Baltic Marine Environment Protection Commission

Fifth Meeting of the Working Group on Reduction of Pressures from the Baltic Sea Catchment Area
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PRESSURE 5-2016

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Background

PRESSURE 4-2016 discussed initial ideas on how to improve the assessment of impact of the activities on dredging and depositing dredged material into the Sea utilizing newly reported data. The meeting further agreed that the assessment methodology and the procedure of its elaboration should be discussed at the expert meeting.

The expert group elaborated a draft methodology based on the recent developments in OSPAR provided by Germany.

This document contains the draft methodology for assessment of environmental impact caused by depositing and dredging operations at sea, which was discussed at two expert meetings (23 May and 13 September 2016) and further improved during the commenting round when additional suggestions by Denmark, Germany and Sweden were taken into account.

Action requested

The Meeting is invited to consider the draft document and endorse it for use in the HOLAS II assessment and further assessments based on annually reported data.

Draft Methodology for assessment of environmental impact caused by depositing and dredging operations at sea

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Introduction

Increasing ship traffic, expanding of coastal industrial and recreational activities require significant development of the related infrastructure. This includes construction of ports and marinas, maintaining and construction of fairways, beach nourishment and other coast protection measures. All these require appropriate amount of work on the seafloor and coastal line. This involves both extraction of material from the seafloor and depositing it for either disposal or construction needs.

London Convention (1972) considers prevention of pollution of the sea by dumping of waste and other matter. In 1996, the Convention was further amended by the "London Protocol" which entered into force on 24 March 2006. The Protocol is more restrictive which implies that all dumping is prohibited unless explicitly permitted; incineration of waste at sea is prohibited; export of waste for the purpose of dumping or incineration at sea is prohibited. The Convention and the Protocol do not cover the disposal or storage of waste or other matter directly arising from, or related to, the exploration, exploitation and associated to off-shore processing of seabed mineral resources. The Protocol identifies the wastes or other matter which may be considered for dumping and assessment procedure for the acceptance of dumping. However, it highlights that necessity of dumping should be critically considered and reduced.

The Helsinki Convention (1992) with some exceptions prohibits dumping in the Baltic Sea Area. Particularly, dumping of dredged material is possible being a subject to a prior special permit issued by the appropriate national authority in accordance with the provisions of the Convention. The need to protect seafloor integrity was recognized in the Baltic Sea Action Plan (2007).

HELCOM Recommendation 36/2, adopted by HELCOM 36-2015 on 4 March 2015, recommends that the Contracting Parties follow the HELCOM Guidelines for Management of Dredged Material at Sea and that the Contracting Parties report on the national data on management of dredged material according to the Reporting Format of the HELCOM Guidelines.

The movement or relocation of dredged sediments to a specific site may have different classifications: In the case of deliberate disposal the activity is termed “dumping”; in all other cases it is considered “placement” (HELCOM Recommendation 36/2). Beneficial use, or reuse, comes under the heading of placement. Beneficial use generally describes activities such as construction, beach nourishment, habitat generation, sediment recharge, land reclamation, and coastal protection where dredged material replaces a material

requirement elsewhere and thus creates an alternative to dumping at sea for the material. Beneficial use may not be an option in every case and is dependent on particle size and contamination status as well as economic and logistic feasibility.

The Marine Strategy Framework Directive (MSFD) of the European Union included seafloor integrity into the list of descriptors for determining good environmental status. The MSFD also identified the physical loss and physical damage to the marine environment and human activities which cause them e.g. dredging/disposal of dredged material; impact on the seabed of commercial fishing, boating, anchoring; exploration and exploitation of living and non-living resources on seabed and subsoil.

Background

Sediment is an essential, integral and dynamic part of the ecosystem. Over 99% of sediment deposited at sea is locally-originated and results from dredging to maintain or improve/extend navigable depths in ports, harbours, marinas and shipping channels. Marine sediments, though not in themselves polluting substances, can be sinks for contaminants that end up in our harbours and ports, mainly from anthropogenic sources such as sewage discharges, storm-water overflows, marine traffic, agricultural run-off, industrial wastewater and historically poor environmental management.

Dredged sediment, especially from developed ports and harbours, may contain elevated levels of such harmful contaminants. Adverse impacts to the marine environment from the dumping or placement of the dredged material may be also chemical through toxicity and/or biological though bioaccumulation and biomagnification of contaminants through the food web. In addition, there is potential for these contaminants to be re-suspended and released from the sediments to the water column where they are more available for up-take in the food web.

The substances that are considered of most concern for the marine environment are those with properties of persistence, toxicity and ability to bioaccumulate (PTB). Typically, the most important contaminants associated with dredged material include organotin compounds (TBT), heavy metals, polychlorinated biphenyls (PCBs), pesticides, polycyclic aromatic hydrocarbons (PAHs) and oils (HELCOM 2010, BSEP 120B; OSPAR, 2004).

Dredging activity at sea and subsequent depositing of dredged material both may cause physical disturbance/damage to the sea floor and benthic ecosystems. Dredging activities in the sea mainly run to maintain shipping channels or to extend them. Dredging sediments implies that sediment bound species are excavated with the sediment. The resulting significance of the impact depends on the ability of species to recover the dredged area. The ability is influenced by different human activities like dredging, fishing and others as well as by different natural disturbance factors like storms etc. A significant part of the dredging activities are carried out in the harbours, ports, marinas, rivers, estuaries and does not cause a direct impact on Sea ecosystem.

Depositing of the dredged sediments in the Baltic Sea may also result in a significant physical disturbance/ damage to benthic communities. This impact can be caused by additional sedimentation, changing of the sea bed morphology as well as by enhanced turbidity.

The current assessment methodology gives an appreciation of the spatial extent and temporal variation of the dumping and placement of dredged material, as well basic observations on patterns of amounts of material deposited and contaminant loads. It also takes into consideration available data on dredging activities obtained on regular basis and reported on the specific request.

Although data on beneficial use are to be included in the assessment, which illustrates different reasons to use the dredged material instead of deliberate disposal.

Data overview

The assessment is based on the data annually reported by the Contracting Parties in accordance with the HELCOM Reporting Format for Management of Dredged Material at Sea defined in the HELCOM Guidelines for Management of Dredged Material at Sea. The reporting format integrates spatial data on the depositing sites and information on the amounts, physical parameters and contamination of the dredged material deposited at the site as well as information on its origin and issued permits. The reporting format implies rather limited information on the location of the dredging sites and their characteristics. Although spatial data on dredging activities were suggested to be optionally reported or requested for the periodic assessment of pressures and impacts on the Baltic Sea in accordance with the HELCOM monitoring and assessment strategy.

The data overview should include analyses of data consistency, continuity of temporal series, and special references. Data availability from all the Contracting Parties should also be analysed. The reported data has to pass a quality assurance procedure. The procedure should integrate evaluation of technical parameters of the reported data, such as accuracy of coordinates, data format or semantics, data completeness, and evaluation of data content.

Data gaps, which cause an uncertainty of the assessment, should be identified.

Dredging activities

The data on dredging activities are not required to be reported by the HELCOM Reporting Format (HELCOM Recommendation 36/2). Nonetheless, indirect information regarding the origin of the material and also classification of dredging activity (maintenance, capital dredging etc.) is to be reported. Spatial parameters of dredging sites are reported optionally, if the information is nationally available and included into national reports since 2017 and onwards. Reporting of this information enables to assess the volume and character of the dredging activities in the Baltic Sea. The spatial data are to be requested for the periodic assessment of pressures and impacts on the Baltic Sea

Annual assessment

The assessment of the volumes of material dredged in the maintenance or capital operations can be performed annually for each country based on the data reported under the HELCOM Recommendation 32/2. Capital dredging can vary wildly between years, as this is dependent on the projects that are carried out. Maintenance dredging can also vary because of different reasons though the dredging volume is more constant and depends mainly on the length of shipping channels and size of port areas. The analyses of trends and tendencies in maintenance dredging activities could reflect growing of the shipping infrastructure in different parts of the Baltic Sea region which has to be adjusted with natural conditions (e.g. specific natural hydrographic events like sieges, storms). Also the sources of material can be evaluated annually per country.

Periodic assessment

The HELCOM Monitoring and Assessment Strategy stipulates that holistic assessments of ecosystem health are produced periodically every six years, and the assessment cycle is synchronised with other international assessments and reporting obligations so as to support the development of initial assessments under the MSFD by those Contracting Parties that are also EU member states. In the assessment of the ecosystem health of the Baltic Sea the spatial data on dredging activities are to be used e.g. as components in assessing of possible cumulative effects of human activities and pressures by the Baltic Sea Pressure and Impact Indices.

Depositing operations

The data on depositing operations are annually reported by the Contracting Parties to the Helsinki Convention in the HELCOM Reporting Format (HELCOM Recommendation 36/2). The reported data on

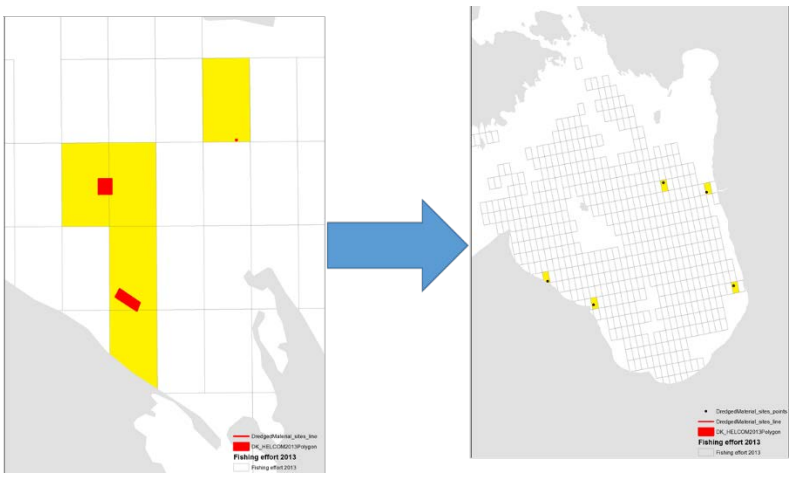
depositing operations enables to give a frame of possible physical and chemical (relocation or input of contaminants) disturbance to the marine environment.

Physical disturbance

Depositing of the dredged sediments in the Baltic Sea may result in a significant physical disturbance to benthic communities. In addition to the burying of biotopes at deposit sites, benthic communities in the deposit areas or located nearby can be affected by turbid plumes or constantly increased turbidity in case of regular depositing of sediments. Unfortunately, a distribution of the adverse effect of depositing dredged material at Sea can be hardly evaluated due to restrictions within the reporting format and gaps in information reported. Monitoring of the environmental impacts of depositing operations is carried out only for representative cases as it is requested within the Guidelines. It has to be noted that depending on natural situation at deposit sites, the benthic communities might be adapted to sedimentation (and erosion) due to sediment dynamics at least to a certain extent.

The estimation of the possible occurrence and extent of a turbid plume caused by depositing operation could be done taking into account lithological composition of the deposited material, hydrological conditions and morphology of the sea bed, type of sediments in the depositing site. The description of deposited material should be available from the data reported in accordance with the HELCOM reporting format. A description of the sediments at the deposit site is not a part of the annual reporting but might be available at least in a very general scale from e.g. Baltic-wide sediment map produced by EUSeaMap.

For the purposes of periodic holistic assessments of ecosystem health of the Baltic Sea, a gridding approach should be tested before applied to estimate the areas which are possibly partly effected by turbid plumes nearby the depositing site. Any further assessments have to take into account the restricted quality of information. Particularly, the impact of turbid plumes and other physical and toxic impacts cannot be evaluated for the HOLAS II due to lack of data.



Pic 1. An example of the assessment of the area affected by depositing of dredged material.

The use of the dredged material will also be annually evaluated in accordance with classification stipulated by the Guideline reflecting the volume of material dumped at Sea or placed for any other purposes – “beneficial use”.

“Placement” is defined in the Helsinki Convention (CONVENTION ON THE PROTECTION OF THE MARINE ENVIRONMENT OF THE BALTIC SEA AREA, 1992). Although open to some interpretation, the reporting format offers for “beneficial use” the following categories:

- Beach nourishment

- Sediment recharge
- Coastal protection
- Construction (or engineering)
- Land Reclamation
- Habitat generation / improvement
- Other.

Loads of contaminants

Contaminant loads (and trends thereof) are highly dependent on dredging activities. Capital dredging can vary wildly between years, as this is dependent on the projects that are carried out. The load by maintenance dredging can also vary due to multiple reasons. It is therefore not straightforward to analyse trends in total loads of contaminants. Trends in concentration however can be analysed to follow up general changes. In this context, it has to be considered that the chemical investigations of dredged materials are undertaken to check only, that the material is not too toxic to be deposited at sea, and not to investigate specifically for trends as monitoring programmes dedicated to that purpose.

In order to improve readability of the assessment, not all reported contaminants are considered. Instead the assessment focuses on the most representative ones which are for the Baltic Sea Zn, Pb, Cu, Cr, Ni and As. As far as Cd and Hg are included into the list of priority pollutants (HELCOM Recommendation 31E/1) these two heavy metals should also be considered together with such organic pollutants as polycyclic aromatic hydrocarbons (PAHs), tri-butyl-tin (TBT), dioxins and polychlorinated biphenyl (PCB) or others compounds, if they are deemed representative.

•Average concentrations

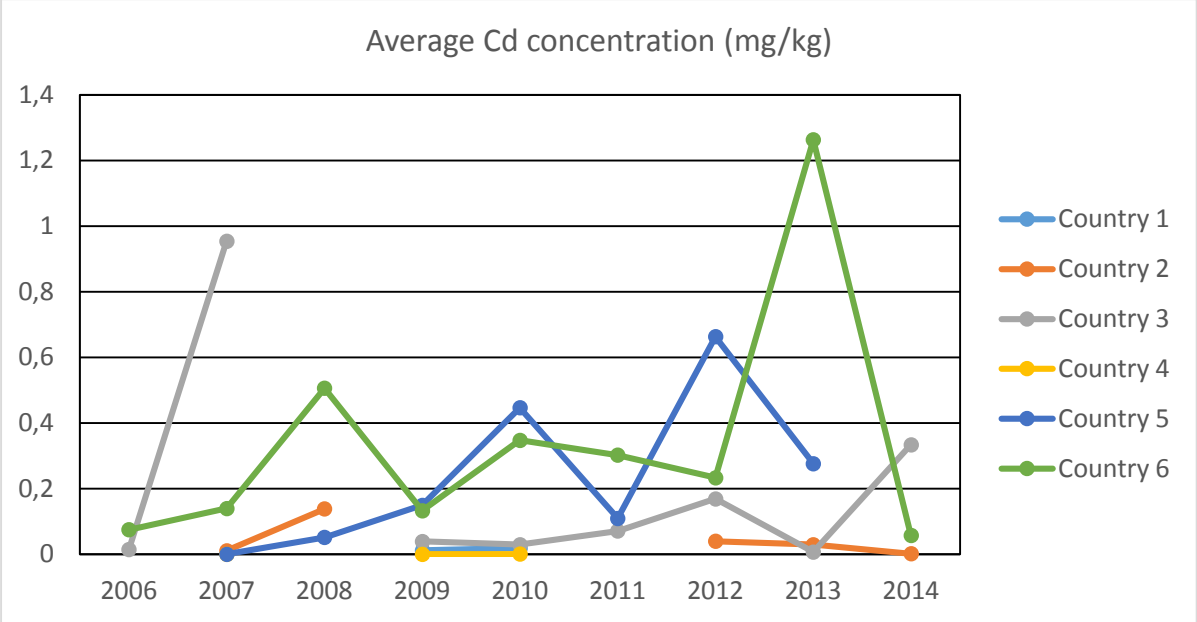
The average concentration for each of the pollutants listed above is derived as a ratio of the reported contaminant loads and amounts per deposit site. Sites where no contaminant load has been reported are not taken into account in this calculation. Distribution of the average concentrations among the depositing sites in the Baltic Sea is indicated on a map by the size of marks placed in the centre of the depositing area.

For every Contracting Party, the average concentration is then determined as the average of all calculated concentrations. The average concentration then might be calculated for sub-basins or entire Baltic Sea. As might be anticipated, this method produced occasional spurious results, even though the original reported data were considered sound. In these cases, the relevant datasets were excluded rather than misrepresented. Concentration of pollutants in dredged sediments, reported in accordance with the Guideline (HELCOM Recommendation 36/2), should be evaluated separately for the sediments originating from ports, harbours and river estuaries and for those which originate from the sea, if the origin of the material can be identified. Only transport of pollutants bound to sediments from ports, harbours and rivers can – at least partly - be considered as an input to the sea. Pollutants transported with sediments originating from and deposited at sea are not regarded as an input because they remain at sea.

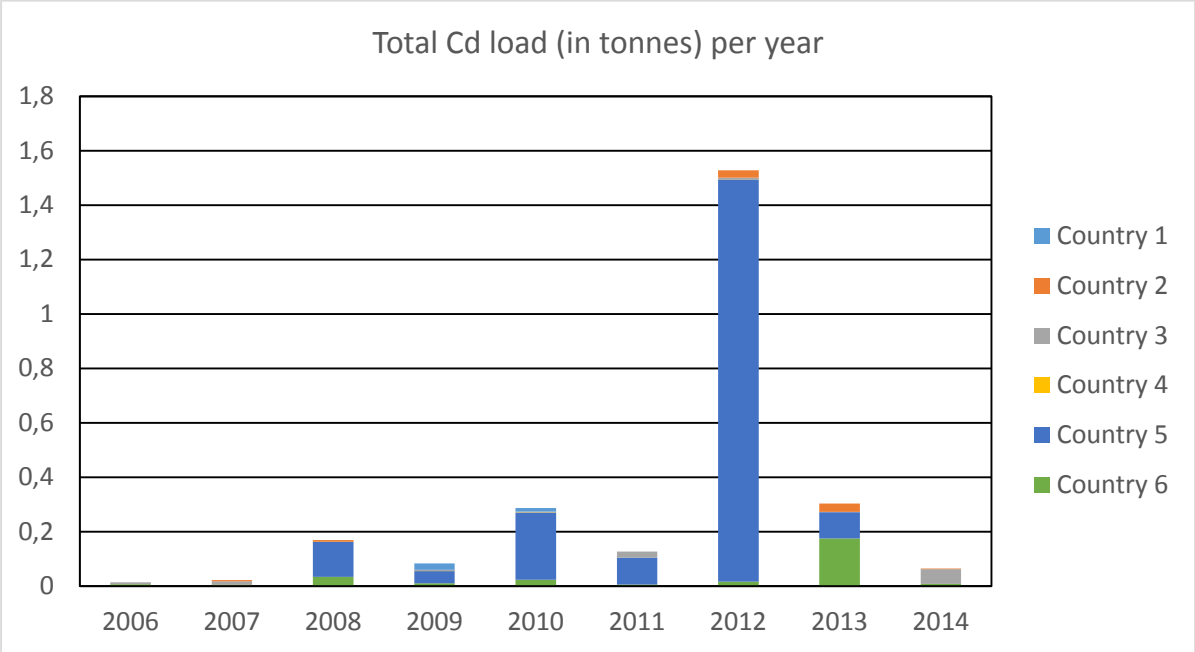
A statistical trend analysis is not possible, not least because the data used as the basis for the assessment are not necessarily comparable across the Contracting Parties, due to differing analytical procedures. However, the data should be comparable within countries from year to year. In addition, not all material dumped or placed has been subject to chemical analysis, testing laboratories may operate to different limits of detection and also samples containing amounts of contaminants at levels below limits of detection may not have been treated consistently across in the Contracting Parties. Moreover, natural background concentrations, which may differ regionally, have not been excluded from the calculated contaminant load in this assessment, however this may be considered in future assessments. It is acknowledged that the assessment method is neither quantitative nor scientifically robust, however it does allow for comparison with previous assessments and consideration of long-term changes.

The following diagrams illustrating concentrations of the pollutants in the dredged sediments can be plotted:

Trend diagrams illustrating evolution of the pollutants concentrations in sediments of different origin per Contracting Party and for the Baltic Sea during the reporting period.



Pic 4. An example of average Cd concentration trend in deposited material.



Pic 5. An example of total Cd load (in tonnes) trend from deposited material to the Baltic Sea.

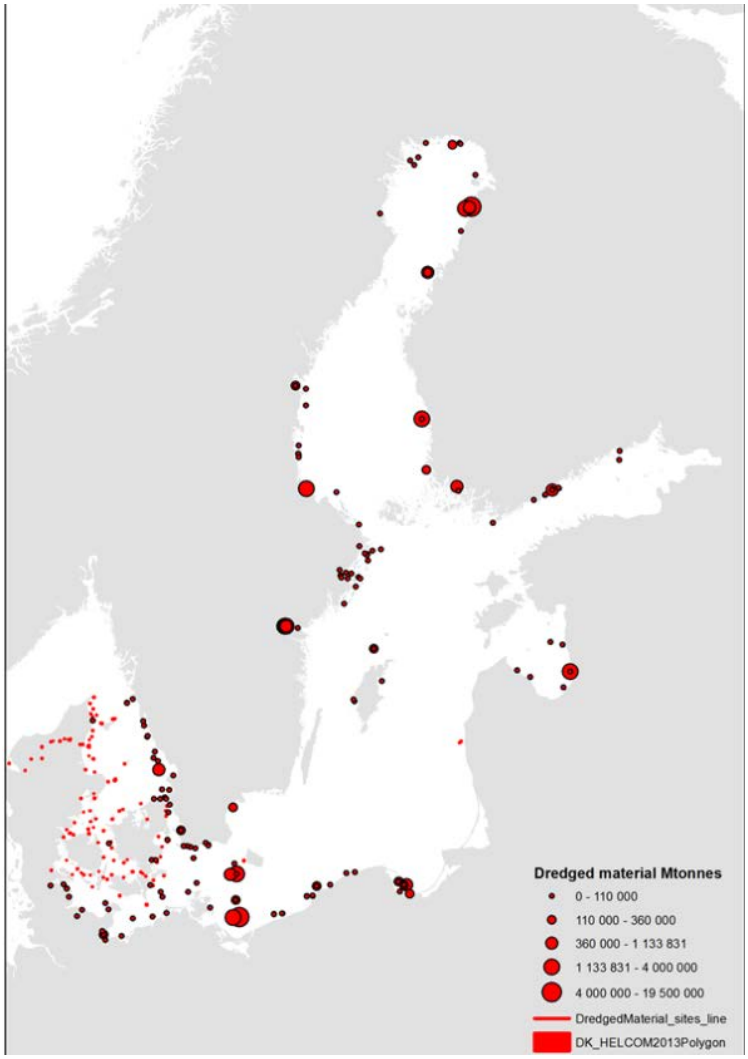
In case of availability of spatial information on dredging operations, concentrations of the pollutants can be visualized on the map as point features corresponding to a dredging area. The size of points might reflect the level of contamination by a certain pollutant. Taking into account regular character of the maintenance dredging operations the map might illustrate a distribution of the concentrations of major pollutants per river, estuary, harbour area (aggregated in case of small ports) or country.

•Total Load

As mentioned in the introduction, the total amounts of material dredged/deposited and subsequently the total loads of contaminants depend on a number of factors: projects started, intensive or less intensive maintenance dredging etc. It is therefore not advisable to conduct a trend analysis for the total load.

It must be noted that the amounts that are shown in the graphs are total load of contaminants that have been deposited, including the naturally present background concentrations. The net amount of contaminants linked to the dredging and deposit operations is obviously smaller, as most dredging operations involve the relocation of material within the system and no new contaminants are introduced.

Nonetheless, the total load can be visualized on the map per deposit site. The amounts of the dredged sediments originating from ports, harbours, rivers and contaminants bound to them are reflected separately from that of sea origin, if the origin can be unambiguously identified. The load of pollutants to sub-basin of the Baltic Sea can be obtained by aggregation of the data on deposit of pollutants at individual deposit sites. The data per sub-basin might be visualised accordingly.



Pic 6. An example of the map illustrating total input of the individual pollutant into depositing sites. (Polygons might be visualized as points using the central point to identify inputs).