Baltic Marine Environment Protection Commission

HELCOM expert network on economic and social analyses meeting

Online, 25.5.2020

Document title	Document 2 – Presenting SOM results
Category	INF
Submission date	18.5.2020
Submitted by	Secretariat

Background

The sufficiency of measures (SOM) analysis supports the BSAP update by contributing to the identification of gaps in existing measures to reach good environmental status (GES) and need for new actions for the updated BSAP. The analysis is carried out through the HELCOM ACTION project and the HELCOM SOM Platform. The data collection for the SOM analysis will be finalized in May 2020, and results will be prepared for the BSAP UP workshops arranged in August-September 2020. SOM Platform 3-2020 proposed that EN ESA will discuss how to present the SOM results (Notes, para 3.10).

This document includes the latest version of the proposal on presenting the SOM results to the BSAP UP workshops. It is based on the preliminary version of the presentation of SOM results prepared for the SOM Platform 3-2020 meeting (Document 3-2), comments received from the CPs to the document, and an ACTION WP6 meeting to discuss the presentation of the results.

The document provides a general description of the presentation of results and illustrates the presentation by giving some example results for the topic of benthic habitats. *Potential physical loss of seabed* has been used as the pressure example in the effectiveness of measures part, and *hard substrate epifauna dominated community* has been used as the state component in the pressure-state part. Note that the results are not final, as data collection is still ongoing in May 2020.

Notes, open issues and questions are marked with red font colour.

Presenting SOM results

Contents

Introduction

The preliminary version of the presentation of SOM results was prepared for the SOM Platform 3-2020 meeting (Document 3-2), using the data available at that point in time. Comments were received in the meeting and intersessionally on the presentation of the results, particularly for the BSAP UP workshops in August-September 2020. These comments have been considered in the current proposal. The proposal applies mainly to the SOM results provided to the BSAP UP workshops, and presentation of the SOM results in the BSAP update background material will be further discussed in the SOM Platform.

The following results are proposed to be included:

a. Activity-pressure contributions
b. Effectiveness and impact of measure types
c. Required pressure reductions to achieve GES/state improvements
d. Significance of pressures to state components
e. Gap assessment
f. Supporting information to gap assessment
    - where measures could potentially be needed (by area and activity/pressure/state component)
    - what types of measures have already been implemented, which measures could potentially be effective (based on the most effective measure types).

The main result from the SOM analysis relevant to the BSAP UP workshops is the gap assessment (a), i.e. whether good status will be achieved with existing measures. The gap assessment is only possible for those topics which have a GES threshold. For those topics without a gap assessment, it is possible to evaluate the state improvements or pressure reductions from existing measures.
Providing the other (intermediate) results (b-f) is important as background information and for evaluating the quality and reliability of the gap assessment. They include the results for the main components of the SOM analysis.

The results from the SOM analysis are proposed to be presented using both summary statistics and probability distributions, as requested by the SOM Platform 3-2020 meeting (Notes, para 3.5). The summary statistics include the most likely (expected) values and their standard deviations. The distributions are presented in graphs which show how the responses are distributed. Both of these illustrate the variation in the responses. When standard deviation is high, values are spread over a wider range, and when it is low, values are closer to the most likely value. Probability distributions show the probabilities of occurrence of possible outcomes, i.e. which values are more likely than others.

The summary statistics are proposed to be presented in tables, which include the most likely value and its standard deviation. Colour codes are used to categorize the most likely value into discrete categories, which indicate the magnitude of the value. For example, for the percent effectiveness of measure types, colours would be used to indicate whether the effectiveness is low, intermediate or high. Colouring or other visualizations could potentially be used also to show the level of certainty of the estimate.

In addition, when expert survey data has been used, expert's confidence in their own responses and the number of experts contributing to each estimate will be reported together with the results. This will provide supporting information for evaluating the certainty and precision of the results.

Distributions and graphs are proposed to be included as supporting material in annexes. They show the same results as the tables, but allow either more detailed information or a different way of presentation to ease understanding.

Tables and graphs will be complemented with text including interpretation, discussion, evaluation and conclusions of the results. The results will also include information on respondents' background (country, organization type, field, and years of experience).

Activity-pressure contributions

Table 1 and Figure 1 show the contribution of activities to the potential physical loss of seabed. Data on activity-pressure contributions for the potential loss and disturbance to the seabed (benthic habitats) is based on the approach employed in HELCOM HOLAS II, which utilizes the Baltic Sea Pressure Index (BSPI) and Baltic Sea Impact Index (BSII) to integrate data reported to the Secretariat from the Contracting Parties through regular reporting and previous data calls. For potential loss to the seabed, no variability is present in the underlying data (only point estimates available).

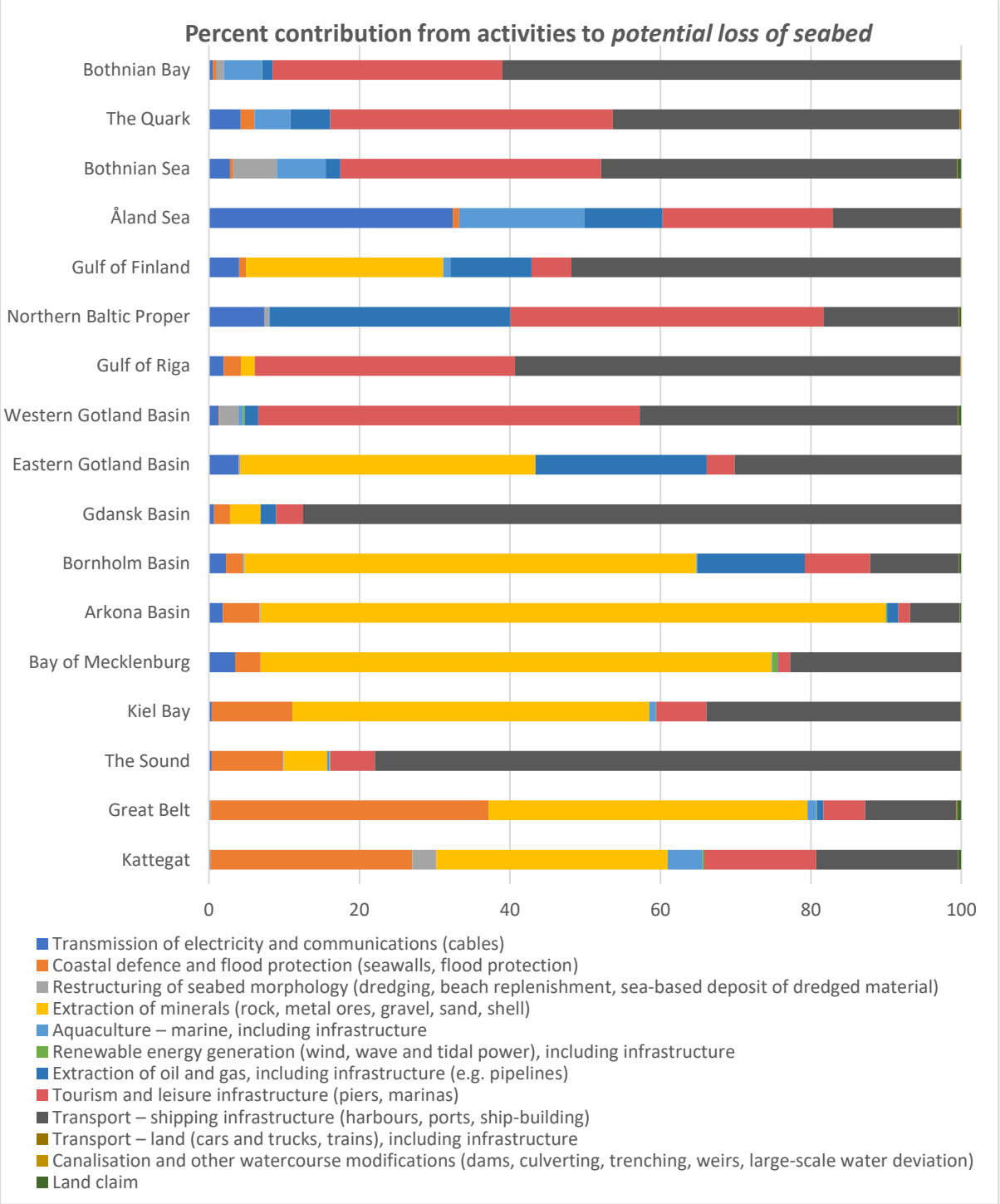


Figure 1. Percent contribution of activities to the *potential loss of seabed* for each of the 17 HELCOM scale 2 sub-basins. Values are derived from data previously submitted to the Secretariat as part of the HOLAS II process.

Any way of indicating the magnitude/importance of the pressure, to assess the importance of the activity? Relative contribution can be misinterpreted in cases where the activity makes a large contribution to the pressure, but the pressure itself is marginal.

Table 1. Activity-pressure contributions. Colour scale needs to be added.

Physical loss	Transmission of electricity and communications (cables)	Coastal defence and flood protection (seawalls, flood protection)	Restructuring of seabed morphology (dredging, beach replenishment, sea-based deposit of dredged material)	Extraction of minerals (rock, metal ores, gravel, sand, shell)	Aquaculture – marine, including infrastructure	Renewable energy generation (wind, wave and tidal power), including infrastructure	Extraction of oil and gas, including infrastructure (e.g. pipelines)	Tourism and leisure infrastructure (piers, marinas)	Transport – shipping infrastructure (harbours, ports, ship-building)	Transport – land (cars and trucks, trains), including infrastructure	Canalisation and other watercourse modifications (dams, culverting, trenching, weirs, large-scale water deviation)	Land claim
Kattegat	0.19	26.85	3.19	30.74	4.63	0.23	0.00	14.88	18.89	0.02	0.00	0.37
Great Belt	0.17	36.98	0.00	42.42	1.16	0.05	0.88	5.58	12.11	0.10	0.00	0.55
The Sound	0.35	9.41	0.17	5.79	0.27	0.14	0.00	5.93	77.86	0.06	0.00	0.02
Kiel Bay	0.38	10.75	0.00	47.41	0.89	0.02	0.00	6.68	33.78	0.10	0.00	0.00
Bay of Mecklenburg	3.46	3.39	0.00	67.89	0.12	0.75	0.06	1.59	22.73	0.02	0.00	0.00
Arkona Basin	1.84	4.88	0.16	83.06	0.03	0.19	1.49	1.53	6.57	0.04	0.00	0.20
Bornholm Basin	2.27	2.19	0.27	60.06	0.16	0.00	14.23	8.70	11.82	0.02	0.00	0.26
Gdansk Basin	0.70	2.12	0.00	4.04	0.00	0.00	2.06	3.61	87.47	0.00	0.00	0.00
Eastern Gotland Basin	3.98	0.04	0.12	39.28	0.00	0.00	22.75	3.71	30.11	0.00	0.00	0.00
Western Gotland Basin	1.29	0.11	2.55	0.00	0.57	0.22	1.83	50.70	42.28	0.10	0.00	0.35
Gulf of Riga	1.95	2.30	0.00	1.83	0.00	0.00	0.00	34.61	59.18	0.04	0.08	0.00
Northern Baltic Proper	7.38	0.06	0.49	0.00	0.15	0.00	32.00	41.65	17.93	0.08	0.01	0.25
Gulf of Finland	4.00	0.94	0.00	26.22	0.94	0.00	10.78	5.31	51.72	0.05	0.00	0.05
Åland Sea	32.42	0.86	0.00	0.00	16.68	0.00	10.32	22.65	16.95	0.11	0.00	0.01
Bothnian Sea	2.80	0.44	5.77	0.00	6.52	0.01	1.94	34.67	47.31	0.06	0.00	0.48
The Quark	4.21	1.82	0.01	0.00	4.77	0.00	5.33	37.57	46.06	0.24	0.00	0.00
Bothnian Bay	0.50	0.42	1.07	0.00	5.04	0.05	1.40	30.57	60.87	0.06	0.00	0.03

Effectiveness of measure types

This section presents the percent effectiveness of measure types in reducing a specific pressure (in this case, physical loss of seabed) from a specific activity. Data on the effectiveness of measure types originate from expert surveys and the literature review on effectiveness of measures.

The percent effectiveness estimates from the expert survey data are based on two questions: the grid question on the relative effectiveness of the measure types (no effect – highest effect), and the question on the percent pressure reduction (%) from of the most effective measure type. The information from these questions is used together to define the most likely (expected) percent reduction for each of the measure types.

The certainty of the effectiveness of the measure type in the grid question (certain – uncertain) was used to form the minimum and maximum values for the effectiveness of the measure type and further the expert-specific probability distributions of measure type effectiveness. It is assumed that if the effectiveness of the measure type was assessed to be completely uncertain, any effectiveness value between 0-100% would be possible. However, if the percent effectiveness calculated from the relative effectiveness and the effectiveness of the most effective measure type is close to either end of the effectiveness scale (0-100%), the values in the other end have a very low probability. This results from the use of the PERT distribution (modified beta distribution). If the effectiveness was assessed to be completely certain, the effectiveness is represented by a point value (most likely) instead of a distribution.

Information on using literature review data

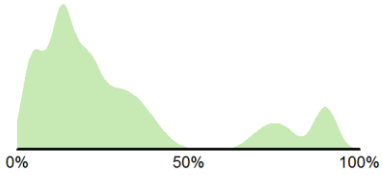
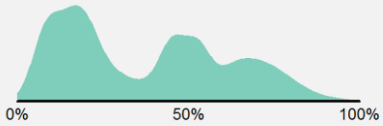
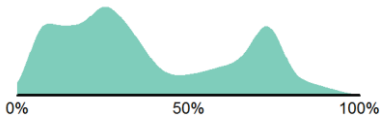
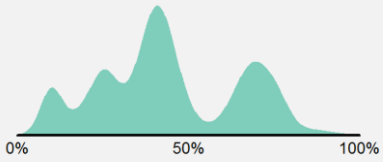
In the following, percent effectiveness is presented per activity, pressure and measure type, and pooled over experts. The effectiveness estimates can be compared across measure types to assess, on average, how effective they are in relation to each other in reducing the pressure from the specific activities, or across activities to assess which measure type could be the most effective for each activity.

Table 2a presents the most likely percent effectiveness and its standard deviation, and Table 2b the distributions of the effectiveness of measure types. Average confidence in Table 2a depicts the most common rating of expert's confidence in their own responses to the effectiveness of measure types question.

Table 2a. Percent effectiveness of measure types for reducing the potential *physical loss of seabed*. The effectiveness of a measure type is the percent reduction in the pressure resulting from a specific activity. The table depicts the most likely/expected effectiveness, and standard deviation is given in parenthesis. Colour scale needs to be added.

Activity Measure type	Extraction of minerals (rock, metal ores, gravel, sand, shell)	Transport – shipping infrastructure (harbours, ports, ship-building)	Activity 3	Activity 4
Expand EIA reporting requirements e.g. to cover new activities or include new environmental components	27.9 (26.2)	24.3 (22.5)		
Implement national plan for sand and aggregate extraction	33.3 (21.7)	NA		
Full implementation of the EU Maritime Spatial Planning Framework Directive	38.2 (24.6)	22.2 (20.3)		
Enhance legal protection of habitats and species	44.2 (20.3)	34.8 (22.5)		
Measure type 5				
Measure type 6				
Average confidence	Moderate	Low		
Number of experts	12-13	12-14		

Table 2b. Distribution of the effectiveness of measure types in controlling the pressure potential *physical loss of seabed*. The effectiveness of a measure type is the percent reduction in a pressure resulting from a specific activity. Effectiveness values are presented as a probability distribution of effectiveness from 0% to 100% effective. The color indicates the average effectiveness of the measure type using the color scale: **Low** **High.** Same colours as in the table.

Activity	Measure type	Effectiveness
Extraction of minerals (rock, metal ores, gravel, sand, shell)	Expand EIA reporting requirements e.g. to cover new activities or include new environmental components	
Extraction of minerals (rock, metal ores, gravel, sand, shell)	Implement national plan for sand and aggregate extraction	
Extraction of minerals (rock, metal ores, gravel, sand, shell)	Full implementation of the EU Maritime Spatial Planning Framework Directive	
Extraction of minerals (rock, metal ores, gravel, sand, shell)	Enhance legal protection of habitats and species	

Impact of measure types (combining information on activity-pressure contributions and effectiveness of measure types, multiply measure type effectiveness by activity-pressure contributions and sum the impacts of each pressure): could be presented in similar tables as effectiveness of measure types, and potentially distributions in an annex

Any way of indicating the magnitude/importance of the pressure, to assess the importance of the measure type? This result could be misinterpreted in cases where the measure type has a large effectiveness but the pressure itself is marginal.

Do we need to present also relative effectiveness of measure types (scale 0-100)?

Pressure reductions from existing measures

These results show the effects of existing measures in reducing pressures by sub-basin (Table 3, Figure 2). They are based on the activity-pressure contributions, effectiveness of measure types and links between existing measures and measure types. The activity-pressure data are at the sub-basin level, and the effectiveness of measures data at the Baltic Sea level, and thus the total pressure reductions are presented at the sub-basin level. They account for the joint impacts across measure types and spatial multipliers for spatially limited measures which reflect the actual sea area where the pressures can be reduced to avoid overestimating the pressure reductions.

Sub-basins with distributions concentrated on some section of the graph have a relatively narrow range of potential pressure reduction, while those with flatter distributions extending to the right show more uncertainty and potential for both low and high pressure reductions.

Add links to excels listing existing measures and their implementation status, and links to measure types.

Table 3. Projected total pressure reductions (%) from existing measures on physical loss of seabed. The table depicts the most likely/expected total pressure reduction, and standard deviation is given in parenthesis. Standard deviations and colour scale should be added.

Pressure Basin	Physical loss of seabed			
Kattegat	10.1 (…)			
Great Belt				
The Sound	16.6			
Kiel Bay	26.8			
Bay of Mecklenburg	37.9			
Arkona Basin	34.0			
Bornholm Basin	15.3			
Gdansk Basin				
Eastern Gotland Basin	10.1			
Western Gotland Basin	34.6			
Gulf of Riga				
Northern Baltic Proper	13.1			
Gulf of Finland	13.2			
Åland Sea	13.2			
Bothnian Sea	28.9			
The Quark	27.9			
Bothnian Bay	29.7			

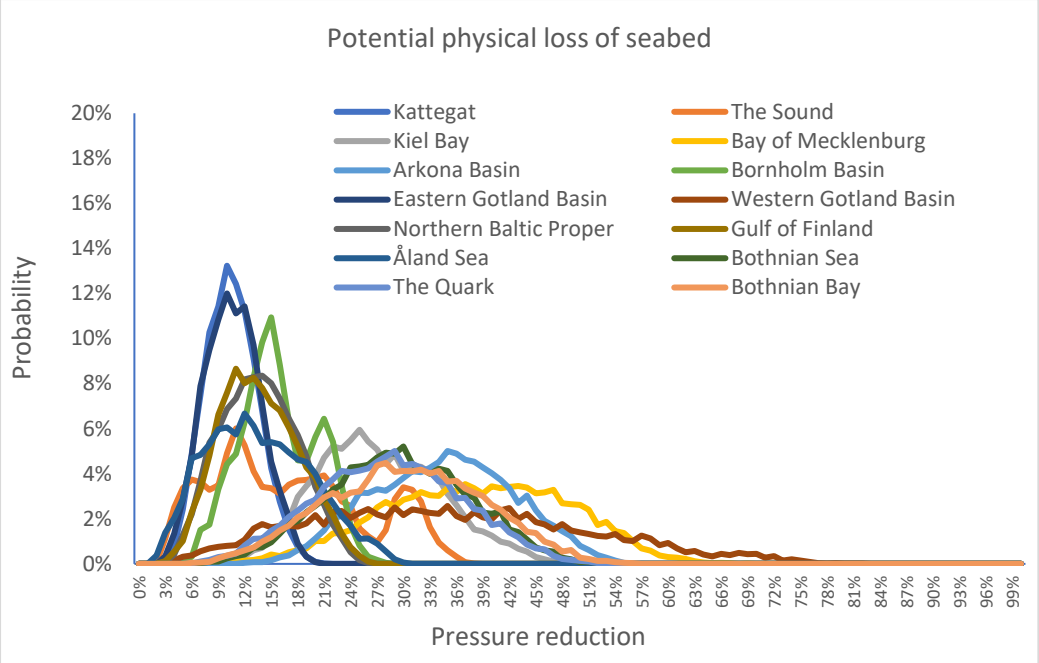


Figure 2. Probability of total pressure reductions with existing measures for potential loss of seabed by sub-basin. Note that loss of seabed is not reduced in the Great Belt, Gulf of Riga or Gdansk Basin. The likely reason is that the measures in those areas are already fully implemented (such as trawling bans), and thus there are no measures that are included in the SOM analysis, which considers partially or not yet implemented measures that still have the potential to reduce pressures in the time frame of the analysis.

Significance of pressures to state components

This section presents the significance of different pressures to state components, based on the responses to the expert surveys. Experts identified 3-6 most significant pressures to the five benthic habitat types by area and rated their significance on a scale from 0-5 (0 = not very significant, 5 = extremely significant). These significance scores were summed across experts, and after that, the score for each individual pressure was divided with the total score for all pressures to calculate the percent shares of pressures to the state component. This calculation was done by habitat types and areas.

The results illustrate the significance of different pressures affecting the state component in question, and in the case of benthic habitats, enable comparison across habitat types and geographic areas. Experts identified seven distinct pressures significant to hard substrate epifauna dominated community (see Table 4 and Figure 3). The most significant pressure was effects of eutrophication, followed by physical disturbance and physical loss of marine habitats.

Average confidence in Table 4 depicts the most common rating of expert's confidence in their own responses to the significance of pressures question.

Table 4. Significance of pressures affecting hard substrate epifauna dominated community (in percent). Colour scale needs to be added

Area Pressure	Kattegat	Southern Baltic	Eastern Baltic	Northern Baltic
Effects of eutrophication	37.5	38.5	26.1	42.9
Physical disturbance of marine habitats	18.8	20.9	17.4	21.4
Physical loss of marine habitats	12.5	17.6	26.1	7.1
Effects of non-indigenous species	0	7.7	17.4	17.9
Human-induced food web imbalance	16.7	6.6	13.0	0
Extraction of fish (includes prey depletion)	14.6	7.7	0	10.7
Change in hydrologic conditions	0	1.1	0	0
Average confidence	High	Moderate	High	High
Number of experts	5	10	3	3

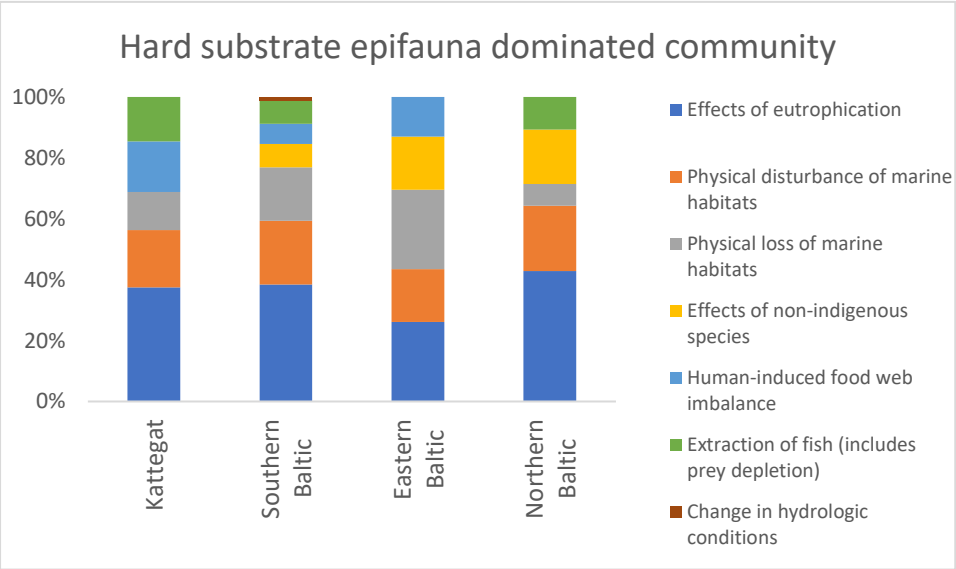


Figure 3. Significance of pressures to benthic habitats (by habitat type and area)

Required pressure reductions to achieve state improvements

Figure 4 presents the cumulative distributions for required reductions in total pressure for noticeable improvement in state, calculated as a weighed sum of projected pressures that are significant for the given state component. They are based on survey questions on the minimum, maximum and most likely pressure reduction required to achieve a noticeable improvement in the state of the habitat type in question.

The probability that a specific reduction in total pressures is sufficient to reach noticeable improvement is the cumulative probability of required pressure reductions to reach good state between 0% reduction in total pressure and the pressure reduction in question. This is based on an assumption that state is improved when total pressure is reduced. It also implies that cumulative probability is equivalent to the probability to reach noticeable improvement in the state of benthic habitats given the reduction in total pressure.

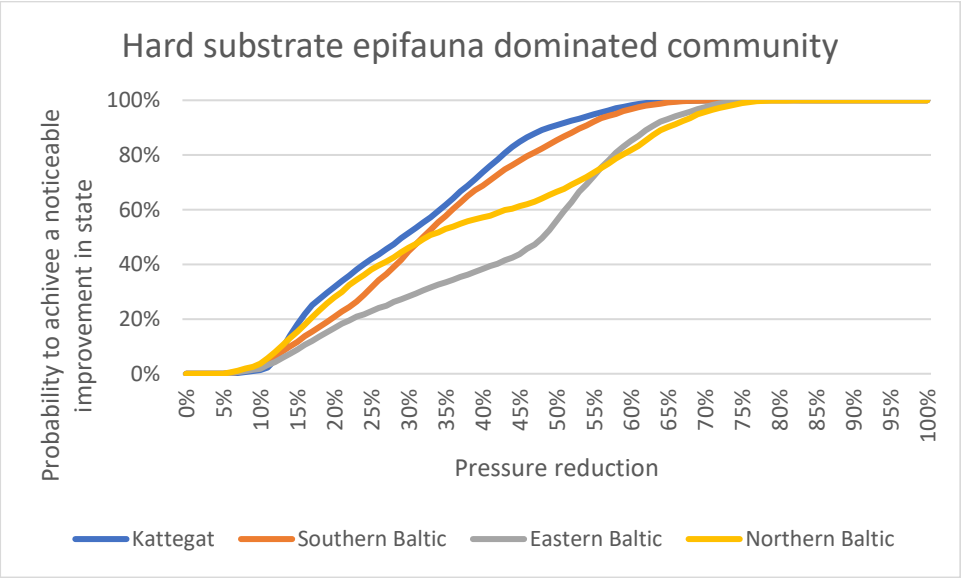


Figure 4. Probability to reach noticeable improvement in the state of hard substrate epifauna dominated community given the reduction in total pressure by habitat type and area

This figure seems to be difficult to interpret based on the comments – need to change the presentation or explain better in the text, and add examples

Gap assessment

The results on the reduction in total pressure from existing measures and the pressure reduction required to achieve state improvements (e.g. GES, or in the case of benthic habitats, a noticeable improvement) can be combined to indicate the probability to achieve a specific state improvement with existing measures.

In the version to the BSAP UP workshops, gap assessment could be presented first, followed by the detailed results for the different components.

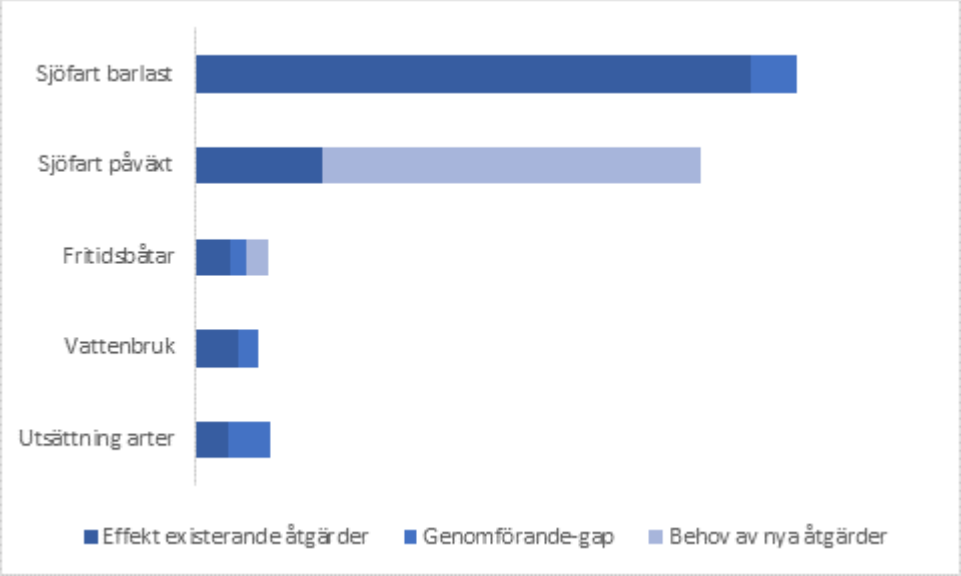
Table format could be used be used for the probability of achieving good state/specific state improvement by each state variable.

Columns could be state components and rows populations/assessment areas. Instead of standard deviation we can provide “confidence intervals” based on the percentiles of projected pressure reduction distributions. The cumulative distributions for probability to achieve good state can be put to an annex with explanation on how to interpret them.

Expected required reduction in total pressure to achieve good state/specific status improvement by 100% could be added to the cells, but that is hard to interpret.

If it would be possible to present the total pressure reduction needed as a percentage, we could use some sort of diagram to illustrate it. See below as an example, this is what we used for our national GAP-analysis

If it´s possible I would think that it would be pretty easy to interpret. This is just an example but if we have the data, I think this concept would be possible to depict in a fairly easy to understand diagram.



Explanation: Dark blue is the efficiency and the lighter blue is the remaining gap, divided into (implementation gap is blue, and need for new measures is light blue)

Supporting information to gap assessment

- where measures could potentially be needed (by area and activity/pressure/state component)
- what types of measures have already been implemented, which measures could potentially be effective (based on the most effective measure types).

Background of respondents

Altogether 20 survey responses with 23 experts were received to the effectiveness of measures survey for benthic habitats. Three of the answers were group responses, with two experts contributing to the response. For the pressure-state survey, there were 19 responses with 21 contributing experts. Two group responses were received.

Almost all experts stated marine or benthic ecology/biology as their field. Most experts had over 10 years of experience in their field (Table 5). Experts represented universities, government institutes, state agencies or ministries.

Table 5. Years of experience in the field for benthic surveys

	Effectiveness of measures		Pressure-state	
Years	**Number of experts**	**Share of experts**	**Number of experts**	**Share of experts**
0-2 years	0	0%	0	0%
3-5 years	1	4%	1	5%
5-10 years	3	13%	3	14%
10-20 years	12	52%	9	43%
over 20 years	7	30%	8	38%

Should this section be more detailed? It is possible to categorise the fields and organizations, and present number/share of experts for each category.

Annex: Visualization options

Colour scales and figures/graphs might be useful for providing additional ways to illustrate the results and improve the understandability of the results. The challenge is that often there are two or three dimensions that should be visualized, including the level/size of the variable of interest (e.g. effectiveness of a measure type) and the certainty of the information (e.g. standard deviation). In addition, experts' confidence in their responses should be reported and potentially visualized.

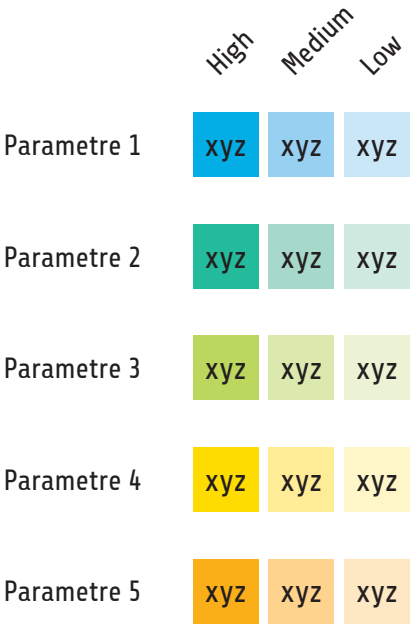
The next pages give options on the colour scale and visual presentation of the different dimensions. The general idea would be to indicate the level/size of the variable in question with the colour, and the certainty with the shade (darker = more certain). Additional visual cues, such as patterns, could be used. The circles with full or partial colouring could be used to illustrate experts' confidence in their survey responses.

Which colour scale is the best? Are any changes required?

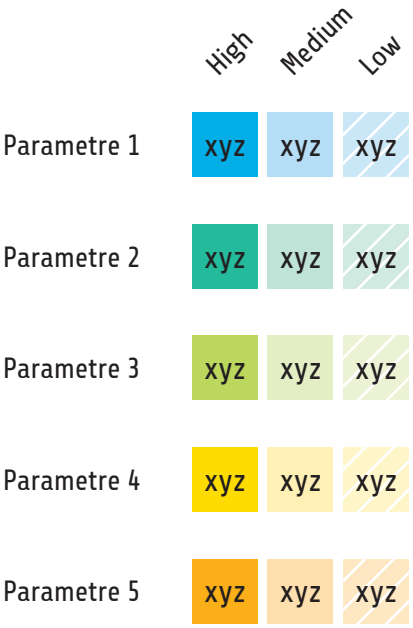
Are shades enough to illustrate certainty or should patterns be used in addition?

Option #1 – with fill variations

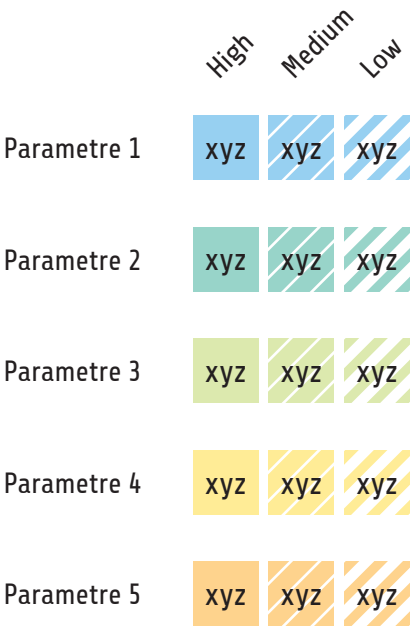
Variation #1



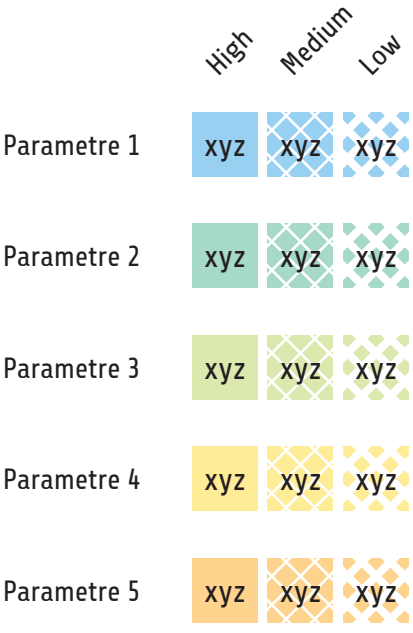
Variation #2



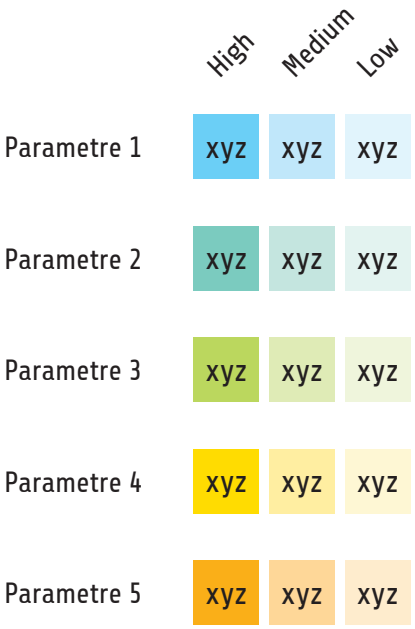
Variation #3



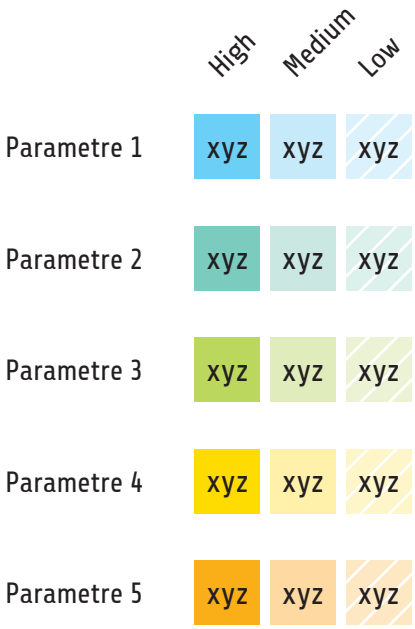
Variation #4



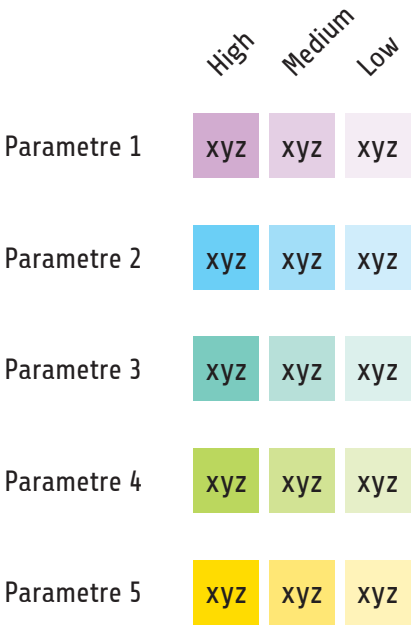
Option #6 (a)



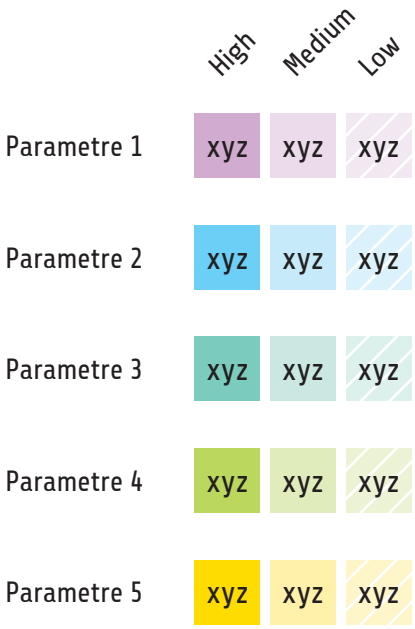
Option #6 (b)



Option #7 (a)



Option #7 (b)



Circle option