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## Outcome of HELCOM TAPAS benthic habitat indicator workshop (1-2016)

### Introduction

The Project for Developing the Second Holistic Assessment of Ecosystem Health in the Baltic Sea (HOLAS II) started in 2014 and will continue until June 2018. The project will produce an update of the overall environmental status of the Baltic Sea and evaluate progress in relation to the goals of the Baltic Sea Action Plan (BSAP). The outcome of the project will be developed so that it can also be used in reporting under the EU Marine Strategy Framework Directive (MSFD).

HELCOM TAPAS is an EU co-financed project with the task to support the HOLAS II project. The project runs from January 2016-June 2017.

### Workshop

The workshop was held on 27-28 September 2016 at the premises of the Estonian Ministry of Environment, Narva Mnt 7a, Tallinn, Estonia hosted by the TAPAS lead partner Estonian Marine Institute.

The aim of the two day workshop was to discuss the results of the development work on the indicator 'Distribution, pattern and extent of benthic biotopes' that is carried out under the TAPAS project. The workshop furthermore addressed the indicators, 'Cumulative impact on benthic biotopes', and 'State of the soft-bottom macrofauna community. The workshop was invited to discuss how the indicators may form the basis for an assessment of benthic habitats. The agenda of the Meeting is contained in **Annex 1**.

The Meeting was attended by representatives of Denmark, Estonia, Finland, Germany, Latvia, Poland and Sweden. The list of Workshop Participants is contained in **Annex 2**.

The Workshop was chaired by TAPAS Theme 2 lead partner Georg Martin, Estonian Marine Institute. Lena Avellan, HELCOM Secretariat, acted as secretary to the workshop.

## Workshop outline and link to the TAPAS and HOLAS II projects

1. The Chair welcomed the workshop participants, and outlined the aim of the workshop as developing proposals on the three benthic indicators for the purpose of submitting proposals to State and Conservation 5-2016 (document submission deadline 14 October).
2. The Secretariat presented how the development of core indicators and the TAPAS project is related to ongoing assessment work in HELCOM and how this work is linked to the time table of the HOLAS II project (**Presentation 1**).
3. The Secretariat informed on ecosystem component spatial data layers developed through the TAPAS project (**Document 5**). The workshop noted that these Baltic-wide map layers have been developed for use in the Baltic Sea Impact Index (BSII) but are available as a resource for the indicators or other HELCOM work areas.
4. The workshop noted that the writing process for the overall HOLAS II report has not been agreed, however that for compiling the indicator reports the relevant expert groups will be involved in the indicator calculation and it has been foreseen that they will also be involved in the writing. For the indicators discussed in this workshop the relevant expert group would be the Intersessional Network on Benthic habitat monitoring (IN-Benthic).
5. The workshop noted that there is an ongoing process to request countries to report WFD biological indicators (e.g. phytobenthos indicators) for the use in HOLAS II.
6. The Secretariat presented the outcome of the intersessional meetings on developing the benthic pre-core and core indicators (**Document 1**). The workshop further noted that the IN-Benthic 1-2016 discussed all the indicators and the progress made as this is included as a task in the networks terms of reference.

## Pre-core indicator 'Distribution, pattern and extent of benthic biotopes'

### Discussion

7. Mr. Georg Martin, TAPAS Theme 2 lead partner and indicator lead country, Estonia, presented the latest work on developing the pre-core indicator (**Document 2, Presentation 2**).
8. The workshop noted that the first version of the indicator concept was circulated in May-June to the IN-Benthic and Co-Lead Country contacts, and that the comments received have been incorporated in this second draft of the indicator concept.
9. The indicator concept proposal is an index based on four relevant habitat properties (area, extent, quality, impact) and a status classification based on three-categories (GES, sub-GES, non-GES) in line with the three classes used in the Habitat Directive
10. The workshop noted that the indicator concept combines the properties based on a conditional approach for each assessment unit, and that each property is assessed against threshold values stemming primarily from the EU Habitats Directive (HD).
11. The workshop noted that indicator proposes, when possible, to use national HD assessments for the HD habitats and other data sources for other habitats.
12. The workshop noted that the indicator concept does not propose a method for aggregating several types of habitats together within one assessment unit, and thus the indicator should be applied separately for each habitat assessed.
13. The workshop discussed the inclusion of the property 'impact', and felt that the inclusion of 'impact' in an indicator aimed to be used for status assessment might create confusion.
14. The workshop noted that the regional spatial data set developed for describing the loss of the habitat area due to different human impacts should be incorporated in the current indicator.

15. The workshop discussed the 'quality' property, noting that the aim should be to use data reflecting status of the relevant biological community and to strengthen the assessment or if such direct data are not available data on relevant proxies (e.g. secchi depth or oxygen depletion) could be used. To ensure regional consistency, it was further noted that a list identifying relevant proxies for 'quality' for each habitat is needed.
16. The workshop noted that in HD 'loss of area' is also considered as 'loss of function', and that the threshold values applied in the HD, such as a 10% change, are relevant if a habitat is assessed where the biological community is included. The workshop noted that if the assessment would be made for a habitat defined only based on substrate on a higher hierarchical level, such as the MSFD benthic broad habitat types, then the 10% change threshold may be too high to be relevant.
17. The workshop noted that countries have developed lists of 'characteristic species' for each habitat that is to be assessed in the HD, and that the status of the 'characteristic species' could be used to assess the 'quality' of the habitat.
18. The workshop noted that Poland does not agree with the Habitat Directive threshold value for area loss (10%).
19. The workshop discussed the suitable spatial scale to be used in the indicator, in particular if information is included using a grid-cell-approach. The sensitivity of the indicator to detect small changes is impaired if assessments are done based on large grid cells (10x10km) compared to small grid cells (1x1km or 100x100m) or as polygons of actual distribution of the habitat. The workshop noted that the resolution of the actual sampled data is important, and that if coarse scale data is used to model fine scale data then the actual information content would not be affected even if the assessment was made using large grid cells.

*Workshop recommendation on 'Distribution, pattern and extent of benthic biotopes'*

20. The workshop proposes that the indicator assessment protocol should contain the properties 'area', 'extent' and 'quality', and that the property 'impact' is removed from the indicator concept matrix. The workshop further proposes to calculate the property 'area' so that 'area lost' identified in the pressure data set in the BSII is subtracted from the habitat area.
21. The workshop proposed that if information is not available for all three properties for a habitat in an assessment unit, then no assessment should be made for that habitat in that assessment unit.
22. The workshop proposes that the assessment protocol (use of grid and grid size) is determined specifically for each assessment unit based on the data availability and resolution. When high resolution data is available, then actual area and polygons should be used for the calculation, and as the resolution of the data decreases then the grid cell approach should be applied with increasing grid size when the data resolution becomes lower. The workshop noted that the sensitivity of the indicator will thus vary between assessment units for the same habitat if different resolution of data is available in different assessment unit. This difference should be expressed as level of confidence of the assessment. The exact way of expressing the level of confidence will be developed and proposed by the Lead Country, in order for the indicator to be used also in the biodiversity assessment tool.
23. The workshop proposed that the Lead Country develops an indicative list of habitats to be assessed using the indicator with a focus on a selection of relevant biotopes/habitats defined by communities that can be defined as relevant sub-types of the EU MSFD predominant habitats (e.g. hard substrate dominated by *Fucus* sp., sand dominated by *Zostera* sp.). The aim of the indicative list of the habitats is to harmonize the assessment approach in the Baltic Sea region taking into consideration that all countries may not have suitable data for all biotopes and the list should be considered as alternatives.

- The workshop recalled that an indicative list was developed during CORESET II that could be used as a starting point.
24. The workshop proposed that the Lead Country develop a habitat specific list of relevant proxy layers to use when assessing 'quality' in cases where biological data is not available.
  25. The workshop proposed to use the HD 'characteristic species' assessment and the WFD benthic indicators when relevant for assessing 'quality' of the habitat. The workshop furthermore supported the proposal to use BQI as metric to assess 'quality' for soft sediment habitats, and this approach was considered to be aligned with the proposed criteria D6C5 of the current version of the Commission Decision on GES criteria (version 14.9.2016). However, if BQI is included as a separate core indicator in the HOLAS II biodiversity assessment, then including the same metric in this indicator may result in double counting and should in such a case not be done.
  26. The workshop supported the use of criteria for assigning GES/sub-GES/non-GES as derived from the Habitat Directive, however noting that the term 'non-GES' needs to be reconsidered since it has no foundation in the MSFD.
  27. The workshop proposes to rename the indicator 'Condition of benthic habitats' to better reflect the indicator concept and the evaluation that the indicator delivers to a holistic assessment.
  28. The workshop proposed that the indicator evaluation should be carried out in a centralized manner as the assessment units are shared by several countries, noting that there might be some issues of assessing quality if national approaches differ.
  29. The workshop proposed that the Lead Country update the indicator report as a submission to State and Conservation 5-2016. The updated indicator report should take the workshop proposals into consideration, and will also contain a proposal on expressing the indicator assessment result as an EQR value to enable the use of the indicator in the biodiversity assessment tool. The proposal will be circulated to the meeting participants before submission.

### Pre-core indicator 'Cumulative impact on benthic habitats'

#### Discussion

30. Mr. Henrik Nygård, Co-Lead Country Finland, presented a test case applying the BSII approach developed in the TAPAS project to assess impacts on benthic habitats (**Document 3, Presentation 3**).
31. The workshop noted that the sensitivity scores for ecosystem components in BSII approach is numerical whereas the approach applied in the indicator, which is aligned to the OSPAR BH3, approach is based on categories.
32. Mr. Kai Hoppe, BalticBOOST partner Germany informed about the Mecklenburg test case (**Document 3**), underlining that the work of the project aims to develop concepts for setting of environmental targets for pressures affecting benthic habitats and is not directly aimed at developing the indicator.
33. The workshop noted that the project found that there is limited information available on measurements of actual impacts on the seafloor from pressures, and that a broad approach of 'effects/no-effects' is therefore considered suitable.
34. The workshop noted the tentative conclusions from the BalticBOOST project that in the Baltic Sea the seafloor integrity is severely affected also by other pressures than those stemming from fishing activities.
35. Ms. Antonia Nyström-Sandman, co-lead country Sweden, presented test cases from Hanö bay, selected for testing as this area is the most data-rich allowing for use of high resolution data in the test (**Presentation 4**).
36. The workshop noted that for the BSII the relevant pressures have been aggregated to two layers representing 'disturbance' and 'loss' and calculations are done on a 1x1 km grid size, and that the survey circulated to establish the sensitivity values has been developed based on this level of

- aggregation. For the purposes of the test case, the workshop noted that pressure data in a 100x100 meter grid had been aggregated to 'disturbance' and 'loss' in the same manner, to compare the effect of resolution in relation to the BSII TAPAS results.
37. The workshop noted that for outer areas the example demonstrated similar results using both the BSII numerical approach and the indicators categorical approach where the bottom trawling fishing pressure was the dominant pressure and similarly included in both approaches.
  38. The workshop noted that for inner coastal areas the example demonstrated differing results, and noted that in the BSII approach data on more pressures in a 100x100m resolution was included in the 'disturbance' layer compared to the pressures used in the indicator and that this likely accounts for differences in the coastal region.
  39. Mr. Torsten Berg, Co-Lead Country Germany, presented a test of applying data to the core indicator approach (**Presentation 5**).
  40. The workshop noted that there is currently no proposal for a GES boundary for the indicator, as there is not sufficient knowledge available on what the impact scaling means for a biotope to establish the boundary reflecting sustainable use.
  41. The workshop noted that expert judgement was needed to complete the test, as for example insufficient data was available to assign categories on 'frequency' as a magnitude of pressure from dredging/deposition. The workshop noted that in the test, this resulted in only the 'moderate' magnitude of pressure category being assigned.
  42. The workshop noted the proposal to ensure comparability with results developed in the OSPAR BH3 approach by modifying the categories, meaning changing 'intolerance' to 'resistance' and 'recovery time' to 'resilience'.
  43. The workshop noted that the indicator report currently states that pressure layers should be calculated as raster data. However, this was found not to be practical as the biotope layer is a raster layer and that pressure layers should be included as vector layers. If pressure layers are available in raster format then the layer should be recalculated to vector format before being included in the calculation.
  44. The workshop noted the proposal to incorporate oxygen depletion in the indicator evaluation by assigning higher sensitivity values to the biotopes if they have been affected. The workshop further noted that in the BSII approach the deep water oxygen depletion has been tackled by excluding the affected area from the assessment, as it is not considered relevant to assess seafloor integrity with physical pressures in this oxygen depleted area.
  45. The workshop noted that fishing is a severe pressure in the southern Baltic Sea and that other pressures such as dredging/deposition and construction have only local effects, however that in the northern regions of the Baltic Sea dredging/deposition may have more relevance as the same areas may be dredged/deposited year after year.
  46. The workshop discussed that the two aggregated BSII pressure layers ('loss' and 'disturbance') and the related sensitivity scores could as a test be translated into the categorical approach applied in the indicator to explore any difference in the assessment result that would appear from applying either the numerical or the categorical approach.

*Recommendations on 'Cumulative impact on benthic biotope'*

47. The workshop proposes to use the BSII approach and selected pressure layers to evaluate impact on benthic habitats for HOLAS II purposes as a short-term solution. This proposal is based on the fact the Baltic-wide layers for pressures, ecosystem components and sensitivity scores are developed as part of the TAPAS project and will be available by end of 2016. While threshold values are missing

- for the BSII this approach will provide the basic information required under criteria D6C3 in the proposed revision of the Commission Decision on GES criteria (version 14.9.2016).
48. In the long-term, the workshop proposes that the 'Cumulative impact on benthic biotope' indicator should be developed to include a GES boundary, noting that this indicator will also allow for comparisons with assessments made in the OSPAR area.
  49. The workshop invited Co-Lead Countries Sweden and Germany to update the indicator report as a submission to State and Conservation 5-2016 with the request to shift the status from pre-core to core indicator, including incorporating the findings in relation to the protocol, add a section on how the indicator compares to BSII, and include the indicative results from the test cases.
  50. The workshop invited Finland to prepare a document on an approach for how BSII can be used in HOLAS II for assessing impacts on the benthic habitats in relation to the assessment of seafloor integrity.

### Core indicator 'Status of the soft-bottom macrobenthic community'

#### Discussion

51. Mr. Henrik Nygård, Co-lead country Finland, presented test cases comparing BQI calculations using different national sensitivity values with the aim analyze any differences between BQI results when using the regionally calculated- or nationally determined sensitivity values to explore if assessment unit specific sensitivity values can be proposed (**Document 4, Presentation 6**).
52. The workshop recalled that the development of the indicator has been delayed due to the indecision on use of sensitivity values for the calculation of the indicator in offshore areas of the Baltic Sea. Previous work carried out under the CORESET II project aiming at using the same calculated sensitivity values throughout the Baltic Sea showed that the approach of using calculated sensitivity values is not appropriate for the species-poor northern Baltic Sea.
53. The workshop recalled that WFD assessment results will be used in coastal waters and that the HELCOM BQI core indicator is developed for use in offshore waters.
54. The workshop recalled previous agreement to use the BQI equation as described in Leonardsson et al 2009 in the core indicator.
55. The workshop recalled that the calculated sensitivity values consists of 19 sub-sets based on a geographical split (north, east, central, south) and salinity, depth and sieve size of the grab samples. The workshop noted that in the test cases the use of national sensitivity values have been compared to the calculated sensitivity values (DK values corrected in presentation, error in document 4).
56. The workshop noted that the figures depicting the resulting BQI calculations against status classification have been made only for the purpose of illustrating the variance in the calculations, not to show status classes as this would require the status classes to be specified for the sensitivity values used.
57. The workshop noted that the calculated sensitivity values as described in Schiele et al 2016 produce the same BQI 'pattern' compared to when national sensitivity values are used, with the exception of the species poor areas in the Gulf of Bothnia where the calculated sensitivity values did not give a relevant result. The workshop noted that when comparing standardized sensitivity values, a large span in the national values is evident, both for species-poor and species-rich environments. Results of the BQI will therefore vary depending on the sensitivity values used.
58. The workshop discussed two alternative processes for developing the indicator assessment for HOLAS II, namely 1) that countries calculate BQI values for each sample/station and submit these to HELCOM and that a central calculation of aggregation of a result per assessment unit is then carried out, or 2) that raw data is collated into one dataset and all calculations are carried out centrally. The workshop noted that if BQI is calculated nationally, then there may be problems with differences in

the protocols applied in problem cases such as different levels of taxonomic determination of the species and how these data points are dealt with.

59. The workshop noted that an R-script that calculates the BQI values has been developed by Germany and is available for use when the indicator evaluation is made.

*Recommendations on 'Status of soft-bottom macrobenthic community'*

60. The workshop proposes that the indicator evaluation should be made based on open sea data extracted from the COMBINE database and that this data is complemented with further nationally held monitoring data as needed, noting that currently the COMBINE does not hold data from Denmark, Estonia and Latvia. The workshop proposes that countries should be requested to make data available as soon as possible, as the data set will be needed to conclude on the indicator approaches mid-November).
61. The workshop proposes to use the calculated sensitivity values as described in Schiele et al. 2016 in all assessment units, except for Gulf of Bothnia and Åland Sea where Swedish-Finnish sensitivity values based on expert judgement are to be used. The workshop noted that the assessment unit specific species sensitivity list will be completed when the dataset to be used in the assessment has been compiled.
62. The workshop noted that Sweden has legally binding sensitivity values and threshold values for the whole east coast, covering both the coastal- and the offshore areas.
63. The workshop proposes that the indicator calculation should be carried out centrally by a group representing each country supporting the calculations and developing agreements on the sub-basin specific approaches among the coastal countries of that sub-basin.
64. The workshop proposes that the assessment unit (and/or within the assessment unit a subset) specific GES boundary of the indicator could be;
- 1) Calculated based on the method used by Finland (Vuori et al. 2009), and intercalibrated for the Bothnian Bay by Sweden. In this method GES is based on defining a reference point as the median of the 10% of highest BQI values in available data set. Next the reference point is set to be 1 and all BQI values are scaled to it, after which the 10<sup>th</sup> percentile of the top 10% of BQI values (now scaled) is defined as the High/Good border. The fraction below this border is divided into five equally large parts, of which the upper two make the Good class, the following Moderate, Poor and Bad, according to the WFD classification. The Good/Moderate border is the defined as the GES boundary.
  - 2) Calculated using either of the two methods used in Sweden 2016 method [described in brief online](#) and both in detail (Leonardsson et al. 2009, Leonardsson et al. 2016, Blomqvist and Leonardsson 2016 (full references included below)). Both methods require benthic community data from disturbed and undisturbed areas as the GES boundary is calculated based on this separation.
- The workshop concluded that the GES boundary concept cannot be finally proposed for State and Conservation 5-2016 as this will depend on the data available for the assessment units. The workshop agreed that the approaches should be tested, in particular for the southern areas where most difficulties are expected, and that a proposal on assessment unit (or subset) specific GES boundaries needs to be made in time for the Heads of Delegation Meeting HOD 51-2016.
65. The workshop proposes to exclude measurement values from open sea hypoxic areas from the indicator, implying both when GES boundaries are calculated and from the actual indicator calculation. The workshop proposes that one hypoxia polygon should be used to determine which stations should be excluded from the calculation, the Secretariat will investigate if a suitable polygon is available.
66. The workshop welcomed that Finland will develop a document describing the assessment protocol as precisely as possible, and the alternative approaches to determine GES boundaries submission to

State and Conservation 5-2016. The proposal will be circulated to the participants of the meeting before submission.

### Indicator contributions to the benthic status assessment component of HOLAS II

67. The workshop discussed the latest version of the draft of the Commission Decision on GES criteria (version 14.9.2016).
68. The workshop noted in general that for HOLAS II purposes it will not be possible to use indicators to evaluate all primary criteria related to the benthic habitats, and further that some of the secondary criteria under D5 are relevant for the assessment of the benthic habitat.
69. The workshop considered the requirement to report the assessment for criteria related to benthic indicators as square kilometers as very problematic. The workshop was of the opinion that this issue is problematic in particular for the criteria under D5 for which it is stated that the assessment should be done in accordance with assessments under the WFD since the assessments under WFD are not designed to assess in square kilometers. The workshop noted that for D5C8 where the BQI indicator could be placed, both an assessment for Ecological Quality Ratios is required and the extent of adverse effects in km<sup>2</sup>.
70. The workshop requested the Secretariat to ask the Intersessional Network on Eutrophication, meeting 30 September, on whether the aim is to use the BQI core indicator approach for assessing the offshore assessment units in the thematic eutrophication assessment.
71. The workshop noted that the criteria D6C1 and D6C2 do not require an assessment against a threshold, and that for HOLAS II purposes this assessment could be made using the pressure data set on 'loss' and 'disturbance' layers that have been developed as part of the BSII approach.
72. The workshop noted that the criteria D6C3 would best be assessed using the 'Cumulative impact on benthic habitat' indicator, however that for HOLAS II purposes the proposal is to assess the criteria using the BSII approach although a threshold value is not available (see point 47).
73. The workshop noted that the criteria D6C4 could include the spatial extent of the seafloor that is affected by hypoxia as the criteria integrates all disturbances, however noted that the issue is not finally concluded as the definition of 'anthropogenic' is not clear in this context.
74. The workshop noted that the indicator on 'Condition of benthic habitats' compares to D6C5, including to make use of the HD assessments.

#### *Full references to Swedish publications*

- Blomqvist, M., Leonardsson, K. 2016. A probability based index for assessment of benthic invertebrates in the Baltic Sea. Deliverable D3.1-4, WATERS Report no. 2016:3 Havsmiljöinstitutet, Sweden.
- Leonardsson, K., Blomqvist, M., Rosenberg, R., 2009. Theoretical and practical aspects on benthic quality assessment according to the EU-Water Framework Directive – examples from Swedish waters. Mar. Pollut. Bull. 59, 1286-1296.
- Leonardsson K., Blomqvist M., Rosenberg R. 2016. Reducing spatial variation in environmental assessment of marine benthic fauna. Mar. Pollut. Bull. 104: 129-138.

## Annex 1 Agenda of the workshop

Tuesday 27 September	
	<p>Arrival and words of welcome</p> <p>Workshop outline and link to the TAPAS and HOLAS II projects</p>
10:00 – 12:30	<p>Pre-core indicator '<b>Distribution, pattern and extent of benthic biotopes</b>'</p> <ul style="list-style-type: none"> <li>• Presentation of new indicator concept by Lead Partner</li> <li>• Presentation of test outcomes on different substrate (rocky and other) and on different level of detail in defining biotopes (cf. HUB level 3, HUB level 5-6)</li> <li>• Conclude on habitats/biotopes to be assessed in the indicator and the concept to be applied</li> </ul>
12:30-13:30	<i>Lunch break</i>
	<i>continued discussion</i>
13:30-18:00	<p>Pre-core indicator '<b>Cumulative impact on benthic habitats</b>'</p> <ul style="list-style-type: none"> <li>• Presentation of relevant new information, e.g. from national projects</li> <li>• Presentation of test outcomes where assessment protocols have been applied in selected areas by indicator Co-Lead countries Finland, Germany and Sweden.</li> <li>• Conclude on the assessment protocol to be used and the scale at which assessment is made</li> </ul>
Wednesday 28 September	
	<i>continued discussion</i>
9:00-12:30	<p>Core indicator '<b>Status of the soft-bottom macrobenthic community</b>'</p> <ul style="list-style-type: none"> <li>• Finland: Presentation of findings from tests of applying area specific sensitivity values and proposals for GES boundaries</li> <li>• Conclude on the GES boundary and sensitivity values to be used</li> </ul>
12:30-13:30	<i>Lunch break</i>
	<i>continued discussion</i>
13:30-16:00	<p>Discuss how the indicators can contribute to the benthic status assessment component of HOLAS II</p> <p>Concluding remarks</p>



## Baltic Marine Environment Protection Commission

Outcome of the HELCOM TAPAS benthic habitat indicator workshop

Tallinn, Estonia, 27-28 September 2016



### Annex 2 List of Participants

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