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Background

The update of the HELCOM Baltic Sea Action Plan will be supported by analyses which estimate the sufficiency of existing measures and the cost-effectiveness of new measures in achieving the good environmental status of the Baltic Sea. The results and approach to assess the sufficiency of existing measures is described in document 3-8. This document describes the updated method and progress of the cost-effectiveness analysis of proposed new measures for the updated BSAP. The cost-effectiveness analysis is conducted by the HELCOM ACTION project, with guidance from the SOM Platform.

SOM Platform 2-2019 and 3-2020 took note that cost-effectiveness calculations will be conducted in the ACTION project but that contributions will be needed from countries, SOM Platform topic teams, or other parties that suggest new measures, and that semiquantitative or quantitative assessment will be possible using existing data and methodology. A previous plan for evaluating the costs and effects of new measures was presented in the SOM Platform 3-2020 meeting ([Document 6-1](#)). SOM 3-2020 took note that the cost-effectiveness analysis is focused on the costs for the whole Baltic Sea region and not the costs of individual countries, but national information on costs will be utilized and cost estimates may be transferred across countries with appropriate adjustments ([Notes](#) from SOM 3-2020, para 6.8). SOM 4-2020 took note that full data validation process for the cost-effectiveness analysis cannot be conducted due to time constraints, and suggested to indicate the uncertainties and confidence of the estimates in the final report ([Notes](#) from SOM 4-2020, para 5.9).

Data on the costs and effectiveness of potential new measures has been compiled from the synopses, via literature reviews and using data collected for the SOM analysis by the ACTION project. In addition, as agreed by GEAR 22-2020 ([Outcome](#), para 4.31), EN ESA supports the data collection by providing national cost estimates in September 2020 ([Outcome of EN ESA 9-2020](#)). Estimates of the effectiveness of proposed new measures collected by the ACTION project have already been provided to the BSAP UP workshops (see e.g. [Document 2-4](#) and [2-4-Att.1](#) for BSAP UP WS-HZ 2020).

This document provides a description of the approach and progress of the cost-effectiveness analysis and the status of cost and effectiveness data collection, as well as a timeline for the analysis for the fall 2020.

Action requested

The Meeting is invited to take note of the methodology and progress of the cost-effectiveness analysis.

Cost-effectiveness of new measures - method development and progress

Cost-effectiveness analysis of new measures

In addition to analyzing the sufficiency of *existing* measures (SOM analysis), the work plan for the BSAP update includes analyses of potential *new* actions in the updated BSAP (costs and effectiveness). The aim is to re-run the analyses of sufficiency of measures including proposed new HELCOM actions and prepare analyses of cost-effectiveness of potential new HELCOM actions.

The cost-effectiveness analysis of new measures builds on the assessment of sufficiency of existing measures to reach good environmental state in Baltic Sea. If the existing measures are not sufficient to close the gap between the current and the good state, then new measures are required, and information on their cost-effectiveness can support the BSAP UP process. The cost-effectiveness analysis studies and compares how effective new measures are in closing the gap between the BAU scenario(s) estimated in the SOM analysis and the good state, when also the costs of the new measures are taken into account. In principle, cost-effectiveness analysis can be used to define a set of measures that is adequate to reach a certain environmental objective with the lowest costs, or to define a set of measures that performs best in reaching an environmental objective, given a budget-constraint on the maximum costs. Cost-effectiveness of new measures will be analyzed following the steps and methods described by Kontogianni et al. (2015) and Oinonen et al. (2016). See below for more detailed information of the approach and steps for the cost-effectiveness analysis. The cost-effectiveness analysis is focused on the costs (and effectiveness) for the whole Baltic Sea region and not the costs of individual countries. However, information on costs from different countries will be utilized to estimate the regional costs, and cost estimates may be transferred across countries if needed with appropriate adjustments.

This document outlines the ongoing cost and effectiveness data collection process and describes how these data will be used in the analysis, as well as possible results of the cost-effectiveness analysis. The collected data will be used in a way that allows the comparison of costs for variety of measures, when different types of costs are included in the analysis. Probabilistic methods and cost categories will be used in the analysis and to present the results. Cost data contributors include EN ESA, ACTION WPs, SOM topic teams, and the same parties who have taken part in filling in the synopses on measures and most of these have already contributed to the cost collection. Also, experts responsible for the cost-effectiveness analyses for national MSFD POMs are encouraged to contribute, since there can be synergies between national and regional work. Representatives of EN ESA have been requested to provide information on national cost estimates by 20 September 2020.

The data on the effectiveness of new measures has been collected mainly through ACTION WPs, SOM topic teams, literature and from the synopses on potential new actions. The data was combined from all these sources as a document to the BSAP UP workshops in August-September 2020. Further, expert-based data on the measure type effectiveness that is used in the SOM analysis and in the cost-effectiveness analysis of new MSFD programmes of measures in Finland could potentially be applied also to estimate the effectiveness of new measures for similar measures/measure types.

The cost-effectiveness analysis builds on the same model as the analysis on the sufficiency of existing measures (SOM) and thus the results are produced either for the HELCOM sub-basins or for the Baltic Sea level. The analysis can in principal be conducted regionally, by sub basin, or nationally and thus it can also support the update of national programmes of measures (PoMs) and vice versa. However, the use of different spatial levels may require aggregation of data for a regional, Baltic-wide, analysis, or that aggregated data weighted by, for example, sizes of national marine areas is used for more disaggregated spatial areas. These

issues have to be taken into account especially when interpreting or comparing the results of cost-effectiveness analyses.

Approach and steps for the cost-effectiveness analysis

- a) Identification of potential new measures based on synopses (incl. existing but non-implemented ones) (finished).
- b) Effectiveness of new measures: Building on the method framework for the sufficiency of measures analysis, the effectiveness of new measures is defined in a similar way as for the SOM analysis (i.e. reduction % of a pressure from an activity) (ongoing) (see next section).
- c) Joint effects of new measures: The joint effects of new measures are estimated by evaluating two kinds of overlaps:
 - Thematic overlap in measure types due to their existence on different policy levels (global, EU, HELCOM, national) or overlapping content (e.g. MPAs in general vs. fishing closures in a specific area).
 - Chain effects of measure types in reducing pressures. Assuming that measures take effect in a chain, a measure can only impact the pressure share that remains after the preceding measures. As the pressure reductions are in percent (%), the chain effect needs to be taken into account.
 - More detailed method presentation of the joint effects in the SOM analysis is given in the [SOM methodology document](#), section 14.
- d) Cost collection and estimation: See a separate section.
- e) Analyzing cost-effectiveness of individual new measures and sets of new measures: Cost-effectiveness analysis will be conducted for the proposed measures covered by the cost and effectiveness estimates. The cost-effectiveness results are primarily given for (optimal) sets of new measures but cost-effectiveness of individual measures excluding the joint effects can also be produced. The method in Oinonen et al. (2016) is used as the basis, but inspiration is sought from Kontogianni et al. (2015), Saikkonen et al. (2018) and ongoing and recent projects. New measures may be assessed in terms of their cost-effectiveness with respect to reaching good environmental state and possible budget constraints, certainty and other relevant aspects. Since the same approach is used for the cost-effectiveness analysis as for the SOM analysis, possible results could include:
 - effectiveness of individual measures in reducing pressures from activities with respect to costs
 - total costs of all measures or subsets of measures with respect to improvement in state or probability to reach good state (averaging over state components per topic, and relying on other methods of aggregation)
 - database for the estimates of costs of measures
 - etc.

Cost estimation

Steps to cost estimation for proposed measures for the updated BSAP are summarized in Table 1.

TABLE 1. CONCRETE STEPS TO ESTIMATE COSTS OF PROPOSED NEW MEASURES	
1.	List the proposed new measures that will be included in the analysis. (finished, overlaps between measures are identified to prevent double-counting in the cost and effectiveness estimation)
2.	Create causal pathways for implementation of the proposed new measures included in the analysis to understand who are affected by the measures and how (from expert workshops, synopses, descriptions of existing measures, reports...). (mainly disregarded due to time constraints)
3.	Identify the types of costs for proposed new measures based on causal pathways (from CEA reports, cost-guidance). (ongoing, the relevant information is stored in the cost database, see Table 1 in Appendix 1)
4.	Considering the cost types for proposed new measures, review available cost estimates and existing data sources that can be used to define the costs of proposed new measures. (ongoing, first draft of the cost database is ready, described in more detail in "Cost data collection")
5.	Cost transfer and estimation: Categorical costs and/or probabilistic approaches will be used for calculating and presenting the costs due to multiple sources of uncertainty along the cost estimation process. The differences between countries and basins will be considered when transferring the collected cost estimates for different areas in order to estimate the total and basin/country specific cost estimates. (planning stage)
6.	Data validation and data gaps in existing cost data. Additional actions: expert opinion etc. (likely disregarded due to time constraints)

Effectiveness data collection

ACTION WP6 has already collected effectiveness data from the following sources:

- 1) Synopses of the proposed new measures (finished)
- 2) References listed in the synopses, with the types of sources listed below (finished)
 - a. peer-reviewed literature
 - b. grey literature such as project reports
- 3) ACTION project outcomes (finished)
- 4) Expert-based data collected for the SOM model, and identification of the links of new measures to the measure types in the expert surveys (finished)

The data above was combined from all these sources as a document to the BSAP UP workshops in August-September 2020 (see e.g. [Document 2-4](#) and [2-4-Att.1](#) for BSAP UP WS-HZ 2020). The following sources and approaches will be considered for further collection of effectiveness data depending on time/human resources:

- 1) Update the effectiveness estimates with the outcomes/notes from the BSAP workshops
- 2) Use the literature reviewed for the cost data collection when it includes suitable effectiveness estimates

- 3) Conduct joint searches for the effectiveness and costs of new measures (see further explanation in the next section)

Cost data collection

ACTION WP6 has developed a database template (see Appendix 1 for more information) to support the collection of cost estimates and to use these estimates to assess the costs of new measures. Database will be applied for the collected data for storing and adjusting the costs for the Baltic Sea.

ACTION WP6 has already collected cost data from the following sources (in parentheses details on the progress and timing):

- 1) The cost descriptions in the synopses of the new measures (finished)
- 2) References listed in the synopses (ongoing)
- 3) Literature that has been reviewed for the effectiveness of existing and new measures (includes notes if cost data exists) (finished)
- 4) Cost data provided from ACTION WP2 estimation (finished)
- 5) Reviewing the cost estimates and relevant studies conducted for the Finnish Water Framework Directive (finished)
- 6) Finding synergies with the Finnish cost-benefit analysis for MSFD POMs. A survey to collect the costs of new measures for the Finnish MSFD POM is currently open. At minimum 53 of the proposed Finnish MSFD measures overlap at least partly with the new BSAP measures, and the collected costs may be used to assess the magnitude of the costs of new BSAP measures. Such synergies may also exist with other contracting parties.
- 7) Data collection for national and other estimates from other project partners, contracting parties and HELCOM EN ESA representatives. A simplified version of the costs database was created to facilitate the data collection. Cost template and instructions are available in a [dedicated folder in the EN ESA workspace](#) (data collection was aimed to end 20th September). Estimates have already been provided by Finland, Estonia, Latvia, Lithuania and Sweden, and they are expected from Denmark and Poland.

The following sources and approaches will be considered for further collection of cost data depending on time/human resources:

- 1) Searching relevant databases of scientific and other literature with the economic terms (e.g., “cost” or “value”), likely combining them with the search strings and terms that have been used for effectiveness of measures.
- 2) Conducting joint searches for the effectiveness and costs of new measures. In principle, the costs and effects of measures can be separate inputs to the cost-effectiveness analysis, but the use of the cost data that can be acquired from the same literature as effectiveness data is prioritized.
- 3) Checking the peer reviewed cost estimation studies that have been included in the systematic literature reviews in the BONUS ROSEMARIE project and going through grey literature that was collected in the same project but excluded from the reviews (started, the database including all the literature collected for the ROSEMARIE project will made publicly available soon).
- 4) Conducting specific literature searches for proposed measures where the causal pathways were described concretely enough in the synopses to define cost items.

Timeline for the analyses of new measures in 2020

Table 2 presents the updated schedule for the cost-effectiveness analysis of proposed new measures for 2020. In the workplan for the BSAP update, the analyses have been planned for the fall 2020. Previously, it was anticipated that results of the cost-effectiveness analysis could be submitted to the Working Group fall meetings, but it is possible that they will be send for intersessional review later. HOD 58-2020 took note that the cost estimates and results of the cost-effectiveness analysis for new measures will likely be available in October-November 2020 ([Outcome](#), para 4.39).

Table 2. Timeline for analyses related to potential new actions

Task	Responsible	Timing (month in 2020)
Collecting effectiveness data	ACTION	April-July
Collecting cost data	ACTION/HELCOM EN ESA	April-September
Analysis of sufficiency of potential new HELCOM actions	ACTION	August- November
Cost-effectiveness analysis of potential new HELCOM actions	ACTION	August-November
Providing effectiveness estimates of proposed measures to BSAP UP workshops	ACTION/Secretariat	August
Providing results to Working Groups (meetings or intersessionally)	ACTION/Secretariat	November-December
Re-running cost-effectiveness analysis with updated information	ACTION	November-December

References

- Kontogianni, A., Tourkolias, C., Damigos, D., Skourtos, M., & Zanou, B. (2015). Modeling expert judgment to assess cost-effectiveness of EU Marine Strategy Framework Directive programs of measures. *Marine Policy*, 62, 203-212.
- Naidoo, R., Balmford, A., Ferraro, P. J., Polasky, S., Ricketts, T. H., & Rouget, M. (2006). Integrating economic costs into conservation planning. *Trends in ecology & evolution*, 21(12), 681-687.
- Oinonen, S., Hyytiäinen, K., Ahlvik, L., Laamanen, M., Lehtoranta, V., Salojärvi, J., & Virtanen, J. (2016). Cost-effective marine protection-a pragmatic approach. *PLoS one*, 11(1), e0147085.
- Saikkonen, L. 2018. Cost-effective combination of measures to reduce the loads of plastic marine litter in urban areas: Case Turku region <https://www.blastic.eu/wp-content/uploads/2018/10/combination-of-measures-to-reduce-the-loads-of-plastic-marine-litter.pdf>

Appendix 1. Information on the cost database template

This appendix explains the database template that ACTION WP6 has developed to store the collected cost data. The database contains two main sheets: “Input Info” sheet and “Database” sheet. The former one includes all the collected cost references, and the latter one processes the cost data listed in the former one for the cost-effectiveness analysis.

“Input Info” sheet

Table 1 shows the template of “Input Info” sheet to report all the collected cost data in the cost database. The costs of measures can be defined from different perspectives. From the perspective of a whole economy, the economic costs are assessed based on the impact on total welfare of a society, whereas the costs for an individual agent (e.g. firm), an institution (e.g. body responsible for implementing a measure) or a sector (e.g. agriculture) do not include the economic effects encountered by others. The cost types used in the is template include:

- Financial – Capital costs of a measure, fixed one-off expenses incurred by the purchase of some tangible or intangible goods that can be used over a longer time period. For example, a capital cost can be the cost to purchase a boat for fishing monitoring.
- Financial – Operation and maintenance (O&M) costs of a measure, for the institution that is implementing the measure and for the sector/agent that the measure is targeted to. For the implementing institution, financial costs include direct costs, such as labor costs of monitoring and fish stock assessment.
- Financial – increase in daily business/operation costs, referring to the increase of original daily business cost due to the implementation of new measures. For example, increasing transportation cost to go further as original fishing grounds are transfer to no fishing areas.
- Financial - Indirect costs of implementing a measure, such as overhead costs of the whole institution or the depreciation costs of general multipurpose monitoring equipment when implementing the new measures.
- Financial – Other costs
- Opportunity costs – foregone revenues, for example, a measure that restricts fishing in a certain area can decrease the profitability of the fishing sector, and this economic loss is an opportunity cost resulting from such a measure.
- Cost saving – Decrease (save) in daily business/operation costs, referring to cost saving from the daily business due to the implement of measures.

The assessment of cost included in the database can be: (1) quantitative estimate (any type, e.g. point or interval value, absolute or relative value, e.g. % of actor's revenues). Provide the estimate, currency and time unit (per year or other), and any other relevant information concerning the estimate (e.g. cost unit); (2) semi-quantitative assessment (categories with quantitative intervals); (3) qualitative assessment (categories e.g. low, high).

Table 1 Template of “Input Info” sheet to report all the collected cost data in the cost database

No*	Name of (sub)measure	Description of measure	Cost item - description	Affected actors	Cost type	Cost type – description ^[1]	Reference	Assessment	Time aspects	Notes and methodology	Notes on uncertainty in the cost assessment	Additional data on taxes, subsidies and other economic incentives	ID of the proposed measure ^[2]
	Item A in the guidelines	Item A in the guidelines	Item B in the guidelines	Item B in the guidelines	Item C in the guidelines	Item C in the guidelines	Item D in the guidelines	Item E in the guidelines	Item F in the guidelines	Item G in the guidelines	Item E in the guidelines	Item H in the guidelines	
1.1.1	[Measure 1] [sub-M1]	[for M1]	[Item 1]										
1.2.1	[Measure 1] [sub-M2]	[for M1]	[Item 1]										
1.2.2	[Measure 1] [sub-M2]	[for M1]	[Item 2]										
2.1.1	[Measure 2]	[for M2]	[Item 1]										
2.1.2	[Measure 2]	[for M2]	[Item 2]										
3.1.1	[Measure 3]	[for M3]	[Item 1]										
3.1.2	[Measure 3]	[for M3]	[Item 2]										
3.1.3	[Measure 3]	[for M3]	[Item 3]										

* Numbering for filled in measures to allow easier review, since more than 1 row can be filled in for the same measure. Also, the number can be used as reference in the “Database” sheet. 3 digital ID are used. First number: Synopses. Same synopses have same ID. Second number: Options or sub-measures to achieve synopses. If there are multiple options to reach the synopses and the options will not happen simultaneously, the second number should be different. Third number: Under the same option, but the type of cost, affected actors, and the studies are different.

[1] Describing the cost type. Providing comments on whether Indirect costs are relevant and whether they are included in the estimate/assessment. For capital costs providing also lifetime and discount rate used for calculating the annual costs.

[2] The proposed measure for which this information can be used for estimating the costs (according IDs in the “Database” sheet).

“Database” sheet

The “Database” sheet aims (1) to put together relevant background information for developing cost estimates for new measures, and (2) to support calculations and provide the developed cost estimates, which are used afterwards in the cost-effectiveness analysis of new measures. In this sheet, each estimation is divided in five sections:

1. Characterisation of measures: Using the same list of measures and the application extent of the measures as for the effectiveness assessment, but it might be needed to separate sub-measures (separate rows in the database) to facilitate cost estimation. This section provides the basic information of the measure. One measure in the cost-effectiveness analysis may contain more than one synopsis, if there is overlap across the synopses.

(1) Characterisation of measures							
ID number	Covered synopses (ID from the synopses)	Name of measure	Description	Type of measure	Activity	Pressure or State component	Application extent

2. Used input information on costs (e.g. estimates, source(s), certainty): This section summarises the input information related to costs which is used for deriving the cost assessment/estimates for the CEA. This section is filled for each measure based on collected input information in the sheet “Input Info”.

(2) Used input information on costs					
Source No(s)	Description of Assessment(s)	Temporal scope	Geographic scale	Year of Assessment(s)	Assessment(s)

Type of information source	Reference	URL	Certainty assessment/estimate on cost?	Certainty assessment	Source/approach of certainty assessment

3. Affected actors – assessment: Columns with the main groups of actors.

(3) Affected actors - assessment						
Private actors	Managing authority/-ies	Controlling authority/-ies	Municipal/local authority/-ies	NGOs	Other	Comments

4. Types of the costs – assessment: This section includes the developed assessments/estimates and related explanatory information concerning types of the costs. The aim here is to derive and provide quantitative estimates (as far as possible). The estimation may require some calculation from the original cost data from the sheet “input info”, thus the approach and other variables used to derive the estimation need to be clearly documented. If the costs are not quantified for a measure, they can be described in other way in column “Description”. This section is further divided by cost types described in the section of “Input Info” sheet. Each cost type has same item need to be filled as below:

(4) Types of costs - assessment / Financial - CAPITAL costs of a measure					
Relevance	Description	Quantitative estimate (EUR/year, for 2020, for whole Baltic Sea)	Lifetime (for capital costs)	Other relevant input variables	Approach

5. Total costs – assessment: This section focuses on the derived quantitative estimate of the total costs based on assessment of each type of cost in the previous section (where it was possible; filling NA if not estimated). The results of this total cost assessment will be used or cost-effectiveness assessment.

(5) Total costs – assessment			
Quantitative point estimate (EUR/year, 2020, whole Baltic Sea)	QUANT Lower bound	QUANT Upper bound	Comments

Certainty – Assessment	Certainty – Comments	Cost categories – assessment