Baltic Marine Environment Protection Commission

Making the HELCOM eutrophication assessment operational EUTRO-OPER

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Background

One task of the EUTRO OPER project is to develop new core eutrophication indicators. EUTRO OPER 1-2014 has decided that indicators for total nutrients should be further developed. The document provides an overview of the indicator rationale and proposes next steps.

Action required

The Meeting is invited to take note of the indicator rationale and to discuss and agree on next steps.

Indicator rationale for total nutrients

The added value of TN and TP as core indicators is to strengthen confidence in the eutrophication assessment through linking eutrophication effects to nutrient enrichment. In particular these parameters allow to take account of climate change in the eutrophication assessment since higher temperatures will lead to year-round phytoplankton proliferation and / or possible changes in zooplankton communities. To illustrate this point Germany, has in recent years in the North Sea, observed diverging trends of TP and DIP. While DIP concentrations have decreased, TP concentrations have increased (see Fig.1). A possible reason for this observation could be that in winter more phosphorus is bound in the phytoplankton due to the higher water temperatures. In such a situation assessing only DIP concentrations gives the wrong impression that nutrient concentrations seem to be declining, while, in fact, they are stable or increasing as can be seen when also assessing TP. TN and DIN concentrations, by contrast, still show corresponding trends in the German Bight (North Sea), however, in the future DIN is also expected to decrease since phytoplankton growth will commence earlier. Differences between the behaviour of nitrogen and phosphorus can possibly be explained by the much more complex hydrochemistry of phosphorus. With declining pH due to acidification P-complexes are increasingly released from the sediments.

For the German Baltic Sea, data have not been analysed for this document, but it is expected that the situation is comparable to the North Sea. In conclusion, to get a good understanding of the trend in nutrient concentrations in the marine environment monitoring and assessing both, total and dissolved nutrients, is important.

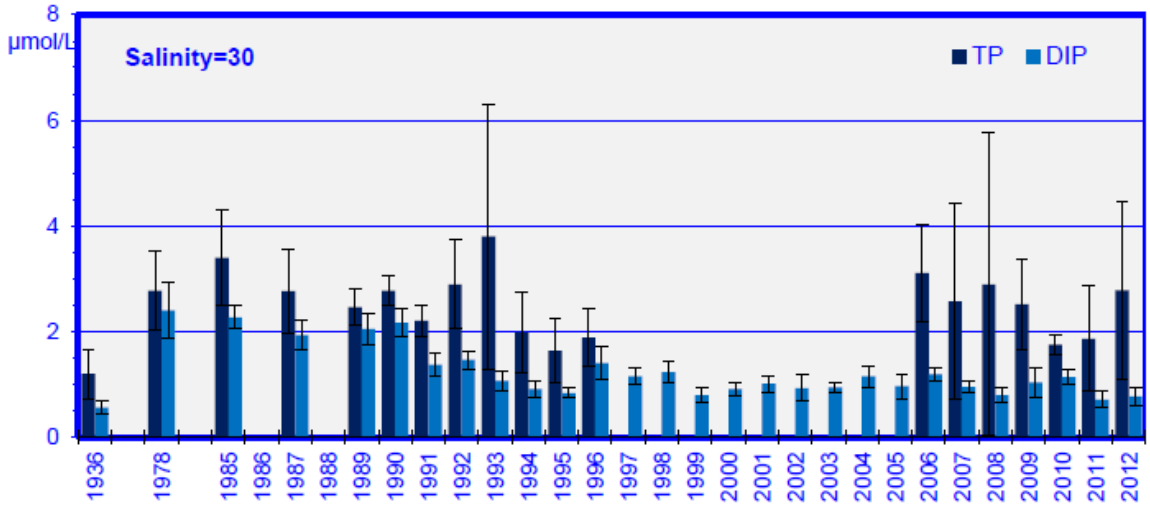

Fig. 1 Time series of winter TP/DIP in the German Bight (error bars indicate 95% confidence intervals). Source: BSH, S. Weigelt-Krenz

Another added value of total nutrients as indicators is that they respond to the requirements of the MSFD (table 1, annex III mentions spatial and temporal distribution of TN and TP). Lastly, total nutrients are also essential for calculating nutrients budgets to assess transboundary fluxes.

Next step: Extend this rationale to include also findings from the Baltic Sea.

Monitoring of total nutrients

TN and TP are assessed year-round, so that data availability is higher than for DIN and DIP and confidence in these indicators should therefore be high. Furthermore, TN and TP are already widely assessed by Contracting Parties. Guidelines for monitoring these indicators already exist in HELCOM.

Next step: Get an overview of which CPs already measure TN and TP on a routine basis.

GES targets

As TN and TP were not simulated in the TARGREV modeling exercise only upper limits of annual means of TN and TP are proposed as GES targets (see TARGREV report page 84). These upper levels already represent a eutrophied Baltic Sea in the early 1970s and are therefore not suitable as GES targets since they are not in agreement with the target levels of the other eutrophication indicators (e.g. DIN, DIP, secchi depth). Nevertheless, some CPs have derived target levels for total nutrients.

In Germany, a new modeling approach has recently provided revised target concentrations for nutrients to be used under the WFD. Such target concentrations could only reliably be derived for total nutrients and not for dissolved nutrients. Hence, under the WFD dissolved nutrients are used only for trend assessments in the future. The modeling approach has also provided target levels for total nutrients for Kiel Bay, Mecklenburg Bay, Arkona Basin and Bornholm Basin which should be in good agreement with the findings of the TARGREV project and could potentially be used for HELCOM assessments (see table 1).

Next step: Get an overview of existing GES targets for the Baltic Sea basins.

Table 1 Comparison of GES target levels for TN and TP from the TARGREV project and from a German project for revision of WFD targets (Schernewski et al).

	TARGREV (2013) table F.2		Schernewski et al. (submitted)	
	TN [µmol/l]	TP [µmol/l]	TN [µmol/l]	TP [µmol/l]
Danish Straits	<21,8	<0,97	19,3	0,47
Arkona Sea	<17,4	<0,67	19,3	0,52
Bornholm Sea	<16,1	<0,54	16,7	0,46
Kiel Bight	<22,2	<0,96	16,6	0,46
Bay of Mecklenburg	<21,65	<0,98	18,3	0,48