Document title	The role of MSP in reduction of seabed damage
Code	5-3
Category	CMNT
Agenda Item	5 - Ecosystem-based approach in MSP
Submission date	26.10.2018
Submitted by	HELCOM Secretariat
Reference	

Background

Seabed is an essential part of the Baltic Sea ecosystem. Loss and disturbance to the seabed is caused by human activities that inflict permanent changes or temporary disruptions to the physical habitat. HELCOM Ministerial Declaration 2018 paid specific attention to the issue committing:

- *to do regional work on developing threshold values for the adverse effects of anthropogenic physical disturbance and, based on the best available scientific information in close coordination with other relevant fora, if needed to achieve GES, to develop the necessary regionally coordinated quantitative targets for the reduction of physical disturbance caused by human activities and habitat loss;*
- *based on best available scientific advice, to work together to elaborate regional and national actions aiming at delivering the necessary reductions in adverse effects of physical disturbance caused by human activities.*

MSP can potentially have a key role in reducing damage to the seafloor by taking into account the sensitive types of seabed in the planning.

Damage to the seabed from physical loss and disturbance was assessed as part of the 'State of the Baltic Sea' report (BSEP 155), produced by the HOLAS II project. Attached document "5-3-ATT_Seabed loss and disturbance and cumulative impacts sections from SotBS report" represents the relevant extracts from that report, covering the aspects of seabed damage.

This documents gives further information on the assessment of seabed loss and disturbance, which was not presented in the report, including an account of underlying human activities.

Action requested

The Meeting is invited to

- take note of the results of the seabed's damage assessment in the 'State of the Baltic Sea' report;
- consider the role of MSP in reduction of physical seabed damage in the light of potential contribution to the update of the BSAP.

Pressure layers Physical loss and physical disturbance in HOLAS II

Although the number of specific HELCOM actions related to the seafloor is limited, several activities in recent years have improved the background information required to assess the impact on seabed habitats. Through the HELCOM HOLAS II and associated projects, the data set representing the distribution of 23 human activities attributed to impacts on the sea floor was compiled. The dataset was further processed into two aggregated pressure layers representing physical loss and physical disturbance, respectively. The data stems partly from regular reporting to HELCOM such as on dredged/depositing operations at sea. Many data layers were, however, collected ad hoc for the purpose of the 'State of the Baltic Sea' report. Thus, only part of the required data is systematically updated in HELCOM.

The aggregated pressure layers physical loss and physical disturbance were used in HOLAS II to assess the potential extent of these pressures, as described in the in section 4.7 in the summary report from the project (presented in document "5-3-ATT_Seabed loss and disturbance and cumulative impacts sections from SotBS report"). In addition, the same layers were used in the Baltic Sea Impact Index (BSII). Section 6 in the attached document covers the BSII. The assessment of cumulative impact on benthic habitats is one sub-analysis of the BSII, where only physical pressures and benthic habitats are considered. This can be found in the section 6.4 in the document.

For better understanding of the assessment seabed damage, this document provides more detailed description of these layers and statistics of the underlying human activities.

Ecosystem components of benthic habitats in HOLAS II

Baltic wide distribution maps of species, biotopes and habitat complexes have also been developed as part of the HELCOM HOLAS II, and by the EU co-financed project TAPAS. These data layers have been improved as part of the 2018 update of the 'State of the Baltic Sea' report. Benthic distribution maps are currently available for five key habitat forming species, eight broad-scale habitats, and nine habitat complexes. The maps representing benthic habitats vary considerably in resolution between countries and there are also gaps in the information. Some countries have carried out mapping and/or modelling of benthic habitats based on the HELCOM HUB- classification of benthic biotopes.

Physical loss

Physical loss is defined as a permanent change of seabed substrate or morphology, meaning that there has been change to the seabed which has lasted or is expected to last for a long period. The following activities were considered in the assessment as potentially causing loss of seabed: construction at sea and on the shoreline (also including cables and pipelines, marinas and harbours, land claim, and mariculture), extraction of sand and gravel, and dredging. However, it should be noted that the identification of "loss" as applied here has a provisional character, and that the available data does not allow for the classification of the effect of exact operations.

To represent the lost area, the total area covered by the abovementioned human activities was used, based on data represented as polygons. For point and line objects, impact distances for individual layers were estimated based on literature and expert evaluations and implemented accordingly, hence resulting in polygons for these as well. To produce one aggregated pressure layer out from individual human activity data sets, all layers were merged, overlapping areas were removed, and the data were clipped with coastline to remove buffered areas that overlapped with land. The resulting area was considered as potentially lost and no attenuation functions were added. The area lost in square kilometers in each grid cell was used as the pressure value. Hence, if all of the area of one grid call was covered by the aggregated pressure layer, it was given a pressure value 1.

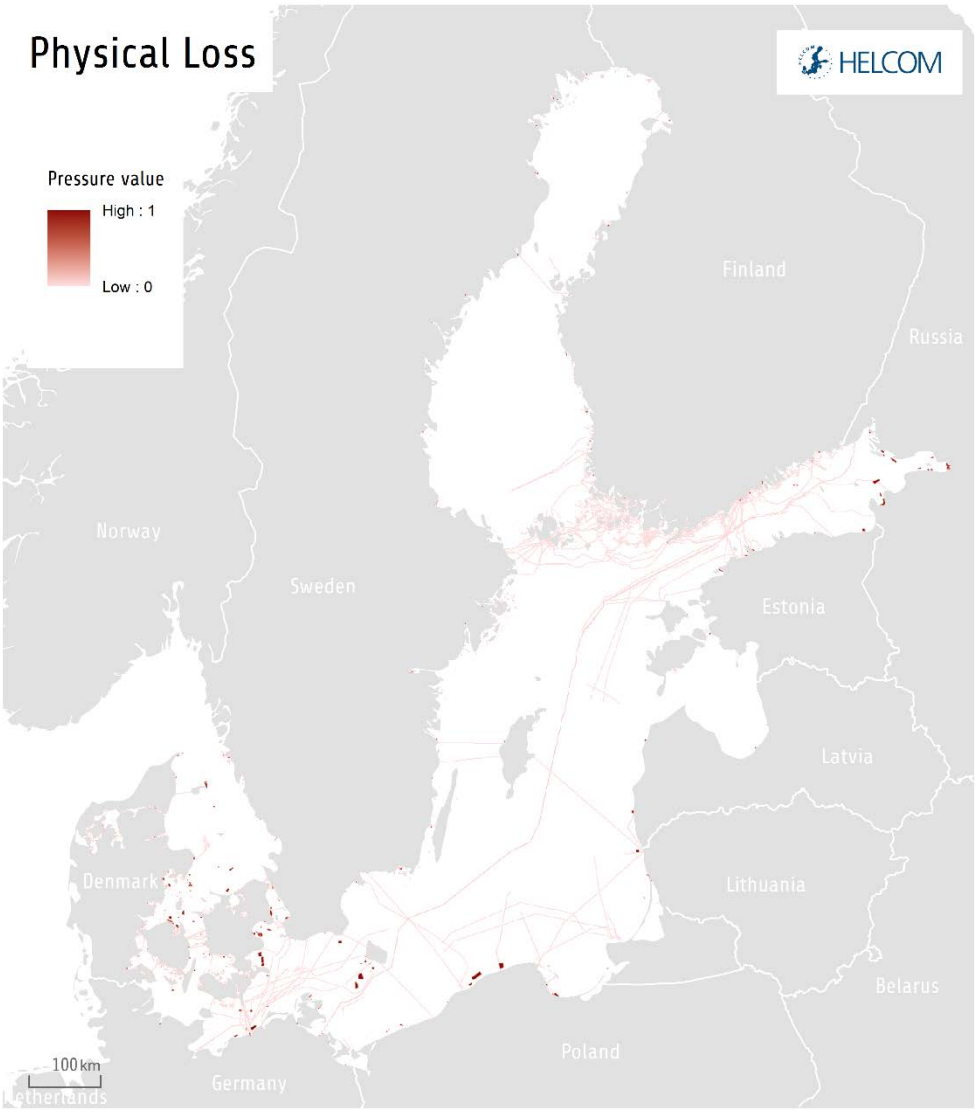

Figure 1. The aggregated pressure layer 'Physical Loss'. An interactive version of the layer can be found here and the full metadata description here.

Physical disturbance

Physical disturbance is defined as a change to the seabed which can be reverted if the activity causing the disturbance ceases. The same activities as in the assessment of physical loss, and trawling, were considered as causing physical disturbance (acting via the pressures of siltation, smothering, and abrasion). In addition, shipping was included as potentially causing physical disturbance. However, it should be noted that the identification of "disturbance" and its extent, as applied here, has provisional character, as the available data does not allow for the classification of the effect of exact operations.

To represent the pressure of physical disturbance, impact distances and attenuation gradients for each individual human activities layer were estimated based on literature and expert evaluations, and were implemented by adding corresponding buffers to the human activity data layers. When merging the individual layers into one aggregated layer on physical disturbance, weighting factors were applied. These were included in order to account for the fact that the intensity of the pressure varies between the different human activities. After the weighting, the human activity data layers (adjusted with buffers) were summed together and normalized to produce the final aggregated pressure layer.

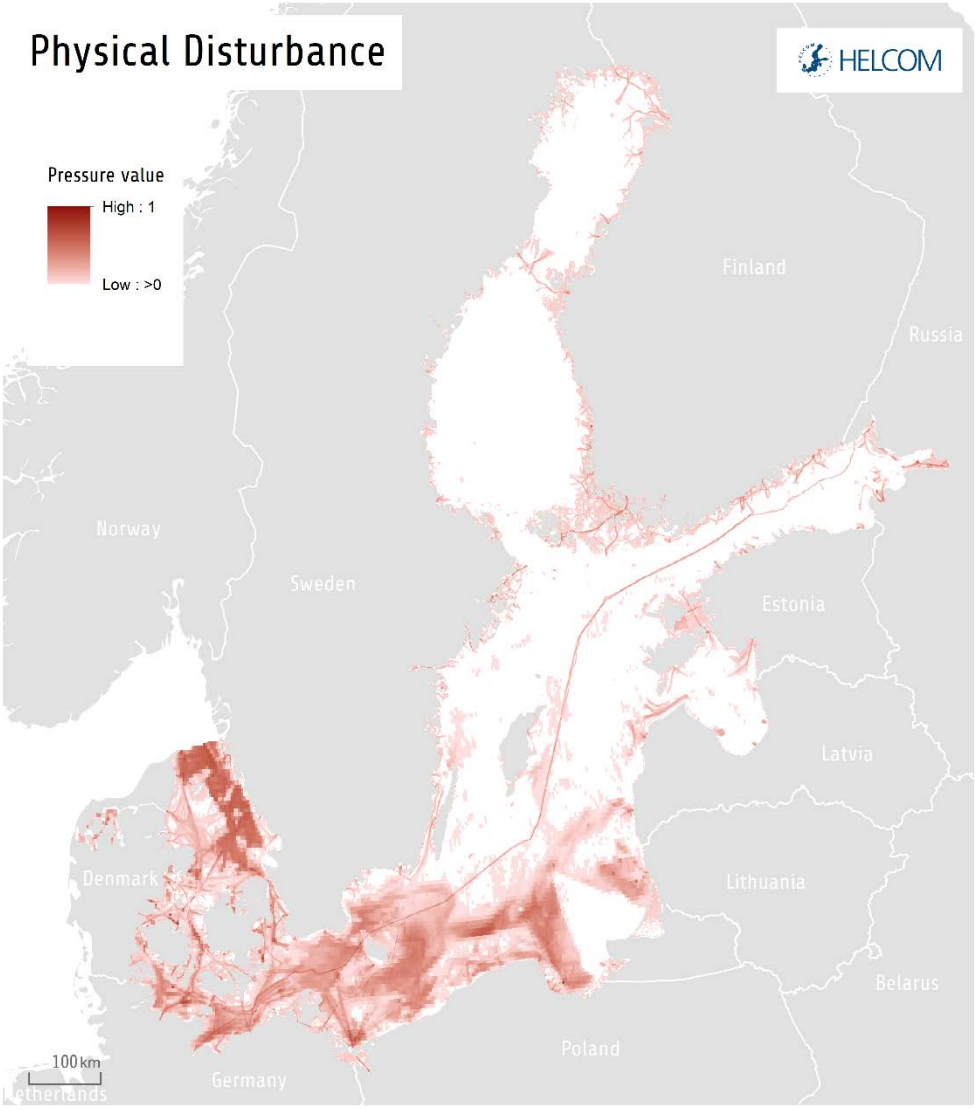

Figure 2. The aggregated pressure layer 'Physical Disturbance'. An interactive version of the layer can be found here and the full metadata description here.

Human activities contributing to physical loss and physical disturbance

In order to understand the underlying factors that cause physical loss and disturbance, the pressures must be scaled down to the level of human activities. Full list of human activities used to compile 'Physical loss' and 'Physical disturbance' can be seen in figure 3 and figure 4, respectively. These figures also provide information on the proportion of each human activity to the whole pressure. By a quick look it is already possible to see that a few human activities are dominant in both pressures, on a regional scale. It is good to keep in mind that on a local scale the picture might look quite different.

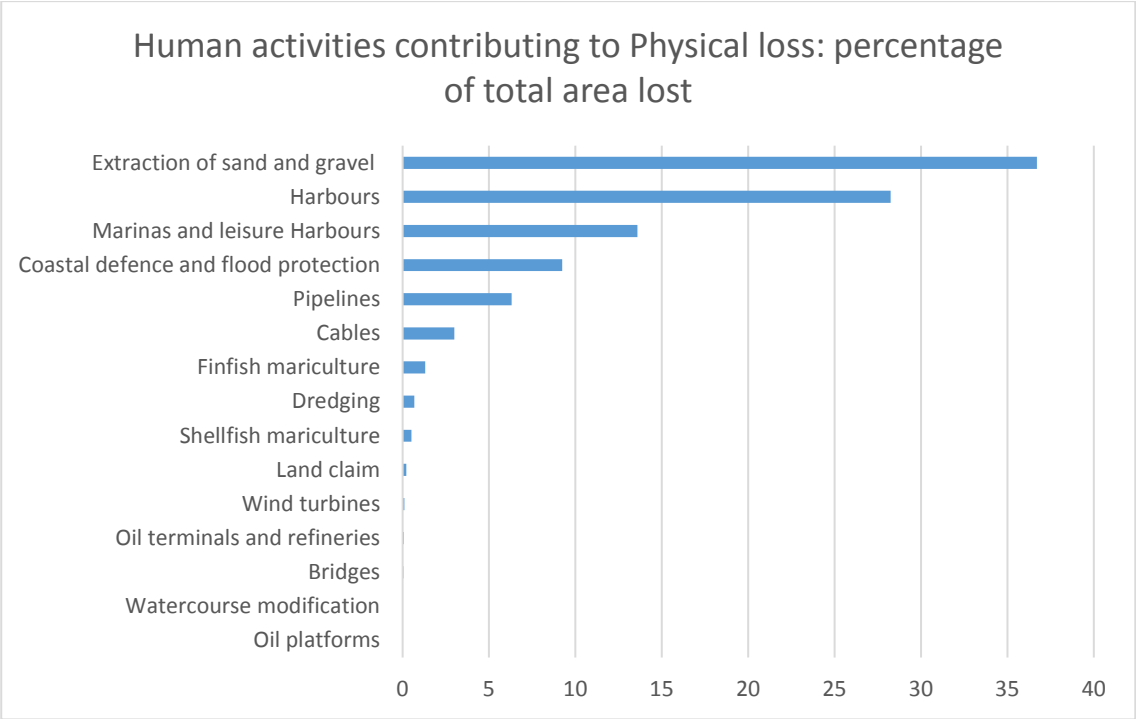

Figure 3. Human activities used in Physical loss and their share of the whole pressure value of the layer.

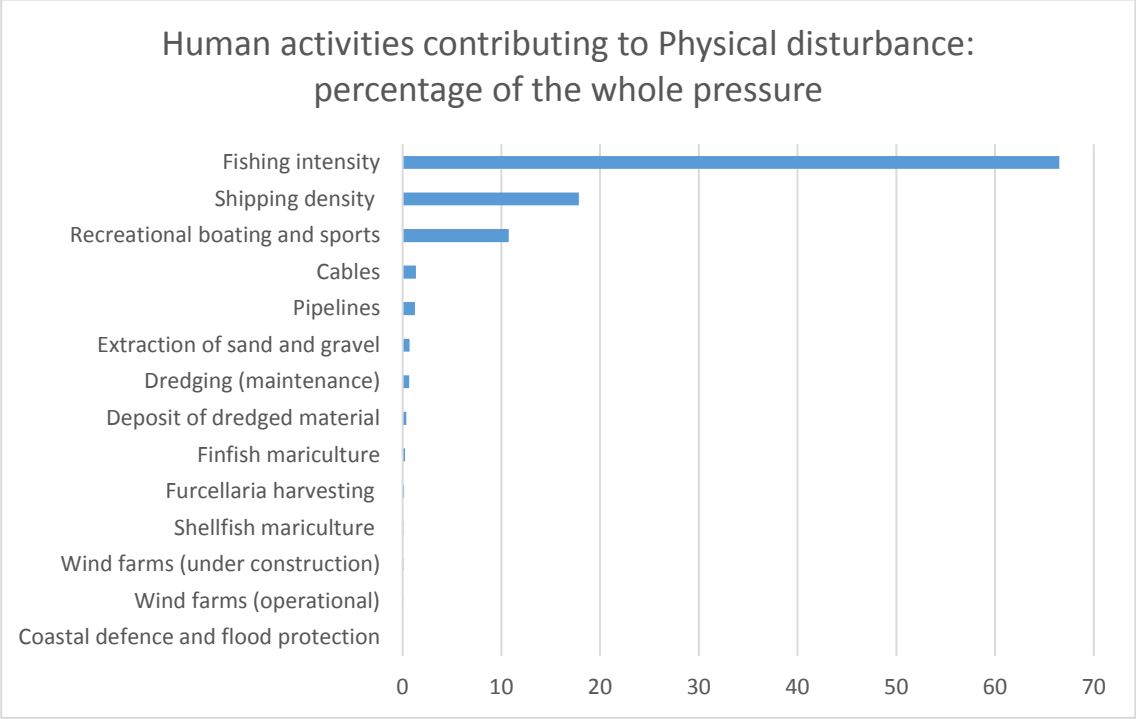

Figure 4. Human activities used in Physical disturbance and their share of the whole pressure value of the layer.

Examples of human activities causing seabed damage

Marinas and leisure harbours

Marinas and leisure harbours data set was created in the SHEBA- project, by digitizing harbours from satellite images. Data set was only used in the physical loss layer. It was left out from physical disturbance to avoid double counting due to their representation in the shipping density and recreational boating and sports data sets. For physical loss layer a 200 meter buffer was used to transform the original point data set, into an estimate of the area lost. Further details how these activities were transformed to pressures can be found in the thematic assessment on cumulative impacts that can be downloaded from State of the Baltic Sea website.

Figure 5. Illustrates the distribution of marinas and leisure harbours data set around Stockholm archipelago in Sweden, where the density of this activity is high. Regions near larger cities and mosaic archipelagos, leisure activities can potentially form a big share of seabed damage in that area. Marinas and leisure harbours have a 13, 5 % share of physical loss (figure 3) for the whole Baltic Sea scale, but locally the percentage can be higher.

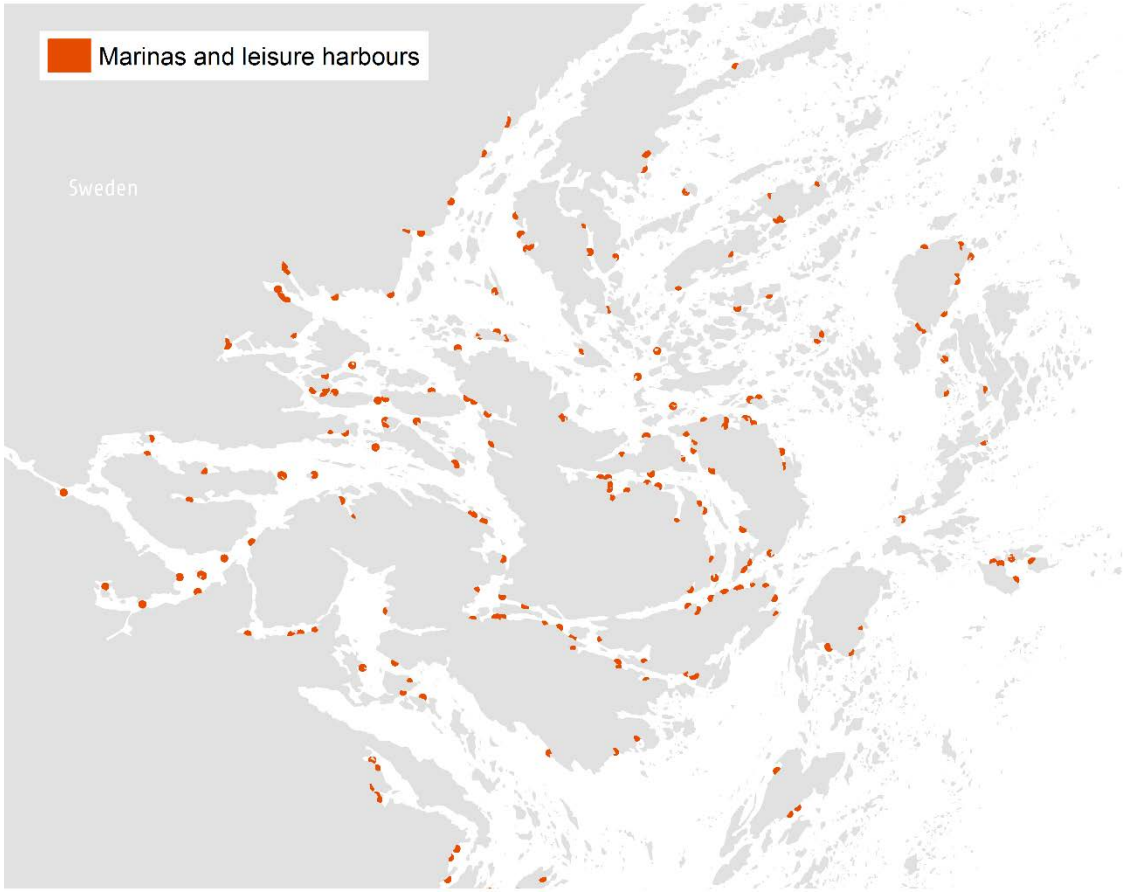

Figure 5. Marinas and leisure harbours data used for physical loss layer, in the Stockholm archipelago area in Sweden.

Dredging and depositing of dredged material

Data on dredging was gathered via a separate data call to contracting parties. HELCOM is gathering data on depositing annually according to HELCOM Recommendation 36/2, and that data was used directly for depositing. Both data sets cover the location of the operation and the amount dredged/deposited in 2011-2016. In HOLAS II assessment capital dredging was considered to cause physical loss and maintenance dredging physical disturbance. Depositing was considered to only cause physical disturbance. Further details how these activities were transformed to pressures can be found in the thematic assessment on cumulative impacts that can be downloaded from State of the Baltic Sea website.

Figure 6. Illustrates the data used for dredging when producing the aggregated physical disturbance layer. The amount of material dredged is used to define the intensity of individual dredging activities. As illustrated by figure 6, maintenance dredging is rather widely spread and can locally have a big effect, even the proportion of dredging for the whole pressure is rather marginal, as illustrated in figure 4.

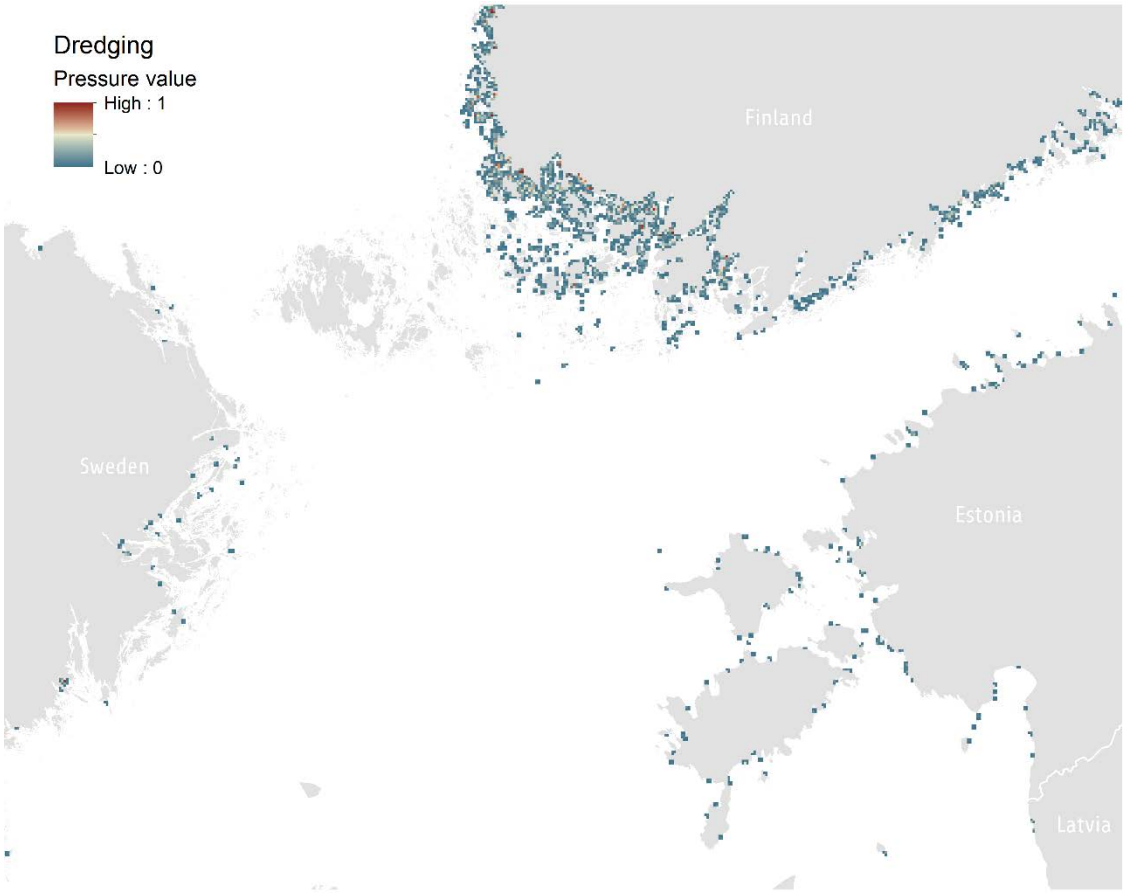

Figure 6. Maintenance dredging data used in the aggregation of Physical disturbance layer, in the central Baltic Sea area.

Extraction of sand and gravel

Data on extraction of sand and gravel was collected via a separate data call to contracting parties. Extraction of sand and gravel was used for both physical loss and disturbance layers. For physical loss only the extent of the area reported was used and for physical disturbance a buffer was used for the extent and the amount for the intensity. Further details how these activities were transformed to pressures can be found in the thematic assessment on cumulative impacts that can be downloaded from State of the Baltic Sea website.

Figure 7 illustrates the distribution of sand and gravel extraction sites around southern Baltic Sea, where most of this activity takes place according to reported data from contracting parties. This activity is the largest cause of physical loss in the Baltic Sea, with the share of more than 66 % (figure 3).

Figure 7. Extraction of sand and gravel data used in physical loss layer, in southern Baltic Sea.

The role of MSP in reduction of seabed damage

A key purpose of maritime spatial planning is to introduce a public process to plan our activities at sea, to achieve ecological, economic and social objectives. One key aspect in achieving the ecological objectives is the implementation of the ecosystem approach. According to guidelines adopted VASAB and HELCOM, the ecosystem approach is an overarching principle for maritime spatial planning which aims at achieving a Baltic Sea ecosystem in good status — a healthy, productive and resilient condition so that it can provide the services humans want and need.

According to EU's MSFD Good environmental status descriptor, the Good environmental status of Sea-floor can be described as: "Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected." Further it is stated that "Human activities may impact the structure (for instance the species composition of the benthic ecosystem) by damaging large or fragile species or modifying their functioning and favoring opportunistic or scavenging species that may profit from disturbance of the bottom and availability of dead organisms."

Considering these definitions, the Maritime Spatial Planning process and the resulting plans may have an important role in reducing and mitigating damage caused to seabed due to different activities taking place at sea. In addition to considering different actions individually, cumulative impact assessment, such as the HELCOM BSII, should be considered in the MSP process as they provide important information on the cumulative burden of different human activities to the marine environment.

Green infrastructure maps can potentially be of great value to be used as a basis for implementing the ecosystem approach in MSP, by providing information on the key ecosystems, including benthic habitats. Currently the Pan Baltic Scope project is working to develop this concept forward in the Baltic Sea are. In more detail the aim is to clarify the concept of Green infrastructure in the context of the maritime spatial planning as well as to test the methodological approaches and data availability for mapping of marine Green infrastructures in the Baltic Sea.

Example: The role of MSP in reduction of seabed damage of sand and gravel extraction?

Figure 8 depicts the identified resources of sand and gravel and current licensed areas for extraction in the area around the Great Belt in Denmark. Blue areas represent sand and gravel resources of various type and areas with red outlines are the areas licensed for the extraction of these materials.

What are the main tools MSP can offer to mitigate and minimize the damage to seabed caused by extraction of minerals? How could the concept of Green infrastructure help to identify areas and mitigate the effect to most important benthic habitats? What would be the most valuable output or aspect of a cumulative impact assessment to be considered? How should the ecosystem approach be implemented to ensure that the key ecosystem services can be safeguarded?

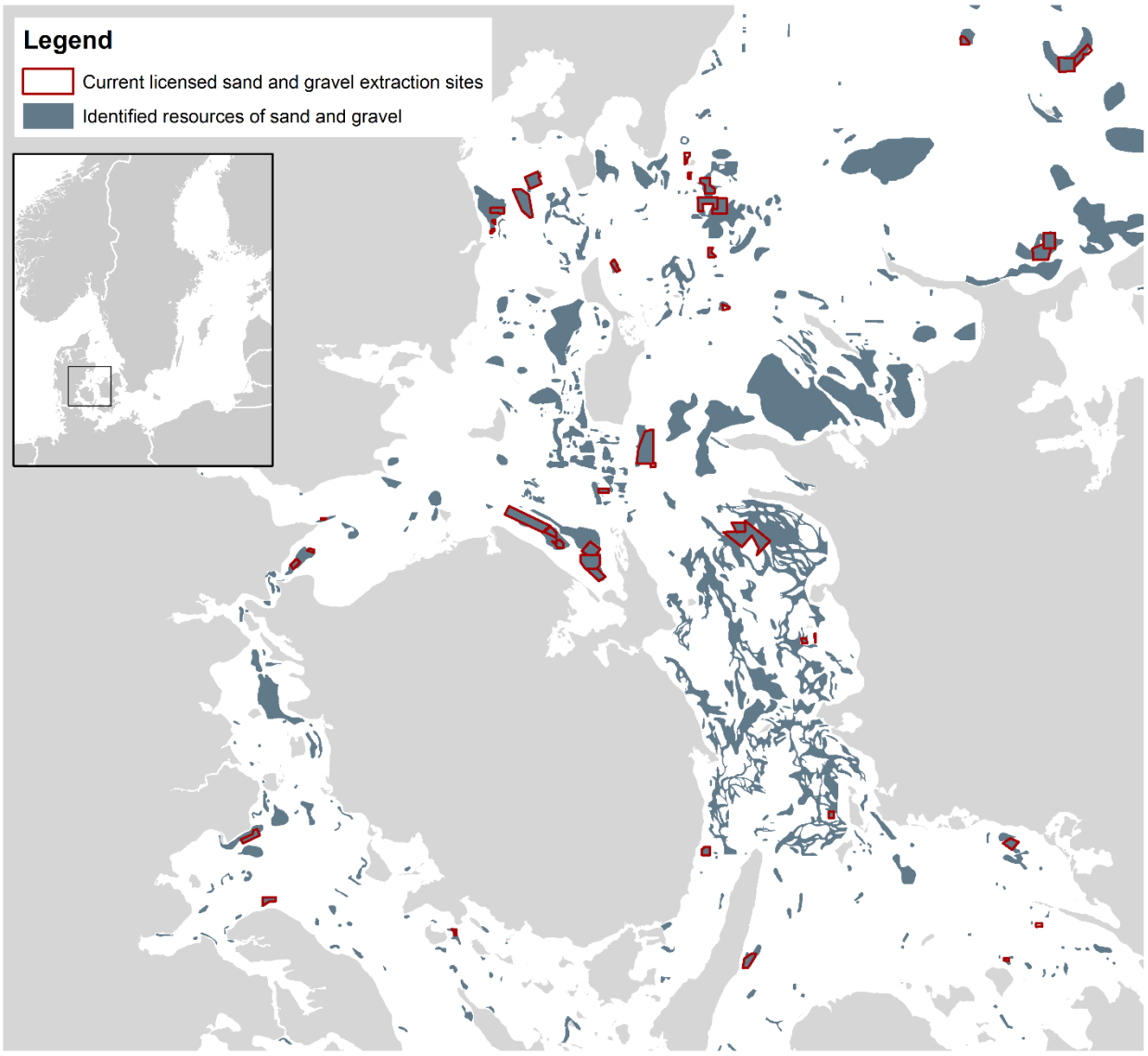

Figure 8. Identified resources of sand and gravel and current licensed areas for extraction, in the area around the Great Belt in Denmark.