Baltic Marine Environment Protection Commission

December 2019

Sufficiency of measures analysis to support the HELCOM BSAP update

Contents

Sufficiency of measures analysis to support the HELCOM BSAP update

Overview in brief

The aim of the analysis of sufficiency of measures (SOM) is to assess what kind of improvements in environmental state and pressures can be achieved with existing measures by 2030-2035, and whether these are sufficient to achieve good environmental status (GES) in the Baltic Sea. This information will be used to support the update of the BSAP and identification of new measures.

The SOM analysis relies on estimating the status of the marine environment at a specific future point in time, given measures in existing policies, their implementation status, natural time lags, and predicted development of human activities/pressures over this time period. This is called the 'business-as-usual (BAU) status' (Figure 1). If the analysis indicates that GES is not achieved, then existing measures are not sufficient and additional measures are needed (or existing measures need to be strengthened).

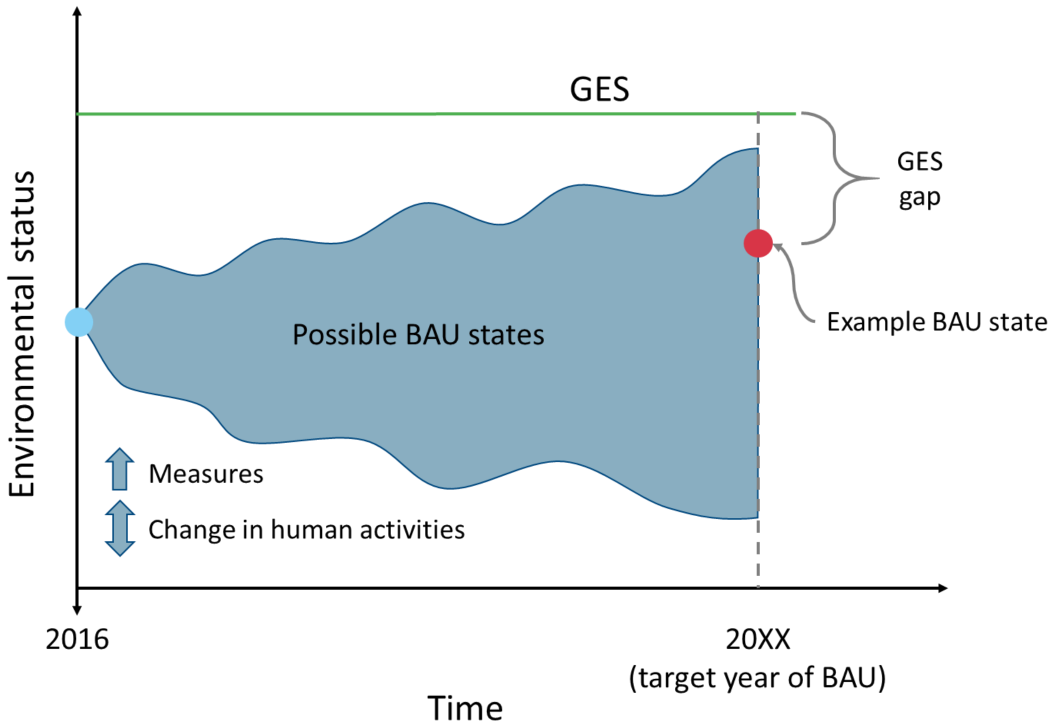

Figure 1. Illustration on the use of the business-as-usual (BAU) scenario in the gap analysis.

The SOM model tracks the impact chains and effects of existing measures through the activities/sectors they moderate, to the pressures the activities/sectors generate, and on to how those pressures affect the state of the Baltic Sea (Figure 2). This is done by estimating how much existing measures will reduce anthropogenic pressures in the time frame of the BAU (linked through the activities/sectors the measures target), the consequent change in each of the state components analysed, and whether this will be sufficient to achieve GES for these components. SOM analysis is carried out for the same environmental themes as in the HELCOM 'State of the Baltic Sea' report, including eutrophication, hazardous substances, litter, noise, non-indigenous species, benthic habitats, fish, birds and mammals.

Uncertainty will be taken into account throughout the SOM model, and will be reflected in reporting and interpreting the results, which will be in the form of probability distributions.

Expert elicitation will be used for three components of the analysis: 1) linking activities to pressures (step 3), 2) effect of measures on pressures (step 4), and 3) linking pressure with state components (step 6). The data gathering through expert elicitation builds on input from dedicated topic teams that have been established by the HELCOM SOM Platform, partners of the HELCOM ACTION project, HELCOM expert groups and networks, and dedicated SOM workshops contributing to the finalizing of the expert surveys for effectiveness of measures and pressure-state linkages.

This is the first time a SOM assessment is done in this extent in the Baltic Sea region, or anywhere else. It brings together natural and social sciences approaches, and addresses multiple and highly different topics/themes, each with differing data quality and type. The assumptions and simplifications that are required to incorporate the divergent topics and data used in the model are explained in the later sections of this document.

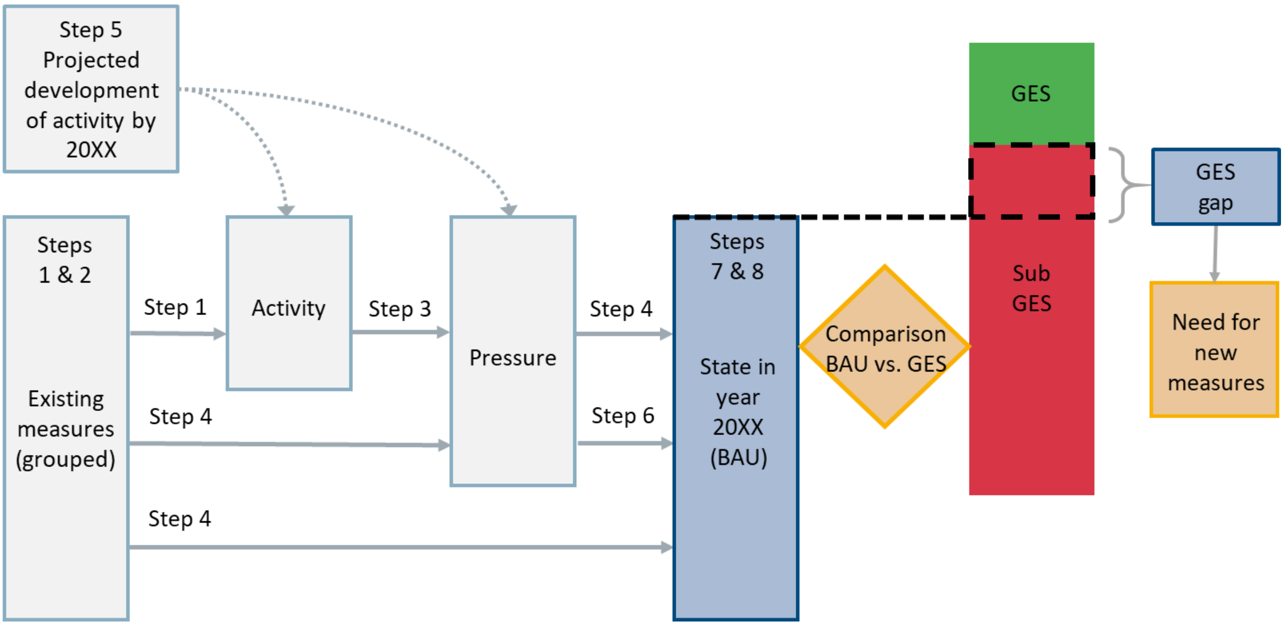

Figure 2. Structure of the SOM analysis: Linking measures with activities, pressures or state components; projected changes in activities and pressures; comparison of the BAU state with GES; and estimation of the need for new measures.

Detailed approach in brief

Step 1. Existing measures

Existing measures are those that have been implemented, are being implemented or are planned to be implemented in the time frame of the SOM analysis (i.e. until 2030-2035). Lists of existing measures have been compiled by the HELCOM Secretariat and topic experts involved in the HELCOM SOM Platform. The lists have then been reviewed by the Contracting Parties, and the measures have been categorized into 'measure types'. The measure type is a generalization of individual measures and can include several individual measures. This categorization allows for simplification of the analysis (i.e. by aggregating similar types of measures and making the analysis more feasible). The measure type is determined by general measure characteristics, as well as more concrete descriptions of the measure. An example of a measure type is 'Technical modification of fishing gears to reduce bycatch of harbour porpoise'. Measure types are used in the evaluation of the effect of measures on reducing pressures (step 4).

Step 2. Estimating time lags in measure-pressure links

Even fully implemented measures do not always have an immediate effect due to time lags between measures and pressures (e.g. banned substance with persistent use of legacy production).

This step involves identifying those measures that will have no further effect on pressures and measures that will still have an effect on pressures in the time frame of the BAU (ongoing or planned measures). If a measure is only partially implemented or planned to be implemented, then the assumption is made that full implementation, including the full effect on pressures, will take place by the BAU end year (cf. the urge by Ministerial Declaration 2018 to implement the BSAP).

Step 3. Identifying main pathways for pressures using activity-pressure-linkages

This step entails assessing the contribution of activities to pressures (in %). This is mostly done using expert elicitation, where experts have been asked to estimate the most likely contribution of relevant activities to specific pressures, as well as the lower and upper bounds of contribution for each activity. For loss and disturbance to the seabed, the HOLAS II approach is used, which links percent contribution of activities to the two pressures. For input of nutrients, the data is produced by ACTION WP4. The data on activity-pressure linkages is used to scale the impact of the effectiveness of measures surveys from step 4 (see below) and helps to identify activities/sectors that could be targeted for future measures.

Step 4. Estimation of effects of measures

In this step, the effectiveness of various measure types in reducing pressures from specific activities are estimated based on information from both existing literature and expert elicitation. Expert surveys are needed to complement the existing literature and studies to assess the effects of all relevant measures.

The expert elicitation is carried out via online surveys, where experts are asked to evaluate the effectiveness of various measure types on important activity-pressure linkages. In the expert survey, respondents are first asked to evaluate the relative effectiveness of measure types for specific activity-pressure parings (e.g. fishing industry contributions to marine litter), together with the certainty of their assessment. The experts are then asked to provide a numeric effectiveness assessment (% reduction in pressure from the specified activity) for the most effective measure type evaluated. This provides a reference point that can then be used to assess the effectiveness of all measure types in reducing pressures.

Information from activity-pressure contributions (step 3) and effectiveness of measures (step 4) will be combined to assess the total pressure reduction, which can then be compared against pressure targets or feed into step 6 on pressure-state linkages of the SOM analysis. Uncertainty in the activity-pressure contributions and the effectiveness of the measure types will be reflected here, as the total pressure reductions will be expressed as probability distributions.

Step 5. Projected development of human activities/pressures

This step develops and approach and collects data for considering projected changes in human activities/pressures in the time frame of the BAU scenario. By including this step, the SOM model can account for changes in society and economies. The analysis is limited to predominant activities, and BAU status will be developed for two alternative assumptions: 1) no change and 2) the most likely change in predominant activities.

Step 6. Linking reduced pressures with state components

In this step, carried out via online surveys, experts are asked to evaluate the impact of reducing pressures on specific state components. The state components considered in the analysis are directly linked to HELCOM core indicators when available (e.g. grey seal population size) or other ecosystem components as reflected in the HELCOM State of the Baltic Sea report (e.g. harbour porpoise population size).

This step entails first identifying the main pressures contributing to the state components and assessing their significance. Second, the survey asks the experts to evaluate the required pressure reductions to achieve or maintain GES, or the required pressure reduction to achieve specific improvements in the state component, depending on the existence of GES thresholds (see below).

It is necessary to be able to evaluate the effect of the full range of potential pressure changes on state. Data availability and the presence/absence of GES thresholds require flexibility.

- When a GES threshold exists, existing data and expert elicitation will be used to evaluate how much pressures need to be reduced to achieve or maintain GES.
- When a GES threshold does not exist, the survey asks how large a state improvement can be achieved with specific pressure reductions.
- When a pressure target exists (e.g. eutrophication, litter, noise), the state will not be evaluated in the SOM analysis.

The results will be presented as probability distributions for reaching good state for different pressure reductions.

Step 7. Comparison of BAU and GES and assessing sufficiency of measures

Running of the SOM model will take place early 2020. Following that, projected pressure reductions and improvements in state components achievable with existing measures will be available for comparison to existing HELCOM pressure targets and threshold values for state indicators. This will enable assessing whether existing measures are sufficient in achieving good status and areas where additional measures may be needed to reach HELCOM goals and objectives.

The results of the model will be discussed at HELCOM spring meetings, including the SOM Platform meeting and thematic BSAP UP workshops to be held in spring 2020 (for proposed dates see outcome of HELCOM SOM Platform 2-2019).

Step 8. Time lags in state recovery

Reductions in pressures during the BAU period do not necessarily mean that the state will become good in the time frame of the BAU scenario. Time-lags in state recovery (e.g. recovery of benthic habitats following removal of trawling) are not included in the SOM model as such. Instead, they will be evaluated as additional information alongside step 7. By separating pressure-state time lags from the BAU scenario, the effect of measures can be separated from unavoidable time-lags and allow for the consideration of the sufficiency of measures in the case of avoidable time-lags (i.e. topic is projected to eventually reach GES under BAU conditions, but GES could be reached sooner if additional measures were implemented).

The expert surveys to support SOM analysis include questions on time lags, gathering information on how long it takes to fully realize the effect of measures on environmental state. This information will be presented together with the sufficiency of measures assessment.

Assumptions of the SOM model

The SOM approach has made the major assumption that all the measures (i) will be fully implemented by the end year of BAU period, e.g. 2030 and (ii) they will have sufficient time to fully influence pressure reductions.

The current level of implementation of some of the BSAP measures is low and this may cause a source of error in the SOM model. Due to this, the SOM model will also be run with the current implementation status to see what the urgency for implementing the remaining BSAP measures is.

Implementation of the national measures under EU MSFD has been reported to EU Commission, but no summary reports have been planned to be included in the HELCOM SOM model. Thus, these measures are assumed to be fully implemented.

Inherent in this assumption is that the measures are implemented to the extent possible, e.g. using best available practices or best environmental techniques. This is an assumption of the strength of measures and it cannot be evaluated in the SOM model.

Simplifications of the SOM model

The SOM model will cover all human activities and pressures and all HOLAS II state components, and captures all measures agreed in the Baltic Sea. This means that the model is wider than any previous model of this field and, hence, requires some simplifications.

Standard working units. Due to the wide coverage of measures, activities, pressures and state components, no common metrics can be found for the model. Therefore, the model builds on the principle of a pressure reduction (%), which can be linked to the improvement of the state (%).

Measure types instead of individual measures. It is infeasible to analyse hundreds of existing measures in the Baltic Sea region in the time frame of the HELCOM BSAP UP. To simplify the catalogue of measures, the SOM approach groups them to 'measure types' which aim to capture the main elements of the measures but limit the number of measures at a feasible level.

This has the limitation that the measure types and real measures are not equal (i.e. the former are abstractions and the latter are closer to reality). In a hypothetical example, a measure type 'apply pingers in gillnets to reduce bycatch of harbour porpoise' does not say how many pingers are being used in gillnets, how widely this is applied in different parts of the Baltic, is this enforced or how frequently this requirement is not followed (or how frequently a pinger prevented an animal drowning). Estimating the effectiveness of a measure type will, however, show that all measures underneath have certain effectiveness. The following steps then show whether the measures are sufficient for harbour porpoise (i.e. do we expect that no new measures are needed) or not. If the measures are estimated to be sufficient, there is the question whether they require strengthening even if there is no need for new measures in the updated BSAP.

Relative scale of effectiveness of measures. The estimation of the effectiveness of a measure type in reducing a pressure is not simple. Even working along a % scale is challenging. The SOM model simplifies the expert survey by asking the effectiveness on the scale from 'no effect' to 'very high effect' (in reducing the pressure). The survey covers all the measure types relevant for all selected combinations of activities and pressures and therefore the relative scale is not only simpler but also quicker.

In addition, the SOM approach uses information from existing studies to produce more robust estimates.

Pressure – state linkage. Dependency of state on pressures is the basic assumption in environmental science. In reality, many of these links have not been established in a quantitative way. In the SOM model, the expert-based pressure-state link (Step 6) is therefore essential, but it can in some cases be compared with the established pressure-state links (e.g. nutrient inputs, fisheries).

General. The SOM model will not give the final answer with a single number of the general sufficiency of measures, but all the model outputs must be interpreted. The benefits of the model use are, however, numerous, as shown in the next section.

Benefits of the SOM approach

The sections above described assumptions and limitations which are good to keep in mind when interpreting outputs from the SOM model. The approach also has benefits (also beside the fact that it is feasible to conduct the analysis and run the model).

Use of effectiveness results for new measures. As the measure types are not too specific, it is possible to use them for estimating the effectiveness of the new measures. This can be done two ways: (i) if a measure is considered new but still falls under the description of the measure type, its effectiveness can be deduced based on the effectiveness of the measure type in the SOM analysis, or (ii) if the new measure is between two measure types, its effectiveness can be placed between the effectiveness of the two related types in the SOM analysis. This can support the discussions on new measures in the BSAP UP process.

Use of pressure-state linkage. The pressure-state linkage is a precondition for many environmental analyses and tools and not very often shown for marine assessments. The expert-based suggestions for these linkages (with uncertainty ranges) can be later validated by specific data and (if found adequate) used for further analyses. For example, preliminary analyses of the HELCOM TAPAS sensitivity scores show relatively good agreement among experts of the sensitive features of the Baltic Sea ecosystem.

Steps forward in the integrated assessment of the marine environment. The development of the methods and results represents a considerable progress in interdisciplinary research on linking measures, activities, pressures and environmental state, and improving the description of linkages between the socio-economic system and ecosystem.

Providing information for further analyses. Many of the approaches and results can be used in further analyses of the Baltic Sea environment, including the linkage framework, business-as-usual scenario (BAU), and effects of measures.

Flexibility and updating of the model. The SOM model is flexible in the sense that it can include information from both literature, studies and models and expert elicitation. In addition, the model can be updated when new information becomes available. The overall approach is general and is applicable in other contexts.