



Draft structure of the climate change work process.

Aim

The ultimate aim of HELCOM work on climate change has been identified as increasing the resilience of the system of the Baltic Sea with regards to climate change impacts.

To achieve this the climate change work within HELCOM needs to focus on a long-term, multi-disciplinary approach to understanding and communicating the implications of climate change for the marine and coastal environment. Simultaneously the lag time in transferring the quality assured science to the policy level, including providing clear guidance on the levels of confidence, needs to be reduced to ensure that the most current information is accessible to support decision making.

The following have been identified as objectives to support this process (see also Figure 1):

1. building HELCOMs function as a regional platform for a policy-science dialogue on climate change;
2. provisioning of robust, policy relevant, research-based knowledge on the state, impacts and vulnerabilities of the Baltic Sea and its surroundings to climate change;
3. reviewing policies in the light of climate adaptation.

To support these three objectives a coordinating framework for the Baltic Sea region is needed, including a stable climate change platform under HELCOM to closer link policy, regulators and leading scientists with a clear pathway from science to several levels of the policy process.

It is inherently recognised that other organisations and institutions around the Baltic Sea, and on the international stage, work closely with climate change related issues and policies at different levels. It is the hope that the proposed work and processes within this document might support and/or complement already ongoing initiatives and vice versa.

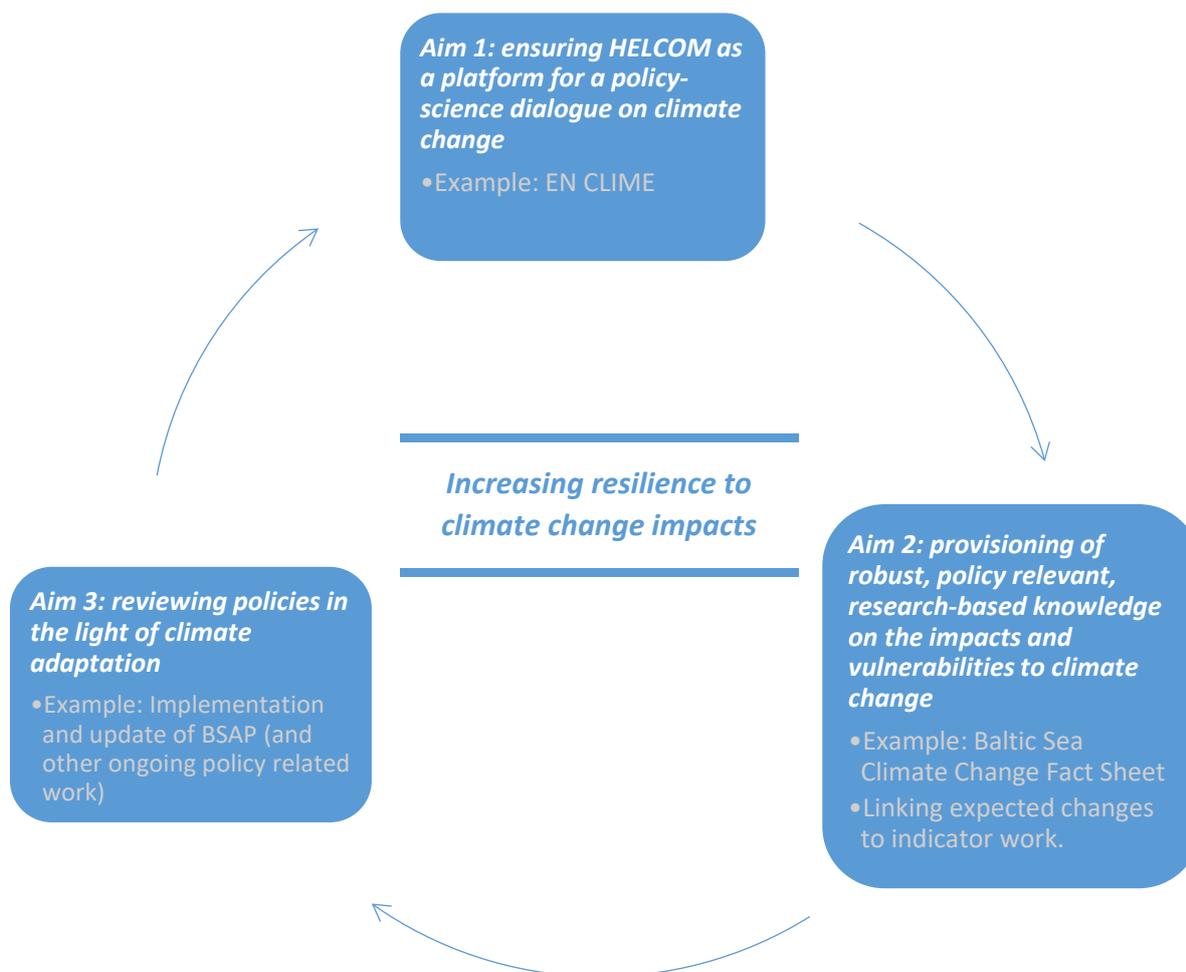


Figure 1. Linking the aims, tools and process of the dedicated HELCOM work on climate change, including example actions and deliverables.

Objective 1: ensuring HELCOM's function as a platform for a policy-science dialogue on climate change

The challenges presented by marine climate change impacts are by their nature a regional concern, covering aspects from science to high level policy. This requires a regional and inclusive working structure to allow the challenges to be tackled in an effective manner.

In the Baltic Sea region Baltic Earth functions as a focal point for technical marine climate change information and expertise. HELCOM in turn is a proven route for addressing issues of regional concern and for delivering high quality products with a regional policy level impact. Close cooperation under a coordinated framework between the two actors provides the opportunity for in depth understanding of the complexity of marine climate change impacts and collective consideration of appropriate adaptation responses.

Expert Network on Climate Change (EN-CLIME)

Such a platform for cooperation is suggested to take the form of a joint HELCOM/Baltic Earth Expert Network on Climate Change (EN CLIME). The group is to be housed under and guided by the State and Conservation group, in accordance with the working groups ToRs, and the Baltic Earth Science Steering Group, and work in close collaboration with other HELCOM Working Groups and Expert Networks, as well as Baltic Earth Working Groups.

The Expert Network, comprising of experts from both organizations and all relevant working groups, would oversee the operational delivery of the main scientific products of the work, as well as, other tasks assigned to them.

As climate change is a cross-cutting issue the proposed EN CLIME would need to have an inclusive working structure and prioritize close cooperation with both internal (e.g. HELCOM Working Groups and Expert Networks, Baltic Earth working groups) and external partners. In addition various organizations and experts may be invited based on need for specific expertise

The intention is for the work of EN CLIME to be an instrument to reduce the lag time for transferring quality assured science to end users, ensuring that new scientific findings on climate change and its impacts on oceans and seas is visible in marine policy making, as well as find their way into HELCOM decision-making and the day to day work. The work could also vicariously support the identification of knowledge gaps and identification of future research priorities.

Objective 2: Provisioning of robust, policy relevant, research-based knowledge on the state, impacts and vulnerabilities to climate change

The HELCOM 2018 Brussels Ministerial Declaration states the following:

WE EMPHASIZE the need to further strengthen the scientific understanding of the impacts of climate change together with multiple other stressors on the Baltic Sea marine environment, and AGREE that HELCOM should take action to bridge this knowledge to policy and practice.

Baltic Sea Climate Change Fact Sheet

One of the deliverables of the work under EN CLIME is planned to be a Baltic Sea climate change fact sheet. This fact sheet will contain a consensus view by the regions climate experts on parameters, both biotic and abiotic, identified as of relevance to the policy process. The fact sheet will strive to be a concise and easily accessible resource supplying a clear pathway from science to regulators and policymakers. The fact sheet will contain information, using agreed language (in line with IPCC), on what has happened and what can be expected to happen for the relevant parameters (a list of identified parameters can be found below).

The intention is for the fact sheet to be a science driven exercise, relying exclusively on, and synthesising, already existing detailed, peer reviewed information from leading marine and climate scientists. This is proposed to be done through a collaborative process using EN CLIME as a platform. The information is to be condensed to key messages, present visually, in an accessible and stable way across years, including information on trends. Information to support the statements in the factsheet will be available as separate publications, clearly referenced.

The first step in the process to link climate change and its effects to HELCOM work e.g. related to indicators, measures and Baltic Sea Action Plan goals, is to be to narrow the range of expected effects of climate change for as many of the abiotic parameters listed under Effects (see list below, also referred to as primary parameters) as possible and present how these parameters

- a) have changed already,
- b) how they are expected to change in the future (an appropriate set timeframe will be used for all the parameters, to be decided jointly by HELCOM and Baltic Earth).

The primary parameters can, together with uncertainty estimates, then be used to identify expected impacts on a number of secondary parameters (as listed under Impacts below). These represent parameters which will experience some form of impact as a result of the changes in the effect of the primary parameters. Wherever possible this information will also be presented in the fact sheet.

Once this information is in place an indicator, measure and goal can be mapped against both primary and secondary parameters (see figure 2 for an illustrative example). Those parameters which have a clear

influence on the indicator, measure or goal in questions can then be clustered. Due to the broad spectrum of climate change effects it is deemed to be insufficient to look at effect of primary parameters on a topic individually, as this might be misleading and result in inefficient actions. Mapping the parameters across a given topic creates a structured overview both of which abiotic and biotic parameters are influencing a given indicator, measure or goal, and how these parameters are expected to change over time. Identifying which parameters are of influences and what the expected effects are allows for a more targeted and precise deduction process of expected impacts. Once this is in place, identifying which policies and measures need to be reviewed and possibly revised is greatly facilitated.

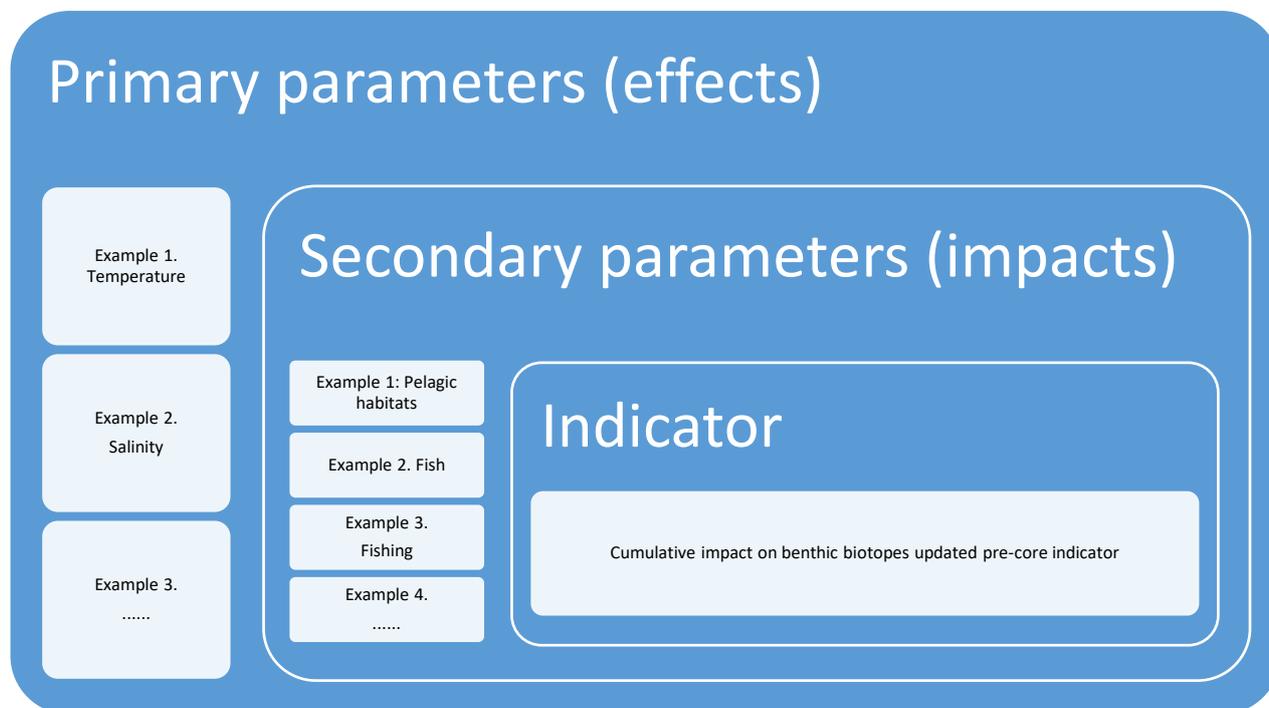


Figure 2. Simplified illustration of the sequence primary and secondary parameters feeding into a given topic (e.g. an indicator). it is also foreseen that to a varying degree there will also be effects and impacts within each of the respective boxes, e.g. changes in availability and species composition of fish due to changes in primary parameters is likely to have an effect on fishing, which in turn will affect the cumulative impact of benthic biotopes.

The long term intention is, in accordance with the agreement of the HELCOM Ministerial meeting in Copenhagen 2013, for successive fact sheets to track advances in the understanding of marine climate change state and impacts drawing on the best available science for the region.

Priority topics and parameters for the fact sheet

Within each parameter covered in the fact sheet it will be described how the individual parameters are affected by climate change, striving to answer the questions identified below. Some of this information will be presented in the fact sheet itself while more in depth information will be provided in the supporting material.

Questions of importance to support management measures include, but are not limited to:

1. What is happening? Provide information on already identified effects (e.g. rise in temperature in degrees)
2. Why is it happening? Very shortly explain the process causing the effect.
3. What are the direct consequences? Examples of consequences can we already see, if available.
4. What is expected to happen in the future? Present ranges of expected effects under each parameter (e.g. range of degrees of expected warming).
5. What are the gaps in knowledge for this parameter?

The following information will be provided if it is available:

6. What can be done about it? Especially focusing on avoidance, alleviation, adjustment and adaptation.
7. What is already being done about it?
8. How does it affect measures taken to reduce pressures on the Baltic Sea?

State and Conservation 8-2018 discussed and supported a number of possible parameters, both primary and secondary, which could be explored in the fact sheet. Once the structure of the updated BSAP is in place the parameters can be clustered under the appropriate BSAP goals. It is to be expected that some of the parameters suggested for the fact sheet will fall under more than one BSAP goal, as climate change is, by its nature, a horizontal topic.

These suggested parameters have been identified based on relevance for policy processes, including the work on indicators, and availability of information and expertise.

Effects (primary parameters)

Temperature (air)
 Temperature (sea)
 Air-sea flux of heat and water
 Atlantic Heat Conveyor (AHC)
 Sea ice
 Salinity
 Stratification
 Air-sea exchange of CO₂
 Acidification
 Sea level
 Seabed
 Weather
 Precipitation
 Storms and waves
 Erosion
 Large scale marine processes (spring bloom, spring/fall circulation, biological carbon pump etc)
 Oxygen
 Blue Carbon storage capacity

Impacts (secondary parameters)

<i>Biotic</i>	<i>Economic and social</i>	<i>Safety</i>
Pelagic habitats (including phytoplankton and zooplankton community structure)	Shipping	Nutrient enrichment
Benthic habitats (including community structure)	Tourism	Harmful algal blooms (HABs)
Fish	Built structures	Pollution
Waterbirds	Fisheries	Flooding
Marine Mammals	Aquaculture	Human health
Non Indigenous Species		Patogens
		Ecosystem services

Confidence and vocabulary

Uncertainty is an inherent part of climate scenarios and variability and uncertainty in climate projections are greater for smaller geographical scales. Hence the simulations for the Baltic Sea region can have larger uncertainty than those for the global level. To account for uncertainty the level of confidence in the presented information will be made available together with the key message, using the matrix and

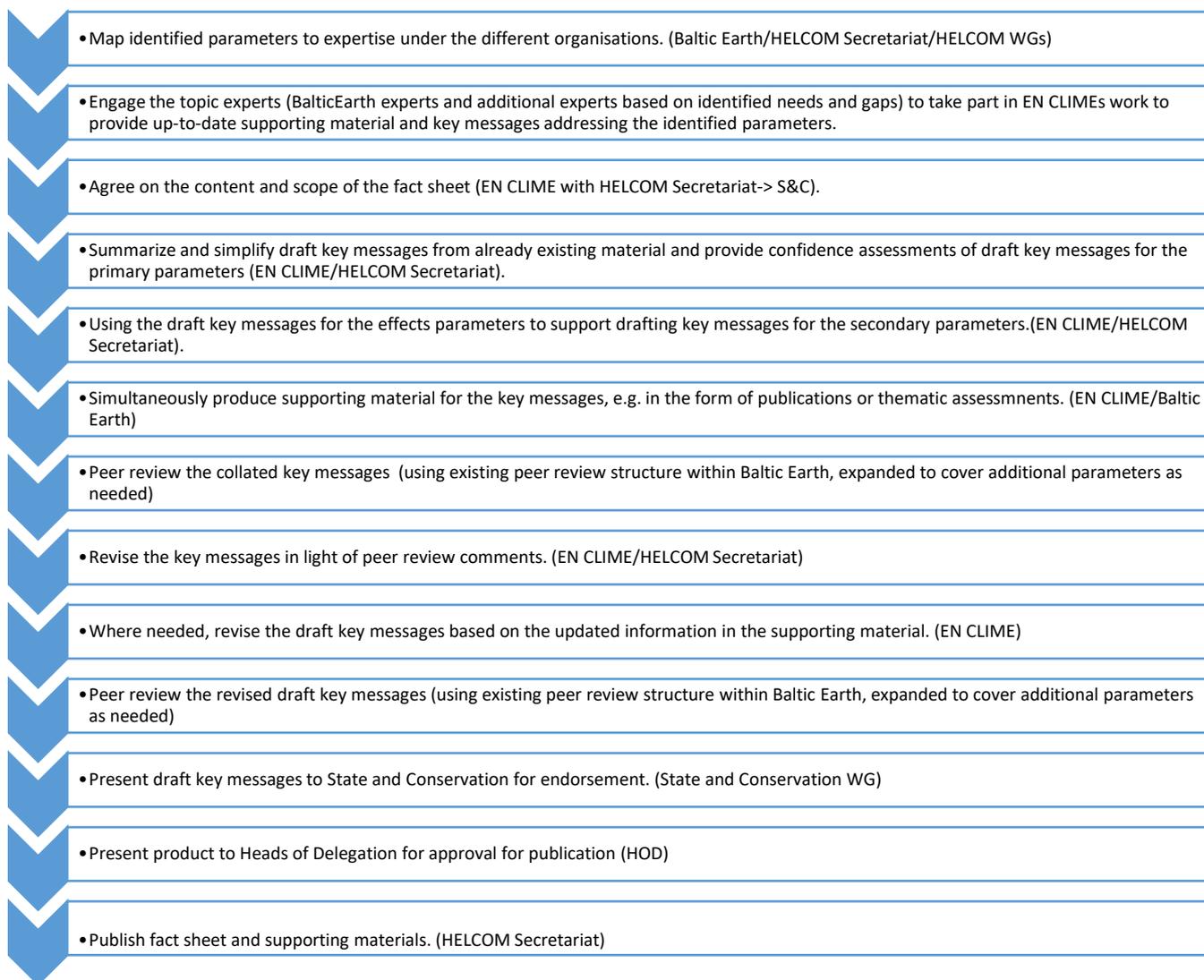
calibrated language developed by the IPCC. If appropriate background information such as ensembles of scenario simulations is available. Traceable accounts will be provided describing the evaluation and sources of the information behind the key messages. To support the provisioning of an estimate for the confidence of the research results presented in the fact sheet, descriptions will be supported by showing climate change results predominantly based on commonly agreed modelling, where possible, and in line with descriptions used in IPCC.

Proposed process for the work on the fact sheet

A key factor in the success of the work on the fact sheet and supporting material is clear division of labor, as well as clearly delineated roles, standing and commitment of the different levels and actors in the work process. HELCOM State and Conservation Working Group, the Baltic Earth Science Steering group and the EN CLIME will together ensure that the goal of the work is achieved, in close collaboration with potential partners. The proposed process has been elaborated in close cooperation with the Baltic Earth Science Steering Group Chair.

It is expected that the majority of the primary parameters will be covered by already planned Baltic Earth work (BEAR, Grand Challenges and BACC III), and the work on these has been planned to minimize any increase in workload. Baltic Earth already work on a broad consensus basis, meaning that most of the regional experts on a given topic are involved in their network or would be consulted. For the secondary parameters the intention is to, once the ranges are in place for the primary parameters, utilize expertise both within HELCOM (under the EGs and WGs) and Baltic Earth to suggest possible impacts, based on scientific results and expert judgement.

Work on the fact sheet is suggested to progress as follows:



Supporting material

It is crucial to have high-quality science, such as presented in the fact sheet, supported by complete background to ensure complete information and transparent presentation e.g. to support scientific advisors to political processes, who regularly evaluate and digest scientific information to provide input to the policy process nationally. This is why more in depth material will be available to support the statements presented in the fact sheet.

This includes a thematic assessment, produced in cooperation with Baltic Earth, which will identify and elaborate recent scientific findings and research results which have become available since the publication of the BACC II report. This will be compiled as a part of the Baltic Earth Assessment Reports (BEARs), which are planned comprehensive assessment reports for the Grand Challenge topics. The fact sheet will further be supported by other work of Baltic Earth under their Grand Challenges. The Grand Challenges are central topics identified by Baltic Earth as the most pressing scientific issues, knowledge gaps and uncertainties related to climate change, as well as other anthropogenic and natural changes in the atmosphere. Baltic Earth promotes efforts to address them through new studies, collaborations, synthesis and the development of tools and each Grand Challenge is addressed through a dedicated Baltic Earth Working Group. Other material such as IPCC reports (e.g. the Special Report on Oceans and Cryosphere in a Changing Climate (SROCC) expected for September 2019) will also be included.

Objective 3: Reviewing policies in the light of climate adaptation

In 2007, 2010 and 2018 HELCOM Ministerial Meetings noted that climate change will have impacts on the marine environment and this should ultimately be reflected in HELCOM policies. The HELCOM Ministerial Meeting in 2013 subsequently agreed to make the assessment of regional climate change and its implications on the Baltic Sea ecosystem a regular activity, collaborating with Baltic Earth in this respect, with the aim to eventually make it an indicator-based assessment.

The 2013 HELCOM thematic climate change assessment was followed by a HELCOM Workshop on Baltic Sea region climate change and its implications, aiming to specify more stringent actions and supplementary measures, as called for by the HELCOM Ministerial Meetings in 2007 and 2010. The Workshop recommendations were that, following the adaptive management approach, any changes in knowledge related to the effects and impacts of climate change should be communicated to the decision makers to enable possible changes to relevant policies.

The Helsinki Commission has stressed the importance of taking concrete steps to, e.g. make the issue of climate change more prominent overall in HELCOM work, especially as it affects regional targets, and the need to use research and innovative approaches to develop new solutions and techniques to address climate change related issues and translate them into policies.

The first step that needs to be addressed in order to review, and possibly revise, policies and associated measures in light of climate change is to have a clear picture of what changes can be expected. This knowledge allows advisors and experts supporting decision makers to narrow the range of possible expected outcomes and allows for more targeted and efficient measures to be put in place. This information is equally important when evaluating the effect of measures, i.e. when developing, modifying or assessing indicators.

Climate change and the update of the Baltic Sea Action Plan

The Baltic Sea Action Plan (BSAP) provides a concrete basis for HELCOM work and incorporates the latest scientific knowledge and innovative management approaches into strategic policy implementation, stimulating goal-oriented multilateral cooperation around the Baltic Sea region. The current BSAP is to be updated by 2021, based on the mandate given by the 2018 HELCOM Brussels Ministerial Meeting. The goal of the update process is set out as a robust action plan for the achievement of the comprehensive HELCOM vision – a healthy Baltic Sea environment.

The Contracting Parties decided that the updated BSAP will, in addition to existing commitments, address new issues based on the commitments made in the 2018 Ministerial Declaration and further deliberations during the BSAP update process. The importance of addressing climate change in the update process of the BSAP was highlighted in the 2018 Ministerial Declaration:

WE STRESS the need for research and adaptive management to strengthen the resilience of the Baltic Sea in the face of climate change impacts. **WE AGREE** to increase HELCOM's preparedness to respond to climate change impacts, by taking foreseen climate change impacts into account when updating the BSAP and by exploring the needs and possibilities to further adapt HELCOM's policies and recommendations 1) in line with existing objectives of protection of the marine environment and sustainable use of marine resources, also under the changing climate, and 2) to maximise the capacity of the Baltic Sea ecosystem to contribute to mitigation of climate change through blue carbon storage.

The intention is to have climate change, and the expected effects of climate change, be a horizontal theme in the updated BSAP, so as to allow for increased resilience, supporting the vision of a healthy Baltic Sea even in a changing climate.

To support the implementation of the updated BSAP there is a need to follow up on changes in understanding the expected effects of climate change, which allows for estimating whether proposed actions are sufficient to reach good status