Status and shortcomings in transitional and coastal waters

- One transitional water body and five coastal water bodies including the adjacent sea are part of the Elbe River Basin and its estuary.
- Eutrophication is one of the most serious environmental issues in the German part of the North Sea and bodies with coastal waters. The main reason of eutrophication is high nutrient input from rivers.
- Due to eutrophication, a change in species composition is occurring together with a large increase in algae biomass and the propagation of opportune macrophytes.
- Five out of the six above-mentioned water bodies do not meet the objectives of the Water Framework Directive.
- Under the OSPAR convention (the Convention for the Protection of the Marine Environment of the North-East Atlantic) and Marine Strategy Framework Directive, these water bodies are classified as problematic areas, and a good status of the environment in terms of eutrophication will not be achieved within the assessment system of the Marine Strategy Framework Directive.
- Results from 10 monitored sections in transitional and coastal waters suggest that the orientation values defined in the Surface Water Decree (OGewV) have been significantly exceeded in almost all monitored sections.

Supraregional objectives for nutrients and the need to reduce nutrient input in crucial sections of the Elbe River

- Supraregional objectives for nutrients are defined in terms of target concentration, target load for crucial sections of the Elbe River in order to achieve the environmental objectives for marine environments *(Tab. 1)*. Supraregional objectives are defined for average concentrations of total nitrogen and total phosphorus.
- For the Seemannshöft monitoring site, target values of 2.8 mg/l for total nitrogen and 0.1 mg/l for total phosphorus were defined.
- For the Hřensko/Schmilka border monitoring site target values of 3.2 mg/l for total nitrogen and 0.1 mg/l for total phosphorus were derived.
- The needs for nutrient input reduction were defined for monitoring sites Hřensko/Schmilka and Seemannshöft based on the ascertained average annual concentrations of total phosphorus and total nitrogen in 2011–2015 and the corresponding nutrient load.
- It was ascertained that the nitrogen load in groundwaters in the German part of the Elbe River Basin needs to be reduced by more than 30,000 tonnes.

Tab. 1: Total nitrogen (N) and total phosphorus (P) input reductions needs in the international Elbe River Basin District on the basis of data from 2011–2015

	N	P
Input reductions needs in the Czech Republic at the Hřensko/Schmilka site		
Target concentration (annual average) in mg/l	3.2	0.1
Target load standardized to flow rate in t/year	30,799	962
Actual concentration (average 2011–2015) in mg/l	3.93	0.115
Actual load standardized for flows in t/year	45,810	1,541
Input reduction needed in t/year	15,011	579
Input reduction needed in %	33	38
Input reductions needs in groundwater in the international waters of the Elbe River Basin District		
Target concentration in seepage waters in mg/l	50 (NO_3)	–
Input reductions of N needed in t/year	≥ 31,000*	–
Input reductions needs in inland waters		
Target concentration (annual average) in mg/l	–	0.1
Input reduction of P standardized to flow rate needed in t/year (2011–2015)	–	1,358**
Input reductions needs for sea protection at the Seemannshöft site		
Target concentration (annual average) in mg/l	2.8	0.1
Target load standardized to flow rate in t/year	66,580	2,385
Actual concentration (average 2011–2015) in mg/l	3.2	0.17
Actual load standardized for flow in t/year	84,400	3,940
Input reduction needed in t/year	17,800	1,555
Input reduction needed in %	21	40

* only the German section
** the input reduction needed at significant tributaries in the German section of the Elbe River Basin with respect to the input reductions needed in the border section

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ICPER Information sheet
Strategy for Nutrient Reduction

Measures recommended for effective reduction of nutrient content of waters in the international Elbe River Basin District

The recommended measures sum up in ten points the specific measures that will contribute in the next time to targeted reduction of nutrient input in waters and reaching common objectives with respect to coastal and marine waters as well as with respect to improving the status of inland surface waters and groundwaters in the international Elbe River Basin District. All of the measures in this ten-point plan are of equal importance.

- Measures recommended for point sources of pollution
  1. Adjustment of wastewater treatment to the best available technology
  2. Improvement of wastewater treatment in rural areas
  3. Amendment of the legal regulations concerning nutrient emissions from wastewaters
- Measures recommended for non-point and diffuse sources of pollution
  4. Consistent implementation of fertilisation ordinance
- Measures recommended for enhancing nutrient retention in the landscape and water ecosystems
  5. Enhancement of nutrient retention in landscape and water bodies
  6. Sustainable and water-friendly utilisation of public-owned properties
- Measures recommended for obtaining information about the significance of nutrient sources and their input pathways to waters
  7. Standardised assessment of the phosphorus-pool in soils
  8. Improvement of monitoring programmes
  9. Long-term update of the nutrient modelling approach
- Measures recommended for informing the general public about the necessity to reduce nutrient input in waters
  10. Effective communication of nutrient reduction demands in public

In order to reduce nutrient pollution of watercourses over the long term, it is necessary – in addition to the above-mentioned measures – to more intensely inform the general public in particular about the generally recognized principles of land farming, the principles of a circular economy and resource protection in general.

A key measure for sustainable development is the systematic reduction of nutrient input in the environment. An example of phosphorus input reduction in the environment is, e.g., in the case of point sources, strict restrictions on the phosphorus compound content of washing agents and detergents for so-called professional application. In the case of diffuse sources, it is important to reduce nutrient balance surpluses from fertilizers applied on agricultural land, etc. Such measures should be implemented via legislation and education, ideally a combination of both.

Conclusion

The Strategy for Nutrient Reduction in Waters in the International Elbe River Basin District:

- was prepared by Czech and German experts of various professional focuses, and it is a precondition of the nutrient issue becoming a truly integral part of management in the international and national river basin districts;
- represents a unique document, even on a European scale, which succeeded in uniformly assessing the current nitrogen and phosphorus loads in the Elbe River Basin and in identifying the key sources of pollution and input pathways in waters in partial sections;
- presents a comprehensive plan of measures that should result in a gradual reduction in the nutrient content of waters and thus the achievement of good status of groundwaters, watercourses and lakes as well as coastal and marine waters as defined in the Water Framework Directive and Marine Strategy Framework Directive.

Measures necessary for implementing the Strategy:

- Discussion and approval of the results on international level at the ICPER and, parallelly, in boards and federal states of the River Basin Community Elbe (FGG Elbe) as well as in the Czech Republic;
- Specification of the measures of the ten-point plan in the international Elbe River Basin District and coordination of their implementation.

More information on this issue is available in the Strategy, which can be downloaded (in German and Czech) from the ICPER website (www.ikse-mkol.org).

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Strategy for Nutrient Reduction in Waters in the International Elbe River Basin District

Introduction

The International Commission for the Protection of the Elbe River (ICPER) set up an ad hoc expert group "Nutrients" (NP) at its 27th meeting on 14 and 15 October 2014 in Berlin with the aim of ensuring a coordinated approach to reducing the nutrient inputs in waters in the international Elbe River Basin District. One output of the ad hoc expert group's activities is the Strategy for Nutrient Reduction in Waters in the International Elbe River Basin District (hereinafter referred to as the "Strategy"), which was approved in October 2018.

The stimulus for drafting the Strategy was, and still is, the current situation in which the nutrient content of waters in the Elbe River Basin remains high. Although significant improvement over the past two decades took place, the objectives set forth in the Water Framework Directive (Directive 2000/60/EC) and Marine Strategy Framework Directive (Directive 2008/56/EC) have yet to be achieved. Despite the fact that all member states in the international Elbe River Basin District apply the principles of water protection set forth by the Water Framework Directive, it is necessary to define a common understanding of objectives for the protection of the Elbe River and coastal and marine waters. A coordinated response with appropriate measures has to be developed to reduce the nutrient load originating from various sub-basins of the river basin and from different sources.

Objectives

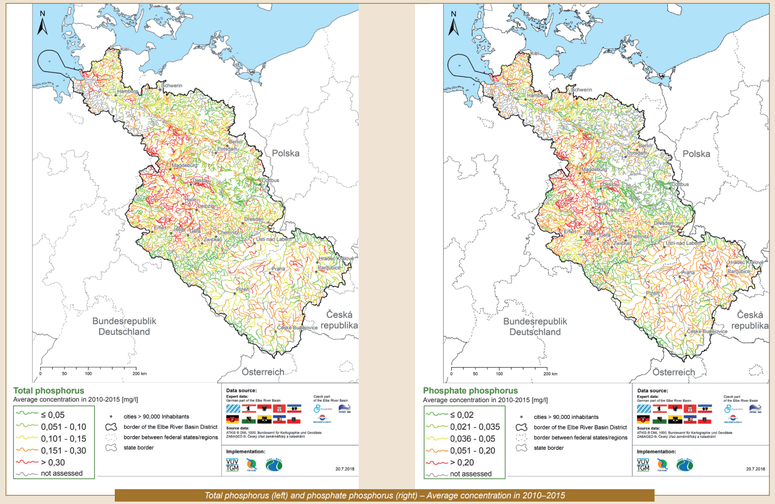
- Review and compare the methods and evaluation of water status in terms of nutrients considering nitrogen and phosphorus in the Czech Republic and Germany.
- Assess jointly the current nutrient load in waters in the Elbe River Basin based on a common data set.
- Set mutual basin-wide objectives for nutrients for the relevant types of waters in the Elbe River Basin and define the nutrient reduction needs at crucial monitoring stations of the Elbe to ensure the protection of the North Sea.
- Evaluate the extent, importance and main areas of nutrient sources and input pathways in the Elbe River Basin, and characterize the dominant types of pollution sources that jeopardize the achievement of the objectives.
- Compile a draft of appropriate measures and further recommendations that should result in an efficient decrease in nutrient content of waters in the Elbe River Basin.
- Apply the findings when drafting national river basin management plans and the International Management Plan for the Elbe River Basin District for 2022-2027.

Comparing objectives and methods of water status assessment in terms of nutrients in the Czech Republic and Germany

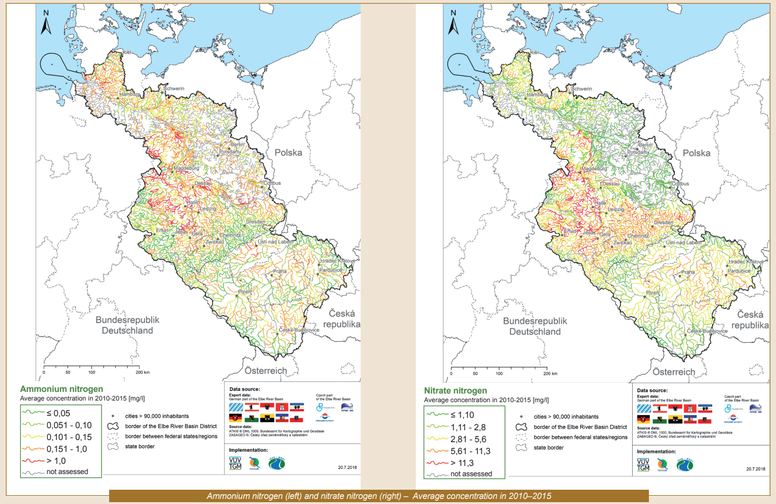
- There are certain differences between the Czech Republic and Germany, when assessing different species of nitrogen and phosphorus in waters.
- In Germany, results of surface waters measurements are compared with orientation values expressed as mean, whereas in the Czech Republic these are compared with target values expressed as a median (with the exception of lakes and groundwaters).
- Differences in how orientation and target values for comparable types of water bodies are set between the two countries are apparent, particularly in total phosphorus and nitrate nitrogen.
- Target values for total phosphorus in most water bodies in the Czech Republic are set higher than in Germany with the exception of specific marsh waters (a type of fertile landscape in northern Germany, flat belts of soil without natural elevations, situated approximately at sea level near the North Sea and also river marshes in areas flooded with tide, e.g. along the Elbe River).
- While only one value relates to both surface waters and groundwaters in Germany (11.3 mg/l) for nitrate nitrogen, the relevant target values for surface waters and groundwaters in some water bodies in the Czech Republic are considerably lower.
- Orientation and target values for nutrients in water bodies in the "lake" category in Germany and the Czech Republic are comparable.
- The above stated reasons restrict – to a certain degree – direct comparison of the results of the environmental status assessments of water bodies for nutrients in both parts of the river basin.

Joint assessment of the current nutrient load in waters in the international Elbe River Basin District – concentrations

- Joint characterisation of the concentrations and nutrient loads was conducted for the entire Elbe River Basin with the exception of water bodies in Poland and Austria.
- The indicators of total phosphorus, phosphate phosphorus, ammonium nitrogen and nitrate nitrogen were exploited for the 2010–2015 period.
- Statistic assessment (Wilcoxon-Mann-Whitney test) showed that data sets for total and phosphate phosphorus in the German and Czech part of the river basin do not differ. In the case of ammonium and nitrate nitrogen, statistically higher concentrations were detected in the German part of the Elbe River Basin.



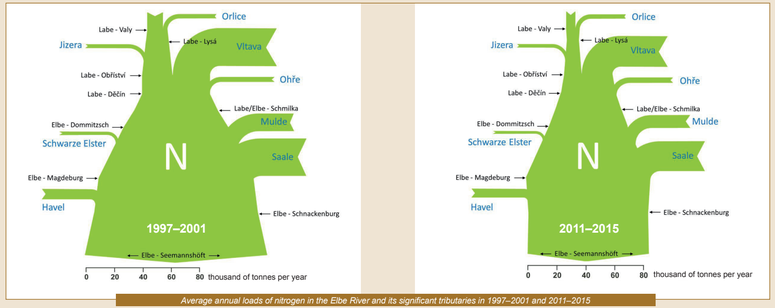
Total phosphorus (left) and phosphate phosphorus (right) – Average concentration in 2010–2015



Ammonium nitrogen (left) and nitrate nitrogen (right) – Average concentration in 2010–2015

Joint assessment of the current nutrient load in waters in the international Elbe River Basin District – total nitrogen and total phosphorus loads

- Average loads of total nitrogen and total phosphorus were calculated for 1997–2001 (the situation before beginning the implementation of the Water Framework Directive) and 2011–2015 (to fulfil the first International Management Plan for the Elbe River Basin District) for important sections of the Elbe River – Hřensko/Schmilka (monitoring site in the Czech/German border section) and Seemannshöft (monitoring site at the transition of the Elbe River in the tidal section of the North Sea) – and for other measuring profiles on the Elbe River and its significant tributaries.
- Comparison of the two periods shows a significant reduction in the total phosphorus load of 40-50% at most profiles; smaller decreases of 20-30% were recorded for total nitrogen.
- Positive aspect is that the reduction in total phosphorus was mainly at balance-significant tributaries (e.g. Vltava and Havel where the decrease of loads was 53% and 41% respectively).
- Another positive aspect is that the decrease in total nitrogen in most sections usually fluctuated at around 20%.
- Negative aspect is that the trend in the reduction of nutrient concentration and flow has weakened since approximately 2010.

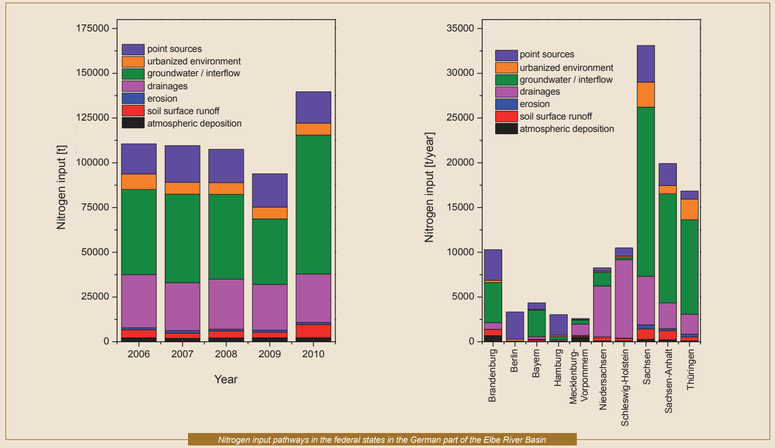


Average annual loads of nitrogen in the Elbe River and its significant tributaries in 1997–2001 and 2011–2015

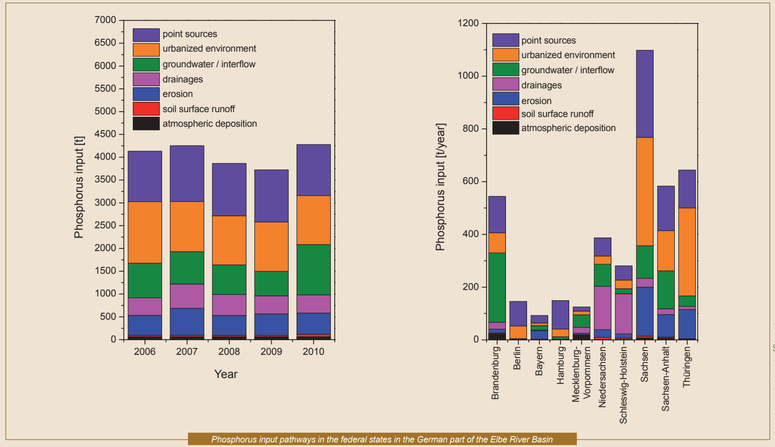
Average annual loads of total phosphorus in the Elbe River and its significant tributaries in 1997–2001 and 2011–2015

Significance of nutrient sources and input pathways

- Assessment of nutrient sources and input pathways was conducted for the German section of the Elbe River Basin on the basis of modelling. In the Czech section targeted monitoring and results of nutrient balance in large basins was utilized to identify pollution sources.
- The very predominant input of nitrogen compounds in the German and Czech parts of the Elbe River Basin is from non-point sources. In comparison, the share of input from point sources at various parts usually only ranges between 10 and 20%.
- The predominant input of phosphorus in the Czech part of the river basin is from point sources, usually with 70-80%. The shares of sources in the German part of the river basin are more balanced, with point as well as non-point sources accounting for approximately 50%. The percentage of non-point sources in lowlands is higher than in mountainous areas.



Nitrogen input pathways in the federal states in the German part of the Elbe River Basin



Phosphorus input pathways in the federal states in the German part of the Elbe River Basin

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