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Note that this document was submitted after the established deadline.
It will be decided by the Meeting whether the document can be discussed or is postponed to the next meeting.

Background

For the implementation of the eutrophication assessment in the HOLAS II project, three issues with tentative implications for the results of been considered by the IN-EUTRO after State and Conservation 5E-2017.

1) Scaling of indicators

The HELCOM SPICE Eutrophication workshop (HELCOM SPICE Eutro WS 1-2017) requested IN-EUTROPHICATION 7-2017 meeting to define scaling (min and max values) for eutrophication indicators. Difficulties found while testing scaling of coastal indicators reported in EQR lead to the proposal of not introducing scaling to the eutrophication assessment during the 1st stage of HOLAS II. These min and max values are however to be used for the eutrophication indicators applied in the biodiversity assessment. Principles for scaling are included in this document and indicator and assessment unit specific scaling values (best value and worst value) are included in Attachment 1 to this document.

2) Weighting of indicators

In HEAT 3.0, eutrophication indicator results are aggregated into three criteria groups, using weighted averaging. HELCOM IN-Eutrophication is responsible for proposing the weights. In this document, indicator weights for the eutrophication status assessment are provided in Attachment 2 and 3.

3) Correction of threshold values for the cyanobacterial bloom index

The indicator on cyanobacterial blooms is a HELCOM pre-core indicator[1]. It has been agreed to test the indicator in the HOLAS II project (Outcome of State and Conservation 5E-2017, para 3.2). Threshold values for the indicator was agreed by HELCOM 38 (Outcome para 4.19, Annex 4). Finland is in lead of the work. This document presents a correction for the threshold value agreed for Bornholm Sea (SEA-007).

Note that the proposals presented in this document have been implemented in the assessment of eutrophication as presented in the first version of the 'State of the Baltic Sea' report (document 4J-14).

Action requested

The Meeting is invited to

- endorse the scaling of eutrophication indicators for use in the assessment of biodiversity
- endorse the weighting of eutrophication indicators,
- endorse the corrected threshold values for the cyanobacterial bloom index in the Bornholm Basin.

[1] Denmark has a study reservation on the shifting the status to core indicator.

1) Scaling of eutrophication indicators

IN-EUTROPHICATION 7-2017 meeting agreed on following principles related for scaling:

HELCOM CORE and PRE-CORE indicators (applied in open-sea areas)

- Determining “best” value
    1. If a reference condition has been determined by HELCOM earlier (eg. DIN, DIP, chlorophyll-*a*, Secchi depth), that should be used.
    2. For indicators already normalized between 1-0 based on historical data (eg. Cyanobacterial Bloom Index), 1 or 0 should be used (the one representing best conditions).
    3. If the reference condition has not been determined (eg. TN, TP), the annual averages of the best five years in the time-series should be used.
    4. In areas with no reference conditions, and small historical datasets (eg. Quark): interpolate from values used in the adjacent assessment units.
- Determining “worst” value
    1. For indicators already normalized betweem 1-0 based on historical data (eg. Cyanobacterial Bloom Index), 0 or 1 should be used (the one representing worst conditions).
    2. For others, the annual averages of the worst five years in the time-series should be used.
    3. In areas with no reference conditions, and small historical datasets (eg. Quark): interpolate from values used in the adjacent assessment units.

Coastal indicators

Determining “best” value

5. If a reference condition has been determined through the national or WFD processes, that should be used.
6. For indicators reported in EQR, the value 1 should be used.
7. If the reference condition has not been determined, target + acceptable deviation should be used. If the acceptable deviation is not provided through national or WFD processes, it can be set at a similar percentage as for intercalibrated indicators in the same area, or the same indicators if used in adjacent or ecologically similar areas. Also, acceptable deviation can be set to be as big as the distance from the G/M boundary to the H/G boundary, (thus assuming linearity).

Determining “worst” value

1. For indicators reported in EQR, the value 0 should be used.
2. If several class boundaries are set: extrapolate “worst” from Moderate/Poor and Poor/Bad boundary values.
3. If class boundaries have not been set: use theoretical worst annual level obtained from time-series or literature.

Indicator and assessment unit specific scaling values (best value and worst value) are included in **Attachment 1** of this document.

2) Weighting of eutrophication indicators

According to the HELCOM Eutrophication assessment manual, indicators shall be assigned with indicator weights, so that the sum of all indicator weights within criteria sums to 100% in each assessment unit. In principle, the indicator weights are set evenly within the criteria, unless there is justification to do otherwise. This justification must be ecologically-based, and include documentation to be added to the assessment methodology. HELCOM IN-Eutrophication is responsible for proposing the weights.

Open sea core indicators

The indicator weights agreed by HELCOM CORE-EUTRO for the 2007-2011 eutrophication status assessment, presented in the HELCOM Eutrophication assessment manual, are proposed to be applied in HOLAS II, with some exceptions. For the new indicators, even weighing within criteria is proposed, unless otherwise justified.

The weights for open-sea indicators are provided in Attachment 2.

Criteria group 1: Nutrient levels

Nitrogen- and phosphorus indicators are weighted to increase the effect of the phosphorus in the Bothnian Bay and the Gulf of Riga, where phosphorus is clearly the limiting element for phytoplankton production. In the Gdansk Basin, the opposite is done, increasing the weighting of nitrogen indicators. In the remaining assessment units, the weights shall be distributed evenly between the N and P indicators.

Criteria group 2: Direct effects

For Secchi depth, the weight is assigned according to available information on the light absorption by colored dissolved organic matter (CDOM) and the relationship between CDOM absorption and chlorophyll-*a* concentration in the sub-basin (Ylöstalo et al. in prep., Stedmon et al. 2000), respectively. The weight between chlorophyll-*a* and Secchi depth is distributed equally in most sub-basins. In the Gulf of Finland, Gulf of Riga, Bothnian Sea, Quark and Bothnian Bay, chlorophyll-*a* is given a greater weight due to higher absorption of light by CDOM in relation to chlorophyll-*a*.

As cyanobacterial indicator dependent on weather and hydrography, some of the basins do not have complete set of parameters and target setting is quite recent it is suggested to downweight indicator.

Criteria group 3: indirect effects

The weights within criteria group 3 set to ensure even weighting between criteria (D5C5 oxygen, D5C8 bottom fauna).

Guidelines for setting indicator weights in coastal areas

In those coastal areas, where weighing has been applied when estimating the ecological status under WFD, the same weights may be used within each criteria group. Weighing between criteria groups is however not possible.

Weighing can also be done for coastal areas if there are specific ecological considerations (e.g. physical conditions, nutrient limitation patterns) that call for downweighing an indicator. This can be especially the case in areas adjacent to open-sea assessment units, where weighing has been done.

Downweighing should be at maximum 55% down from equal weight value in extreme cases. Justification shall accompany the changed weight. If one or two indicators are downweighed, the rest should remain equally balanced (i.e. the removed weight is distributed equally among the rest of the indicators).

The weights for open-sea indicators are provided in Attachment 3.

3) Correction of threshold values for the cyanobacterial bloom index

The HELCOM CORE CyaBI indicator consists of two parameters: 1) **cyanobacterial surface accumulations (CSA)**, combining information of spatial volume, length of bloom period and severity of surface accumulations estimated from remote sensing observations and 2) the **cyanobacteria biomass (BM)** in the water column analyzed from in-situ observations. The parameters are normalized, to allow combined use in the index.

A calculation error was detected in the threshold values agreed for the second parameter, cyanobacteria biomass, in the Bornholm Sea (SEA-007). The corrected threshold values are:

HELCOM ID	**Name of assessment unit**	**Agreed BM threshold value (µg l^{-1})**	**Agreed BM threshold value (normalized between 0-1)**	**BM eutrophication ratio based on agreed threshold value**	**Corrected BM threshold value (µg l^{-1})**	**Corrected BM threshold values (normalized between 0-1)**	**BM eutrophication ratio based on corrected threshold value**
SEA-007	Bornholm Sea	65.15	0.87	0.99	41.76	0.92	1.06

As a consequence, the CyaBI indicator threshold values is proposed to be corrected. The status based on the corrected values are indicated in the table.

HELCOM ID	**Name of assessment unit**	**Agreed CyaBI threshold value (normalized between 0-1)**	**CyaBI eutrophication ratio based on agreed threshold value**	**CyaBI status, based on agreed threshold values**	**Corrected CyaBI threshold value (normalized between 0-1)**	**CyaBI eutrophication ratio based on corrected threshold value**	**CyaBI status, based on corrected threshold values**
SEA-007	Bornholm Sea	0.87	0.99	**GES**	0.89	1.02	**SubGES**