Document title	Future work on HELCOM indicators - Eutrophication
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Background

The following document contains a brief topic summary that addresses the overall aim of indicator work and assessments on the given topic. It outlines, the current status, and gives an indication of the work needed to adjust/develop the identified indicators. Potential avenues of cooperation avenues are also described. Where possible the information has been compiled based on responses received from the HELCOM indicator questionnaire process and revised based on comments received at the 1st HELCOM Indicator Workshop. This is, particularly the case for the section on the aims of the work, which was that were a focus of attention at that 1st indicator workshop.

The aim section has been updated to reflect changes proposed by the HELCOM Intersessional Network on Eutrophication (IN Eutrophication). Other minor changes were added specific to the oxygen indicators. Changes are marked with underlined text.

Action requested

The Workshop is invited:

- to take note of the information and use it as needed to support the discussion
- provide comments or corrections as needed

Eutrophication

Future work on HELCOM indicators – towards the 3rd Holistic Assessment of the Baltic Sea 2023.

Indicators under discussion

1. Total nitrogen (TN)
2. Total phosphorus (TP)
3. Dissolved inorganic nitrogen / DIN
4. Dissolved inorganic phosphorus / DIP
5. *Inputs of nutrients to the subbasins
6. Chlorophyll-a
7. Cyanobacterial bloom index
8. Water clarity
9. *Oxygen debt
10. *State of the soft-bottom macrofauna community (applied in some areas)
11. Baltic Sea acidification
12. Other indicators

*Completed indicator questionnaires received.

Additional information is taken from the outcomes of previous meeting of the IN-EUTRO group.

Other indicators are briefly included as discussion and planning has taken place in IN-EUTRO meetings.

These indicators appear in the additional document that considers the HELCOM indicator-policy match and scoring (Document 17 - HELCOM indicator-policy matching and draft scoring, and annex).

Aim (updated based on comments via IN Eutrophication)

A Baltic Sea regional evaluation of indicators representing ecosystems components (e.g. chlorophyll-a concentration, oxygen deficiency, nutrient concentrations water clarity and algal blooms). Such evaluations should be made against commonly agreed threshold values (for state indicators) or target levels (for inputs) that have relevance to the ecosystem and effects on biota. A quantitative overall integrated assessment is constructed from the indicators.

Other relevant aspects associated to this topic may include hydrographical conditions (e.g. acidification) as this indicator is currently hosted under the IN Eutrophication group.

General introduction and current status

Nine (plus one) eutrophication-related indicators were updated in 2018 with an integrated assessment of eutrophication carried out in the 2018 State of the Baltic Sea report, examining three divisions: nutrient concentrations, direct effects, and indirect effects. Coastal waters are commonly assessed using national Water Framework Directive (WFD)-related threshold values. In general eutrophication remains a major pressure, with a large number of assessed areas failing to achieve their respective threshold values. The majority of indicators are operational though some discussion related to threshold values (TN and TP), final approval (e.g. Cyanobacterial Bloom Index), and further development are relevant. Similarly, further adjustment and development of the confidence assessment applied to the overall assessment is under discussion.

Relevant species (regional lists of species for the assessment)

N/A

Development/adjustment work

This group of indicators is significant as it corresponds to a major and well studies pressure on the Baltic Sea ecosystem. Further development/adjustment of the confidence assessment approach (and the implementation of this in the indicator evaluation tool hosted by ICES) is needed.

Total nitrogen (TN): The revisiting of TARGREV values and issues such as total nitrogen and total phosphorus indicators lacking common targets in certain open sea assessment units need to be addressed, in addition to the remaining study reservation.

Total phosphorus (TP): The revisiting of TARGREV values and issues such as total nitrogen and total phosphorus indicators lacking common targets in certain open sea assessment units need to be addressed, in addition to the remaining study reservation by Denmark.

Dissolved inorganic nitrogen / DIN: No information.

Dissolved inorganic phosphorus / DIP: No information.

Water clarity: No information.

Chlorophyll-a: Further work on the Chlorophyll-a indicator to extend the inclusion (spatial and temporal) of data from satellite (Earth Observation Data) and FerryBox systems should be considered.

Cyanobacterial bloom index: Development work on the pre-core indicator cyanobacterial bloom index is anticipated, including clarification and discussion on the current study reservation by Denmark. As part of this discussion the relevance/suitability of the indicator in southerly areas needs to be discussed.

Oxygen debt: The indicator is generally operational but adjustments are needed to facilitate a complete spatial assessment in all areas where it is applicable. Clarification/confirmation on a new indicator lead is also needed. The spatial coverage for oxygen debt based on sub-halocline data is complete since it was deemed unsuitable in the northern parts (Bothnian Bay and Bothnian Sea), thus adjustment or alternative approaches should be applied. Other developments are needed, such as division of the Baltic Proper and Gulf of Finland assessment and development of appropriate independent threshold values. Since the oxygen debt indicator cannot be used in all basins the 'shallow oxygen indicator' is currently under development. These indicators can complement each other. A number of national projects related to development for oxygen indicators are underway, with work on writing a common concept for the oxygen indicator possible to start in January 2019, though no lead country role is currently in place. Such developments are important due to increasing areas of anoxia in the Baltic Sea.

Inputs of nutrients to the subbasins: The indicator is operational and used to assess MAI (Minimum Allowable Inputs), but requires minor practical adjustments to improve it for future assessments. Standardized data delivery from EMEP would be beneficial as well as moving the EMEP deadline to mid-August or even earlier to enable preparation and indicator evaluation in appropriate time for relevant HELCOM meetings and deadlines (also note that data reported are 2 years in arrears).

Cost estimate after data have been collected, reported, uploaded and quality assured in the PLUS database and after EMEP has delivered modelled airborne deposition: Checking dataset, transferring

to assessment database, filling in data gaps/missing data: 1-2 days. Normalization of inputs: 1 day. Preparing dataset for statistical analysis and statistical analysis: 1.5-2 days. Assessing statistical results, calculating trends and changes in inputs, making tables and plots for the indicator, updating text and preparing spreadsheet with results, and figures to HELCOM Sec.: 2 days. Layout by HELCOM Sec and updating maps, fine tuning set-up: 1 days. In total approx. up to 8 working days per occasion.

The Core Pressure indicator on nutrient inputs (MAI follow-up) is of high relevance since it directly assesses the fulfilment of MAI, which is a vital part of the follow up of HELCOM BSAP nutrient reduction scheme. Correspondingly a Core indicator for assessing CART fulfilment could be developed which would be of high relevance. CART are followed-up every three years in a policy message and a scientific report. Based on the results in the policy message and the scientific report a Core indicator could be elaborated.

Other indicators: Shallow-water bottom oxygen and Phytoplankton spring bloom intensity based on chl-a are being discussed and worked on within IN-EUTRO.

Baltic Sea acidification: Initial discussions have regarding initial planning for the acidification indicator have taken place within IN EUTROPHICATION. A number of national and regional cooperation projects have been identified as relevant (BONUS project INTEGRAL and the Nordic Council of Ministers funded OMAI Project) and these will be linked into development work.

Note: many of the above issues or potential obstacles also have resource implications.

Potential obstacles

No major obstacles have been identified.

Frequency

The inputs indicator is proposed to be updated on an annual basis. Other indicators evaluated through the automated assessment platform could be updated on an annual basis, though major uopdates should be times with relevant HELCOM and other policy relevant deadlines (e.g. 6 year MSFD cycle).

Potential for cooperation

For HELCOM countries that are also EU Member States, work particularly needs to consider guidance derived from MSFD processes (e.g. the planned review of integration methodologies via the JRC). Linkages with ICES, in particular related to development of the indicator evaluation tool, will be important. Following ongoing processes related to the development of the SDG 14.1.1. indicator will also be relevant. Linkages with biodiversity topics to develop common understanding of ecosystem interactions may also be relevant.

Inputs: RedCore DG assisted by PLC IG and under the auspices of HELCOM PRESSURE. Possible synergies with the OSPAR indicator “Nutrient Inputs to the Greater North Sea and the Bay of Biscay and Iberian Coast” (cf. https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/pressures-human-activities/eutrophication/nutrient-inputs/).

Other issues

The workshop is invited to document other aspects they consider to be relevant to the development of this specific indicator category.

A number of issues raised previously (though not an exclusive list) that may be relevant for discussion include: integration rules, appropriate coordination with MSFD CIS processes, and appropriate coordination with OSPAR.