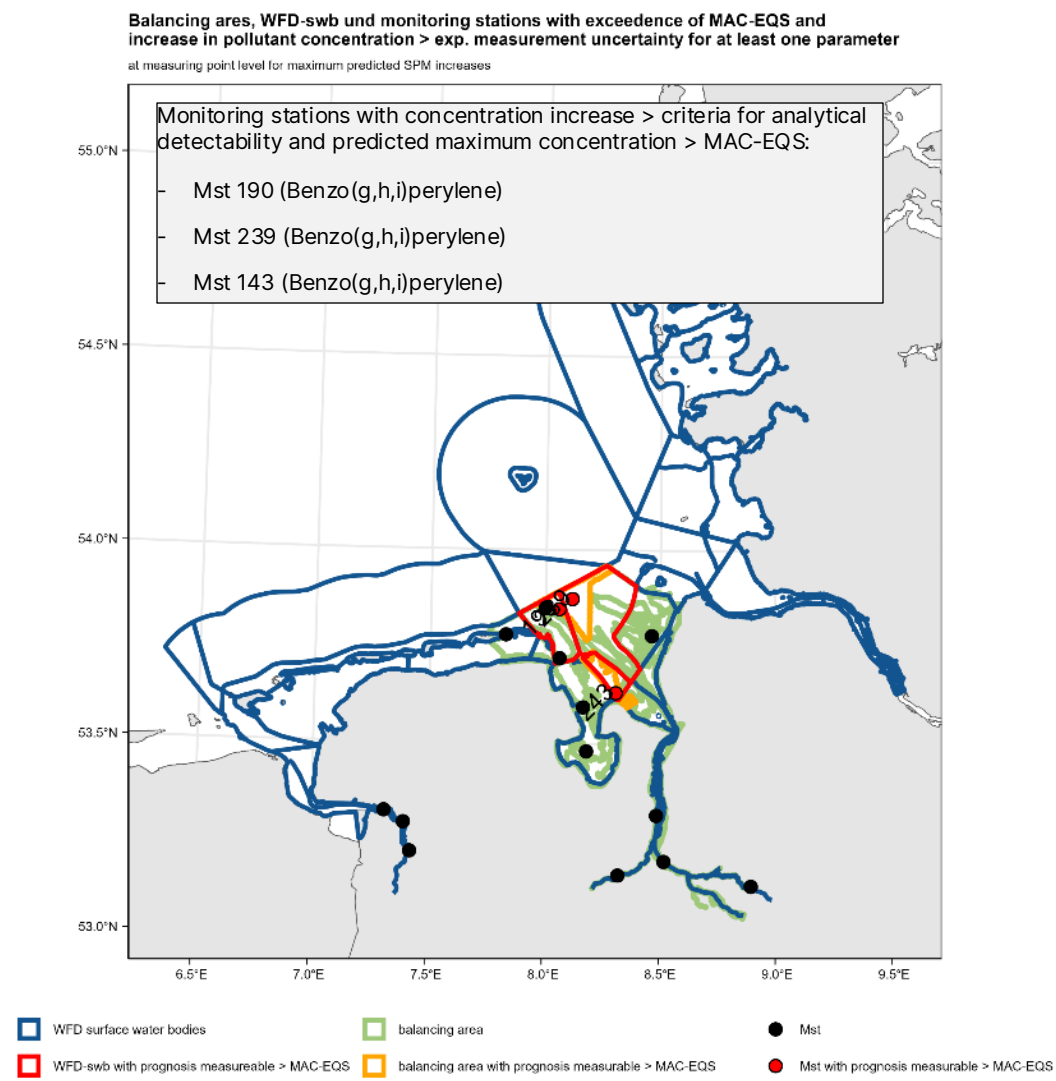
Results Elbe dumping site within the Elbe estuary – Predicted maximum concentrations



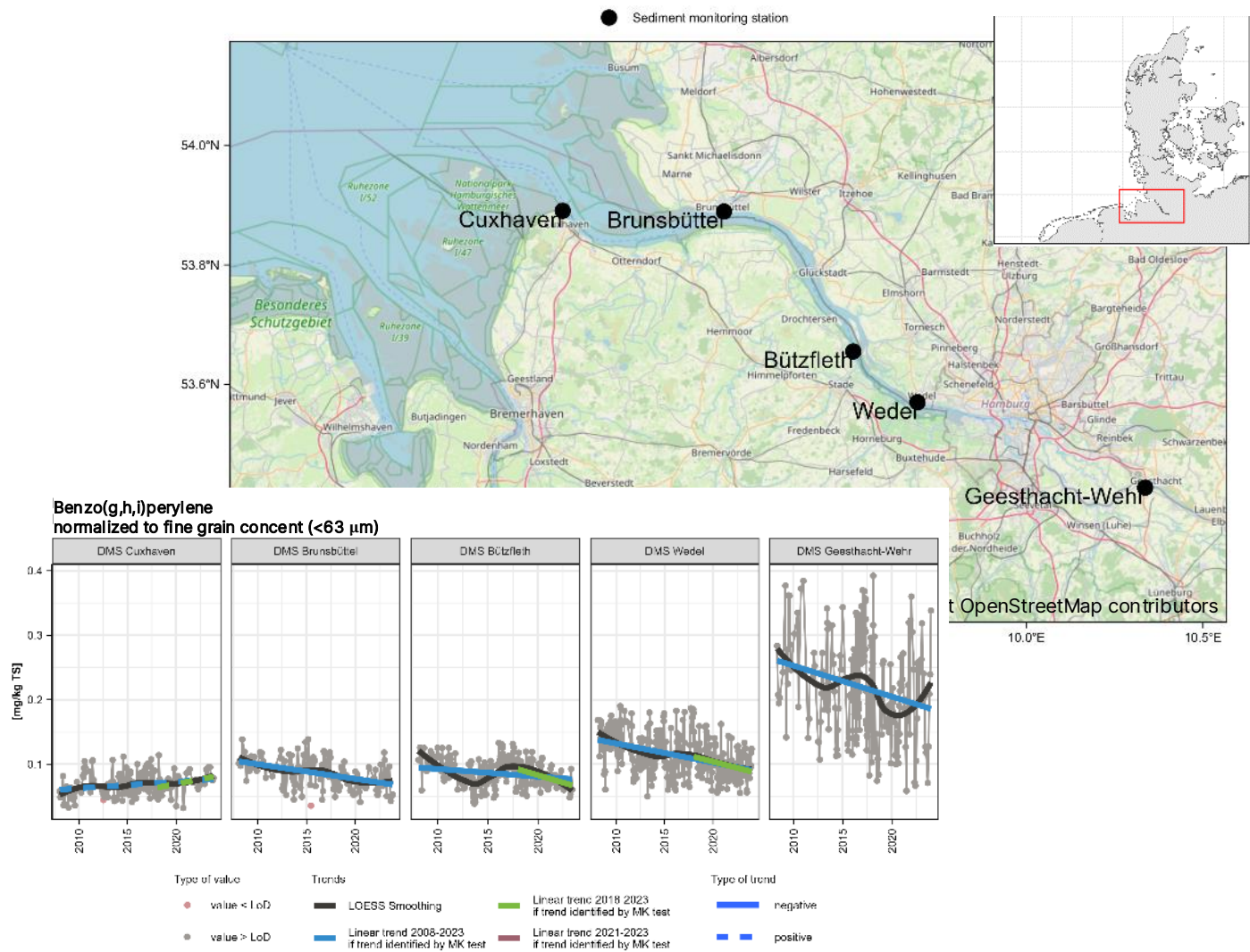
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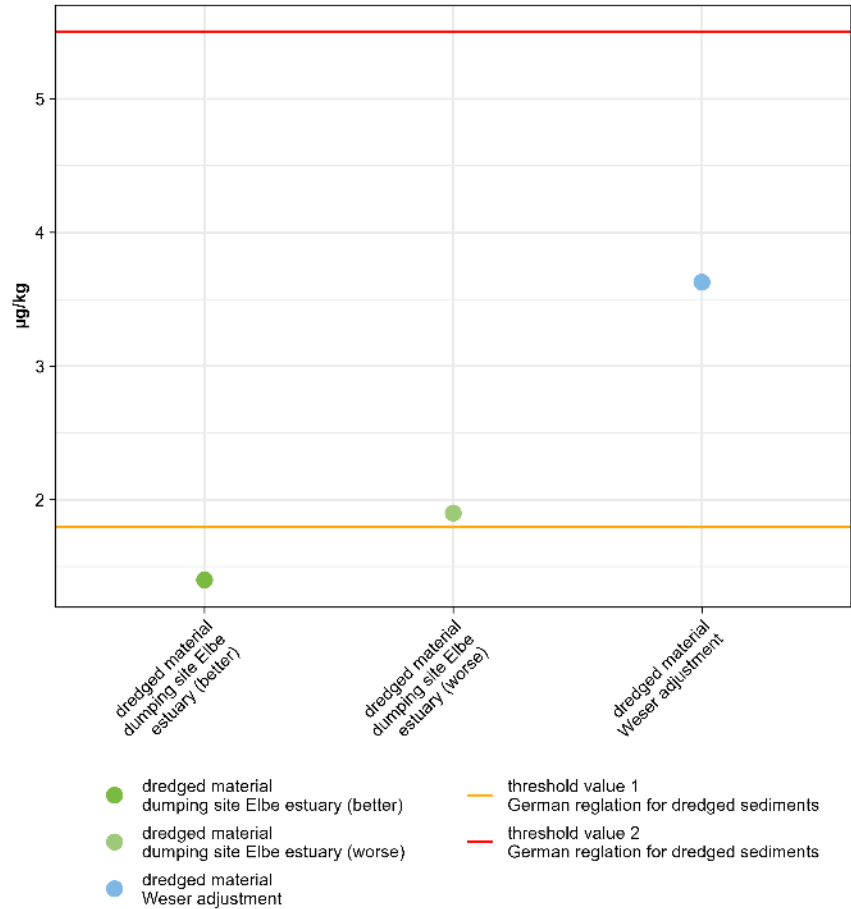
Results Weser adjustment – Predicted maximum concentrations

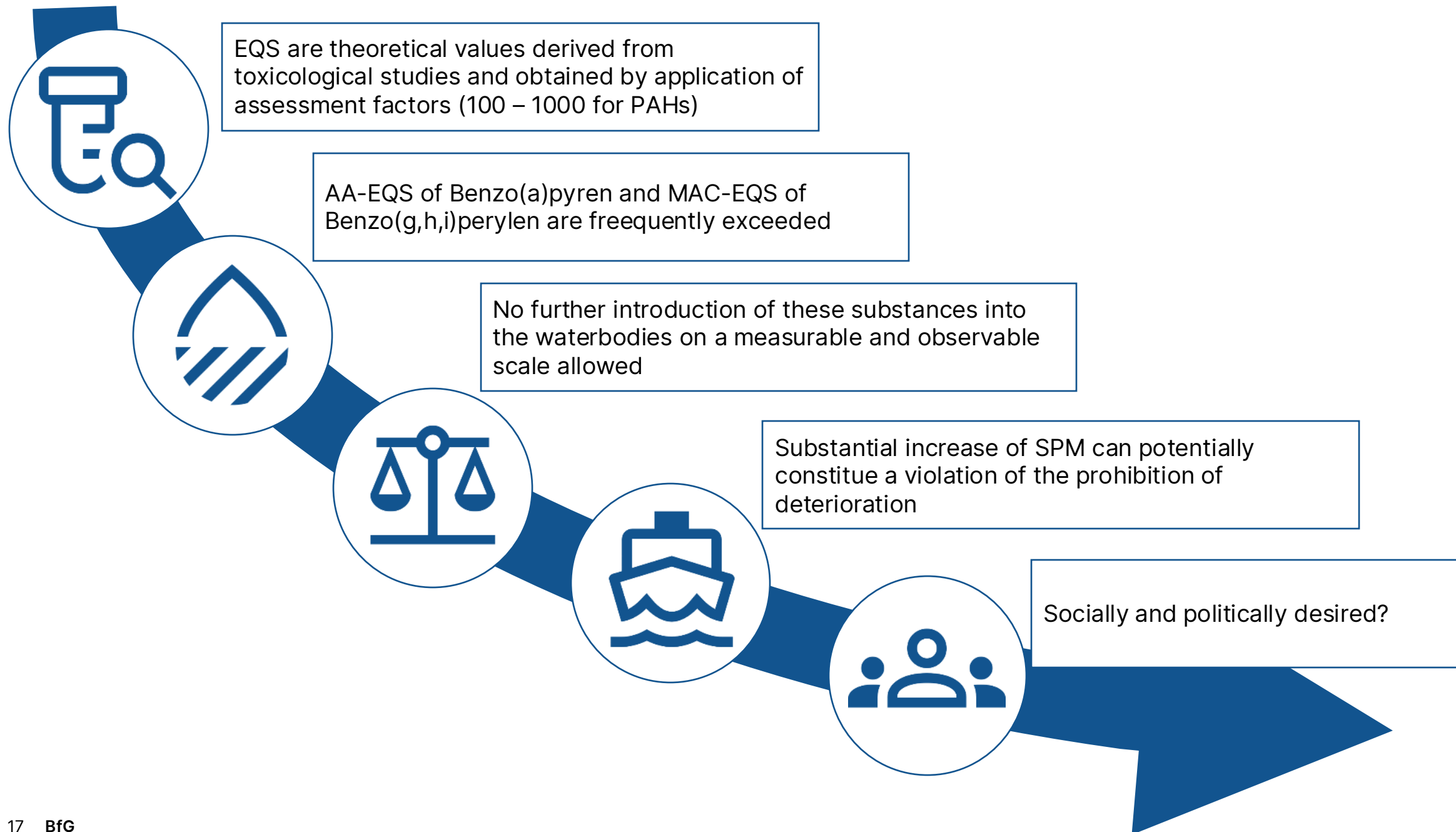


PAH concentrations of the dredged sediments



Assumed PAH Sum 16 concentrations of the dredged sediments in risk assessment Elbe estuary and Weser adjustment





Thank you for your attention.

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