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Background

The update of the new 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. This document describes the method for the cost-effectiveness analysis in more detail.

The ACTION project and ToR for the HELCOM SOM Platform include the task of analysing cost-effectiveness of proposed new measures. The [SOM Platform 3-2020](#) meeting took note of this method document and information from the ACTION project that cost-effectiveness calculations will be conducted in the ACTION project and data on costs and effectiveness of new measures in the synopses will be complemented by ACTION from published literature ([Notes](#), paras 6.2-6.11). SOM Platform 3-2020 suggested that the ACTION project should go over the synopses and highlight what type of information is missing that would be needed for the cost-effectiveness analysis, and the BSAP UP workshops could help to identify the missing information and this could be part of the guidance for the workshops ([Notes](#), para 6.12). The method for cost estimation, as described in this document, was already presented to SOM Platform 2-2019.

This document provides an updated description of the approach based on the comments in SOM Platform 3-2020. The document describes the cost-effectiveness analysis and the steps involved, as well as a guidance for providing cost data. This method has been discussed at EN ESA 4-2019 and 5-2019 meetings as well as in the ACTION project meeting in February 2020.

Action requested

The Meeting is invited to consider the proposed approach for evaluating the effects and costs of new measures and guide its further development.

Method for analysing the cost-effectiveness of new measures

Cost-effectiveness analysis of new measures

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) and in this document they are applied to the BSAP UP process.

This document outlines also guidance for identification of cost types related to new measures and for providing available cost data on these costs types and proposed new measures to support the cost-effectiveness analyses. These data can then 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. The types of costs related to a measure can be identified by defining causal pathways on whom the measures affect and how. Further expert validation may be required to complement the cost data, and especially to assess the uncertainties of measure costs. Tentative cost data contributors include EN ESA network, ACTION WPs, SOM topic groups, and all the same parties who have taken part in filling in the synopses on measures. 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. In addition to all these parties, topic teams can provide valuable information on the causal pathways of measures.

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. If possible, cost estimates should be delivered in a format useful for estimating national costs. These are further explained below in Section 'Guidance for providing available cost data on proposed/new BSAP measures'.

The data on the effectiveness of new measures will be collected mainly through ACTION WPs, SOM topic teams, and some available estimates may also come from the synopses on potential new actions. Further, surveyed data on the measure type effectiveness that is used in the SOM analysis can be applied also to estimate the effectiveness of new measures. Joint effects, aka synergistic or antagonistic effects of measures will be identified and assessed using the activity-pressure-state linkage chains.

The cost-effectiveness analysis builds on the same model as the analysis of existing measures 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. 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 (from the synopses).

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).

Information on effectiveness of potential new measures will be collected from the following sources: (1) synopses of the new measures, (2) peer-reviewed literature (ACTION WP6), (3) grey literature such as project reports (ACTION WP6), (4) ACTION project outcomes and (5) expert-based data collected for the SOM model, when new measures can be linked to the measure types in the expert surveys. The effectiveness will be estimated as % change in pressures or state and it can be expressed on a probability scale.

Timetable: The ACTION WP6 objective is to primarily collect the data for the proposed measures in March-April and this will support also the BSAP UP workshops in August-September. It is suggested that the BSAP UP workshops could also contribute to the effectiveness estimates. ACTION WP6 will, however, continue to fill gaps and strengthen the effectiveness data until summer, because no other data collection processes have been set for the effectiveness of new measures.

c) Joint effects of new measures: The joint effects of new measures will be estimated by evaluating three kinds of overlap:

- 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. When multiple pressures affect a pressure from an activity, the %-effectiveness to reduce initial pressure for an individual measure is decreased, because other measures are also affecting the pressure.
- Possible additive, synergistic or antagonistic joint effects of all the measures on all gaps to GES.

d) Cost estimation: See next chapter.

e) Finding optimal sets of new measures: Cost-effectiveness analysis will be run for the proposed measures. The cost-effectiveness results are primarily given as 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. (2018 and on-going and recent projects. New potential measures are assessed in terms of their cost-effectiveness with respect to reaching good environmental state and possible budget constraints, certainty and other relevant aspects.

Guidance for providing available cost data on proposed/new BSAP measures

Background and general guidelines for providing cost data for new measures

The purpose of this chapter is to provide guidance for collecting information on cost data on proposed/new BSAP measures. This section was presented already in SOM Platform 2-2019 and it was further developed in ACTION WP6 meeting in February 2020. SOM Platform 3-2020 reconfirmed that the costs will be estimated for the Baltic Sea scale but noted that 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.

In principle, the costs and effects of measures are separate inputs to the cost-effectiveness analysis, but ACTION WP6 is also interested in existing models and their results that take both costs and effects into account (for example the [Displace model](#)). In general, ACTION WP6 will only gather available cost data that can be applied to analyze

cost-effectiveness, and therefore it is asked that possible contributors do not start estimating any new cost values without discussing it first with ACTION WP6 participants. Thus, if a contributor wishes to take part in the cost estimation, please consult ACTION WP6 to ensure that the methodology applied for cost estimation is compatible with the approach.

Provided cost data can include anything from the description of different agents and institutions that are affected by the implementation of the measure to the actual measure cost estimates (also qualitative and relative cost estimates are welcomed, in addition to monetary). In addition to cost estimates for new measures, ACTION WP6 is interested in the available cost estimates that have been used in the previous analyses for MSFD, BSAP, WFD and other relevant policies. Any references to such documents are appreciated.

The reported cost data can be used in the cost-effectiveness analysis as such or as an input for cost calculation. The cost data used in the analysis may further be validated by expert evaluation. To harmonize the analysis among measures the partners of WP6 will choose what types of costs related to measures are included in the analysis. Therefore, it is suggested that possible contributors provide as disaggregated cost data as possible for each measure. Further instructions for disaggregated cost reporting are given in section 3.

Steps to cost estimation

ACTION WP6 meeting in February 2020 recommended six concrete steps which guide towards cost estimations for the proposed new measures (Table 1). The important message from these steps is that before starting data collection on costs, there are important steps to be taken: in Step 2 causal pathways are defined for implementation of the proposed new measures and in Step 3 types of costs are identified (see more of Step 3 in the next section).

TABLE 1. CONCRETE STEPS TO ESTIMATE COSTS OF PROPOSED NEW MEASURES
1. List the proposed new measures that will be included in the analysis.
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...).
3. Identify the types of costs for proposed new measures based on causal pathways (from CEA reports, cost-guidance).
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. [can be start at the same time as Step 1]
5. Cost transfer: how to use existing cost estimates and data for the cost types of proposed new measures. This step also includes a proposal to use categorical costs instead of monetary values. The proposal is that national cost estimates are categorized into common categories which reflect the national 'low costs' or 'high costs'. This categorization will reflect the obvious need to have intervals for the costs but also to ensure comparability among the Contracting Parties and help to deal with uncertainties with the cost estimates. The categories could be 'very low', 'low', 'moderate', 'high' and 'very high' and they would be more clearly defined to support their use.
6. Data validation and data gaps in existing cost data. Additional actions: expert opinion etc.

Short introduction to different types of costs

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.

Opportunity costs refer to costs of foregone opportunities. 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. Fishing restrictions can also impose **out of the pocket (financial/accounting) costs** 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, and **indirect costs**, such as overhead costs of the whole institution or the depreciation costs of general multipurpose monitoring equipment. For a sector/agent, financial costs can result, for example, from an increased use of fishing efforts and requirements for new fishing equipment. The distinction between direct and indirect costs is that direct costs can be traced to the measure, whereas indirect costs are more difficult to allocate to specific cost objects. The costs for the same types of measures are often similar. As an example, the common cost types related to marine protected areas are listed in Table 2 (Naidoo et al. 2006). **Capital costs** are 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.

Table 2. Example cost types and descriptions for marine protected areas.

Cost type	Description
Direct/Indirect, Capital cost	Acquirement of property rights for protected areas
Direct/Indirect	Management of a conservation program.
Transaction Direct/indirect	Negotiating an economic exchange of property rights
Opportunity cost	Damages to economic activities arising from conservation program
Opportunity cost	Foregone commercial opportunities

Discount rate is needed in order to estimate the net present value of costs resulting from a measure extending over multiple years (or some other longer time period). It is a rate that is used to discount future costs to present value. Especially for measures whose implementation require future one-off capital costs, or if the measure costs are unequally distributed over the assessment period (unequal annual costs), the discount rate can have a significant impact on the net present cost value.

Taxes, subsidies and interest on borrowing are direct transfers between agents and institutions of an economy and do not therefore constitute an economic cost. However, ACTION WP6 is interested in all economic incentives used for measure implementation and thus they should also be reported.

Possible formats for providing available information on measure costs

Table 3 can be used as a format for reporting the costs for new measures. This is based on an Excel template developed by the ACTION project and the cost-guidance document discussed in the SOM platform 2 meeting. An example of using the format of Table 3 on a sub-measure of a measure is provided in Table 4. The same format can also be used to provide available data on existing measures based on, for example, available cost-effectiveness analyses. However, this can be time consuming and thus reports on cost data for existing measures can also be reported as references and their short summaries.

The steps to provide information on the costs related to a certain measure using Table 3 include:

A. Definition of what is included in a measure in the table name. Can a measure be divided into more detailed sub-measures? Costs can be broken down to separate tables by sub-measure.

B. Description: Identification of agents affected and institutes involved by the implementation of a measure. Identification of agent activities (preferably from MSFD activity list) affected and institutional involvement required by a measure.

C. Cost type: Determination of cost types related to activities and involvement. What kind of involvement is required? How is the activity of an agent affected? Are the costs direct, indirect, opportunity costs, capital costs, or costs of some other type?

D. References: Assessment of data sources that can be used to estimate the costs. What kind of data are available? Are there available cost estimates? Are there other data available that can be used to estimate the costs?

E. Estimate: What are the estimated costs? If there is a cost estimate available, provide it here.

Also provide the currency and time unit (per year or other) and possible uncertainty of the cost estimate.

F. Time aspects: Definition of temporal scope of the costs. Are the costs annual or are they non-recurring such as capital costs? What is the life-time of the cost estimate/measure? If existing measure is reported, provide also the year of estimation.

G. Notes and methodology: Description of methods used to estimate the costs, if an estimate for costs is provided. What was the method used to estimate the cost? What is included in the cost estimate? What was the discount rate used for estimation? Is the cost estimate national, regional or for sub-basin or some other geographical unit?

H. Add all available **data on taxes, subsidies and other economic incentives** that may be used for the implementation of the measure at the end of the table.

It is important to identify different costs that can be associated to a measure, even if their estimated values are not available!

Table 3. Template for reporting the measure costs for measure/sub-measure. Steps A-H are listed as in the text.

A. Name of (sub)measure
Description of measure
B. Cost item - description
Affected actors
C. Cost type
Cost type - description
D. Reference
E. Estimate
F. Time aspects
G. Notes and methodology
H. Additional data on taxes, subsidies and other economic incentives

The example presented in Table 4 shows how the costs have been estimated for a (sub) measure included in the Swedish MSFD POM: Introducing new fishing regulation to protect threatened coast spawning stocks inside trawling boundaries (measure): a ban on cod fishing inside the trawling boundary in Skagerrak and Kattegat (sub-measure) for a 4-year period (Vretborn, 2016). In this example the data sources vary across the costs, but for some measures

there may already exist cost evaluation reports that can be used as uniform sources (for an example see Bacher and Albrecht (2013) on Evaluating the costs arising from new maritime environmental regulations).

For available cost estimates that have been used in the previous analyses for MSFD, BSAP, WFD and other relevant existing policies, the references for reports and other documents can be provided simply by writing a short summary of the report/document and providing a reference/link to it. Reports in other languages than English are welcomed as well.

Table 4. Costs of Swedish PoM sub-measure 4: a ban on cod fishing inside the trawling boundary in Skagerrak and Kattegat for a 4-year period

B. Description	C. Cost type	D. References	E. Estimate	F. Time aspects	G. Notes and methodology
Decrease in commercial fishing, MSFD activity: fish and shellfish harvesting	Opportunity cost	The 2014 Annual Economic Report on the EU Fishing Fleet.	700 x 10 ³ SEK/year	Annual, for 2016-2020 (?) Estimated in 2016	Decrease in value added of commercial fishing.
Decrease in recreational fishing, fish and shellfish harvesting	Opportunity cost	SCB (2013). Fritidsfisket i Sverige 2013.	8 000 x 10 ³ SEK/year	Annual, for 2016-2020 Estimated in 2016	Decrease in consumer surplus from recreational fishing.
Recreational fishing monitoring	Direct/indirect	Interview survey on monitoring of recreational fishing	4 800 x 10 ³ SEK/year (range: 3200-6400 x 10 ³ SEK/year)	Annual, for 2016-2020 Estimated in 2016	
Commercial fishing monitoring	Direct/Indirect		Not available		
New fishing regulation	Capital Direct/Indirect	Estimate based on previous experience	350 x 10 ³ SEK/year	Annual, for 2016-2020 Estimated in 2016	
Analyses of fish stocks, Research, survey and educational activities	Direct/Indirect	Estimate based on previous experience	200 x 10 ³ SEK/year	Annual, for 2016-2020 Estimated in 2016	

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