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Background

The project for the development of the Second Holistic Assessment of Ecosystem Health in the Baltic Sea (HOLAS II) started in late 2014 and will continue until June 2018. The assessment will give an update of the overall environmental status of and pressures on the Baltic Sea and evaluate progress in relation to the goals of the Baltic Sea Action Plan. It will be developed so that it can also be used in the 2018 reporting under the EU Marine Strategy Framework Directive by those Contracting Parties that are also EU member states.

The project builds on concepts developed under the first Holistic Assessment of the Ecosystem Health of the Baltic Sea, and is set to develop these further to include more recent developments in the field. The work of the project is guided by a core team with representation from the Contracting Parties.

This document summarizes the aims and structure of the planned holistic assessment, with focus on assessment of pressures and impacts from human activities.

In addition, the Meeting will be presented with the recent HELCOM work on regional core indicators, data products providing quantitative regional assessment of different elements of the marine ecosystem of the Baltic Sea, to be used as a basis for the HOLAS assessment.

Action required

The Meeting might wish to consider how such regional assessment and core indicators could be of use in transboundary MSP.

Aims of HOLAS II

The project for the development of the Second Holistic Assessment of Ecosystem Health in the Baltic Sea (HOLAS II) will give an update of the overall environmental status of and pressure on the Baltic Sea and evaluate progress in relation to the goals of the Baltic Sea Action Plan (BSAP). It will also address social and economic impacts. It has been decided by the HELCOM Contracting Parties being EU member states that the HOLAS II will be used in their reporting under the EU Marine Strategy Framework Directive. Hence, the assessment will be focusing on the regional scale, but performed in such a way that the results can also be used in national assessments of marine and coastal areas.

An additional aim of the project is to develop HELCOM status assessment tools and support the development of the Baltic Sea Pressure and Impact index.

The project will also produce thematic assessments on the key HELCOM segments: biodiversity, eutrophication, hazardous substances and maritime activities. As part of these activities, the project will also contribute to the HELCOM assessments being fully operational and increasingly automated.

Planned overall structure of the holistic assessment

The assessment will build on the core indicators developed jointly by HELCOM, and by ICES for commercial fish stocks. The applied set of indicators are to, as far as possible, cover all aspects relevant for assessing progress in relation to the BSAP, and for covering the ten descriptors of the MSFD. The assessment tools to be used will build on existing tools for assessing biodiversity, hazardous substances and eutrophication, which will be developed as needed in order to suit the purposes of HOLAS II.

The assessment will also include the spatial distribution of main pressures on the Baltic Sea. The format for presentation will build on the Baltic Sea pressure and impact index, as used within the first holistic assessment (HELCOM 2010, <http://www.helcom.fi/Lists/Publications/BSEP122.pdf>). This will be evaluated and modified as needed in order to account for any recent methodological developments, and reporting needs.

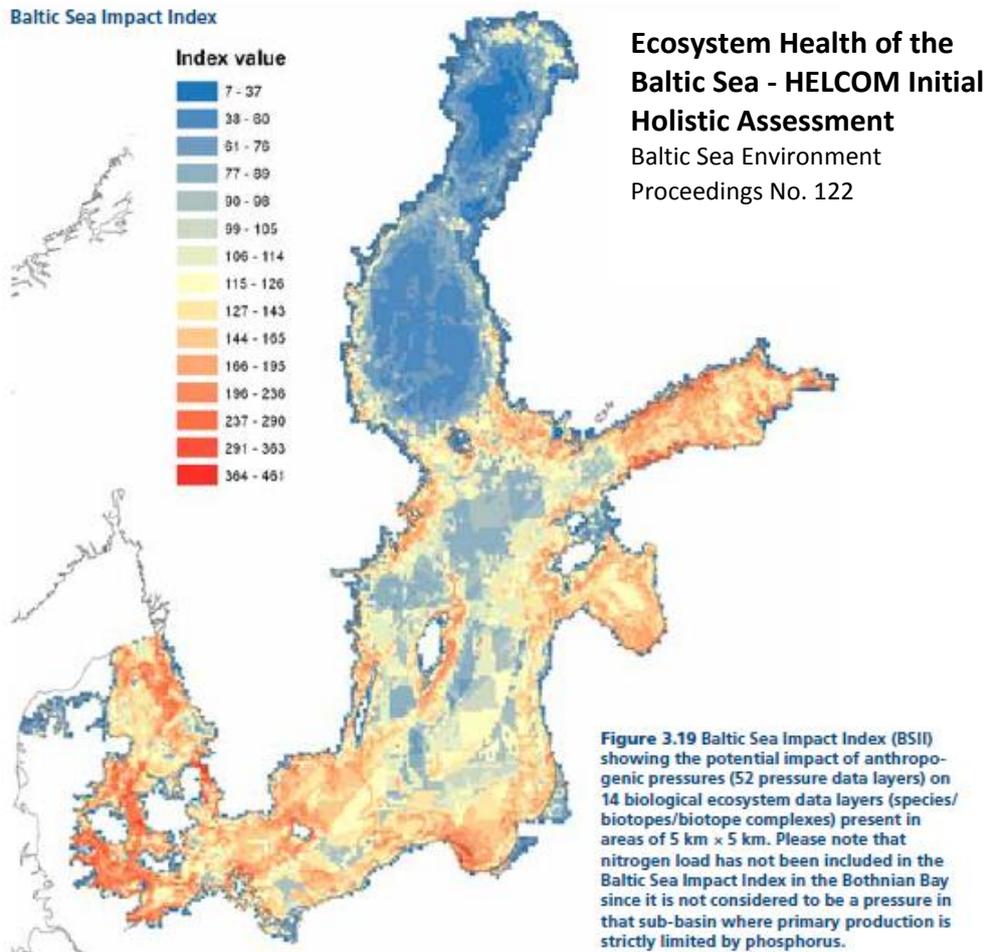
The holistic assessment is set to cover all aspects within the DPSIR cycle, with a focus on pressures, state, as well as social and economic impacts.

- The main pressures addressed are related to inputs of nutrient loading and hazardous substances, fisheries and maritime activities. Marine litter, underwater noise and non-indigenous species are also to be considered.
- Status of the environment is based on key elements of biodiversity, focusing on marine mammals, fish, birds, the seafloor, and the pelagic habitat.
- The assessment of impacts is carried out by environmental economic analyses to assess the cost of degradation, and addresses ways of optimizing the probability of success for different management measures to improve environmental status.

Plan for assessing pressures and impacts within HOLAS II

Previously used pressure and impact indices

The Baltic Sea Pressure index (BSPI) and the Baltic Sea Impact index (BSII) were first applied in the initial HELCOM holistic assessment of ecosystem health (2010¹).



These built on the concepts described by Halpern et al. (2008), and the method description of the BSPI and the BSII are given in BSEP 125² and Korpinen et al. (2012)³. The concepts were subsequently developed further for the eastern parts of the North Sea by the HARMONY project, which has developed a HARMONY Pressure & Impact Mapper software⁴. The same methodology has also been used in the Mediterranean and the Black Sea (Micheli et al. 2014⁵)

¹ <http://www.helcom.fi/Lists/Publications/BSEP122.pdf>

² <http://www.helcom.fi/Lists/Publications/BSEP125.pdf>

³ Korpinen, S., Meski, L., Andersen JH., Laamanen, M. 2010. Human pressures and their potential impact on the Baltic Sea ecosystem, *Ecological Indicators* 15(1):105-114.

⁴ Andersen, J.H. & Stock, A. (eds.), 2013. Human uses, pressures and impacts in the eastern North Sea. Aarhus University, DCE –Danish Centre for Environment and Energy. 136pp. Technical Report from DCE –Danish Centre for Environment and Energy No.18 <http://www.dmu.dk/Pub/TR18.pdf>

⁵ Micheli, F., Halpern, B.S., Walbridge, S., Ciriaco, S., Ferretti, F., et al., (2013.) Cumulative Human Impacts on Mediterranean and Black Sea Marine Ecosystems: Assessing Current Pressures and Opportunities. *PLoS ONE* 8(12): e79889. doi:10.1371/journal.pone.0079889.

The impact index (BSII) is based on georeferenced data sets of anthropogenic pressures, human activities and ecosystem components, and on weight scores that combine the pressure and ecosystem component layers. The weight scores estimate the potential impact of each assessed pressure on specific ecosystem components. In the HELCOM initial holistic assessment, the weight scores were produced by expert judgement by a set of experts from the Contracting Parties. In HARMONY, the scores were based on more developed and detailed questionnaires directed to a larger group of experts.

The pressure index (BSPI) assesses the anthropogenic pressures/human activities in the defined assessment units without including ecosystem components. It however includes a weighting component in order to grade the effect of the pressures on the ecosystem in a generalized perspective.

HOLAS II 3-2015 agreed that the HELCOM (2010) indices for assessing cumulative pressures and impacts from multiple human activities (BSPI and BSII) should be used also in the HOLAS II report, and that they before this, should be developed further based on experiences from the initial assessment and in order to make use of new knowledge.

Proximate aims for the assessment of pressures within HOLAS II

The next step for the assessment of pressures within HOLAS II is to **further develop the indices** that are used for assessing the impact of pressures on ecosystem components, and the distribution of pressures. Another step is to **collate and develop data layers** for the assessment, with regard to the distribution on *human activities and pressures* and to the distribution of *ecosystem components* (benthic habitats and mobile species).

- With respect to the indices there is a need to better incorporate information on the temporal and spatial extent of the pressures that are assessed, to update and improve the impact weight scores that the BSII builds on, and to include uncertainty estimates in the assessments.
- With respect to data layers, there is a need to update the data layers that are used and align these with the MSFD and its Annex III, including any potential forthcoming revisions.

Update of data layers

The pressure and impact assessments require updated and improved data on the spatial distribution of human activities and pressures, and on ecosystem components (mammals, birds, fish, benthic habitats). A process has been initiated for updating and improving the information available in HELCOM Data and Map services (<http://www.helcom.fi/baltic-sea-trends/data-maps>). The maps will serve the assessments within HOLAS II as well as other HELCOM activities.

Planned development of the Baltic Sea pressure and impact indices (BSPI, BSII)

The existing Baltic Sea pressure and impact indices (BSPI and BSII, see above) will be developed further focusing on the following tasks:

- 1) Update and further develop the impact weight scores that are used for quantifying the relative impact of each pressures on each ecosystem component. The weight scores will be updated in order to incorporate any new knowledge since the initial holistic assessment, and in order to align with the updated list of layers to be included.
 - o The weight scores will be updated based on an online survey will be developed and carried out among experts in all HELCOM countries. Expert judgement has shown as a helpful means of making use of available evidence in cases where this is very limited, of mixed

- quality, or only indirectly relevant⁶, as is foreseen for many cases of the BSII development.
- In addition, the possibility to support the assignment of scores by including information from peer-reviewed publications will be investigated.
- 2) Improve the representation of temporal and spatial aspects. This development will be based on recent developments outside the Baltic Sea, such as the FP7 project ODEMM⁷ and the Dutch CUMULEO impact assessment⁸.
 - a. Temporal and spatial detail may be added in the data processing, by designing data layers that more accurately match relevant seasons and spatial scales for each pressure and ecosystem component.
 - b. Alternatively, weight scores may be assigned in order to incorporate any temporal aspects (e.g. if impacts are occasional, periodic, or permanent), and by including spatial impact gradients.
 - 3) Ways of including uncertainty estimates or probability distributions (see O'Hagan 2012) into the obtained impact scores will be explored.

How to carry out the work

The development of the indices and the expert survey to inform the setting of weight scores are planned to take part within the HELCOM TAPAS project, for which HELCOM has applied for funding together with two partners for this theme: SYKE, Finland and NIVA Denmark. The literature database is being developed as part of HOLAS II under the lead of Germany.

The development work will be done using the HARMONY pressure and impact mapper, which is a software tool to carry out multiple index calculations with different data selections (Andersen & Stock 2013).

The BSPI and BSII indices will be tested with the new improvements and the test results are planned to be reported as part of TAPAS. The indices, when finalized, will be used within the HOLAS II project to estimate the potential anthropogenic cumulative pressures and impacts on the Baltic Sea.

Planned workshops

Two workshops are planned to be organized to support the development work. The first workshop will be held at the HELCOM Secretariat on **November 13, 2015** and will:

- identify data layers to be included in the analyses, concerning pressure and human activities as well as ecosystem components
- plan the way forward on how to develop the impact weight scoring
- discuss how to improve the spatial and temporal aspects of the assessment

The second workshop will be held in 2016 and will discuss the results of test runs in order to support and give guidance to the finalization of the index.

⁶ O'Hagan, A. 2012. Probabilistic uncertainty specification: Overview, elaboration techniques and their application to a mechanistic model of carbon flux. *Environmental Modelling & Software* 36:35-48.

⁷ Knights AM, Piet GJ, Jongbloed RH, Tamis JE, White L, Boicenco L, Churilova T, Kryvenko O, Fleming-Lehtinen V, etc., (2014) An exposure-effect approach for evaluating risk from human activities in large marine ecosystems. Submitted to *Journal of Biological Conservation*.

⁸ van der Wal, JT & Tamis JE (2014) Comparing methods to approach cumulative effects in the North-East Atlantic: CUMULEO case study. Report number C178/13. IMARES Wageningen UR.

Next HOLAS II meeting

The next Meeting of HOLAS II (4-2015) will be held on 24-25 November in Berlin, Germany, and will among other things consider and give further guidance to the ongoing and planned work on the assessment of pressures.