



HELCOM Indicator Manual 2025 update

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1.

HELCOM indicator manual – introduction



HELCOM indicators are developed to evaluate the status of biodiversity elements, evaluate other relevant environmental condition factors, evaluate human-induced pressures on the Baltic Sea, and support broader assessments and overviews in the region.



The HELCOM indicators are a critical component of the Baltic Sea Action Plan (BSAP) and its approach to the assessment of good ecological/environmental status (referred to as 'good status' from here on) in the marine environment. The indicators, and the key assessments of state and pressures they feed into, generally address issues under one of the four goals of the BSAP (see Figure 1). The indicators provide a mechanism to address the effectiveness of the measures put in place to reach the goals and objectives of the BSAP, by regularly synthesising common regional monitoring data into an evaluation of progress towards these goals and the BSAP vision.

Previously, within HELCOM, indicator development has taken place via HELCOM projects such as CORESET I and CORESET II, and supported by other large regional projects (e.g. the EU co-financed SPICE Project – see also list of HELCOM Projects). However, as the HELCOM structure (e.g. implementation of numerous topic specific Expert Groups)

and approach for indicator development (e.g. application of lead country approach) has advanced, as well as the sheer number of individual indicators (HELCOM indicator web page), so has the need for the development of a clear strategy to outline the relevant processes for the develop and management of new and existing indicators.

This manual describes the optimal development and management of HELCOM indicators. It is however clear that, especially where development is underway or initial indicator evaluations are tested (e.g. candidate or pre-core indicators), not all proposed optimal solutions presented here will be achieved immediately. Some of these optimal solutions may not be possible even at the stage of an indicator becoming a core-indicator, such as where data flows or automation are involved (despite an indicator being functional, approved and capable of carrying out an evaluation). In such cases, this manual should be considered as a guideline to achieving a fully operational and optimal HELCOM indicator.

A major aim of this manual is to compile available information of relevance to the HELCOM indicator process into a single document. This overview is intended to outline the stages and process of indicator development, requirements for HELCOM indicators, division of responsibilities, and the flow of information (e.g. between Expert and Working Groups). With clear and accessible guidance technical development can be streamlined and approval stages facilitated.

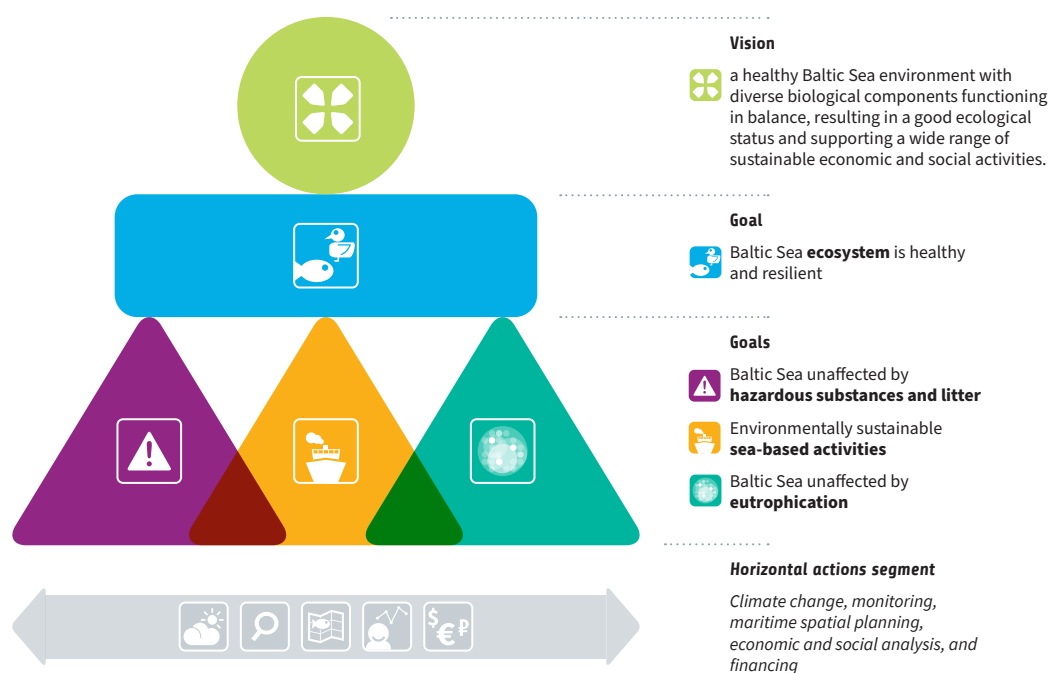


Figure 1. Vision and goals of the Baltic Sea Action Plan to which the HELCOM indicators contribute.



The indicators are selected according to a set of principles including ecological and policy relevance, measurability with monitoring data, and linkage to anthropogenic pressures.

1.1. Purpose and significance of HELCOM indicators

1.1.1 What is a HELCOM indicator?

HELCOM indicators are developed to evaluate the status of biodiversity elements, evaluate other relevant environmental condition factors, evaluate human-induced pressures on the Baltic Sea, and support broader assessments and overviews in the region. The observed status of HELCOM indicators is measured in relation to a regionally agreed threshold values (or targets/ceilings). These values are generally specific to each indicator and thus the application of targets/ceilings may take the form of maximum, minimum or a range values and there can also be variation in the threshold value(s) (quantitative values or approach) within an indicator or between indicators, as discussed in greater detail below. Under optimal conditions these indicators also use data from regionally coordinated monitoring under the auspice of HELCOM. The outcome of an indicator evaluation is expressed in terms of failing or achieving the threshold value and this is therefore indicative of if good status is achieved or not for each specific indicator.

The indicators are selected according to a set of principles including ecological and policy relevance, measurability with monitoring data, and linkage to anthropogenic pressures. They are then developed by lead Experts through regional cooperation, using the best available scientific knowledge as the basis. Each indicator is reviewed by technical and policy experts from across the region (Expert and Working Groups) during both their development and any subsequent updates.

Operational and valid HELCOM indicators contain the following basic elements: 1) Scientific concept, 2) Assessment protocol, 3) Monitoring and methodology, 4) Threshold value(s), 5) Data management, 6) Evaluation results, and 7) Environmental and policy context. These key elements provide a structured and transparent framework for the evaluation of good status. These components, in addition to other relevant structures and procedures (see Figure 2), are described in greater detail within the main body of the document, below.

1.1.2 Why does HELCOM develop indicators?

Through evaluating the status of biodiversity, as well as human-induced pressures on the Baltic Sea, the HELCOM indicators support measuring progress

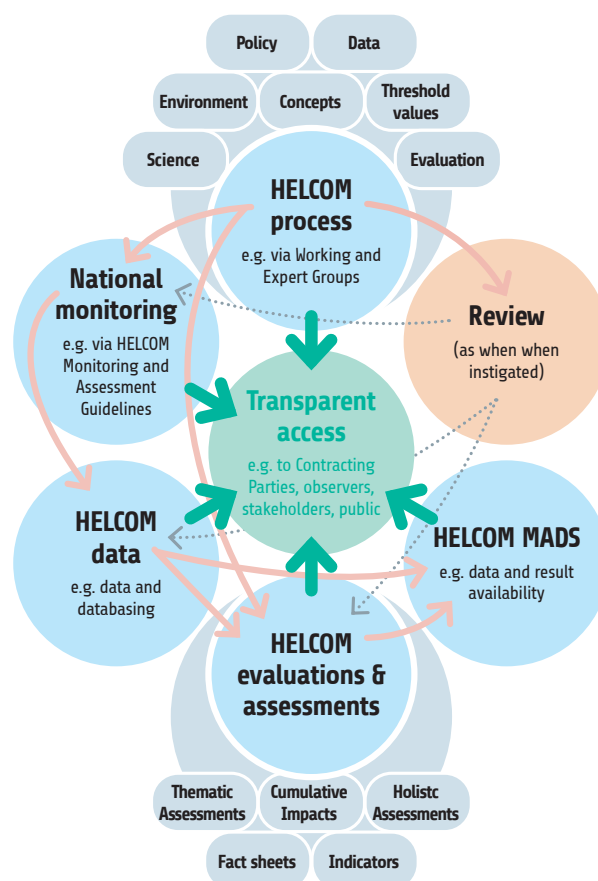


Figure 2. Overview of interacting elements that contribute to transparent and accessible HELCOM indicator evaluations.



towards regionally agreed targets and objectives, as defined under the BSAP. HELCOM indicators form the basis of status assessments in the Baltic Sea region, further contributing to broader thematic and integrated assessments. The indicators are reliant on clear and well documented scientific reasoning, fulfilled by regionally agreed monitoring (HELCOM Monitoring and Assessment Strategy), incorporate data from national monitoring programmes (and make it public), provide transparent assessment methods, and assess the achievement of good status against regionally approved and scientifically substantiated threshold values (or targets/ceilings).

Each HELCOM indicator addresses a topic of importance in the Baltic Sea region (often being topics of wider or even global relevance), directly evaluating one or a few closely related components, to provide an ecologically relevant evaluation. Furthermore, when integrated and agglomerated in a holistic manner these independent components can provide support for an ecosystem-based evaluation of status over a given time period. In doing so these assessments evaluate progress towards the goals and objectives of the Baltic Sea Action Plan (BSAP) and provide the Contracting Parties of the Helsinki Convention with an approach towards their vision to improve the environmental status of the Baltic Sea. Moreover, the HELCOM indica-

tors provide the Contracting Parties of the Helsinki Convention that are also EU Member States with the possibility to directly address relevant Marine Strategy Framework Directive (MSFD) descriptors and criteria. Similarly, HELCOM indicators can also contribute to other policy initiatives for example supporting the evaluation of relevant United Nations Sustainable Development Goals (UN SDGs).

The individual indicators have the capacity to contribute to broader thematic, integrated and cumulative assessments in the region, and when regularly updated over longer time periods enable trends to be documented, and improvements towards achieving good status to be identified. By their nature these HELCOM indicators improve the understanding of the marine environment and have the potential to be of direct relevance within a conceptual management frameworks, their status showing the balance between human activities, remedial measures applied, and the natural biogeographical conditions of the Baltic Sea.

All HELCOM indicators should therefore be well planned (i.e. relevant to policy and/or environmental issues), in keeping with the regional approach applied through HELCOM, adhere to highest possible quality standards (e.g. best available scientific knowledge), and be developed and applied in a completely transparent manner.



2.

The making of a HELCOM indicator



An indicator can be proposed via two main routes, 1) Bottom up – via HELCOM Expert Groups, or 2) Top down – via HELCOM Working Groups (or high level meetings, such as: Heads of Delegation (HOD), Ministerial Meetings).



This section addresses the general process through which an indicator can be proposed and developed within HELCOM, bringing the idea or concept through to an operational indicator.

2.1. Proposal of a HELCOM indicator

An indicator can be proposed via two main routes, **1) Bottom up** – via HELCOM Expert Groups, or **2) Top down** – via HELCOM Working Groups (or high level meetings, such as: Heads of Delegation (HOD), Ministerial Meetings).

1) Bottom up:

Experts nominated and engaged in HELCOM work (i.e. members of HELCOM Expert Groups) are able to propose relevant issues to their Expert Group. Where supported by the members of the Expert Group, and scientifically substantiated, the proposal can then be lifted to the appropriate Working Group (via practical support by the Secretariat). The proposal will then be considered for approval as a candidate indicator (see process and definitions in later segments).

For clarity and to support the decision-making process at the Working Group level as much relevant information as possible should be included in the initial proposal. Where possible all sections and categories within the HELCOM indicator template should be addressed within a short summary of the idea. The minimum information required at this stage includes addressing the following aspects:

- indicator name
- policy, societal, and ecological relevance and significance (for example the recent review and gap analysis carried out, or later related/ equivalent processes)
- indication of the activities and pressures involved
- indication of data availability or if data is missing, inclusive of the relevance for national monitoring programmes (i.e. if already monitored or requires additional monitoring to be discussed)

Where possible and the information is already available, addressing the following aspects would be beneficial:

- information on the initial approach/methodology to be applied and focus of the indicator evaluation.
- an indication of resource requirements where possible (e.g. need for a lead, time required for development, optimal data flows and practical intermediate solutions, monitoring requirements, analytical costs, etc as appropriate)

2) Top down:

Issues of relevance for the development, review or adjustment of HELCOM indicators may be identified via the HELCOM Working Groups, or other high level and strategic groups (for example: HOD, Ministerial Meetings). In such cases an issue may be referred to the Expert Groups with a request for information gathering and the guidelines above (under Expert identified factors) related to specific indicator development would then apply.

2.2. Approval and validation of an indicator

The approval of an indicator from the idea or concept stage is shown in the diagram below (Figure 3). In essence the idea should be developed to provide an indication of function and potential, within the Expert Groups, leading to an approval step by a relevant HELCOM Working Group to create candidate indicator status. Review and guidance from a Working Group, and approval to a candidate indicator, should happen at an early stage to ensure efficient resource/time use (national and withing Expert Groups).

State indicators and pressure indicators (see below) will be handled by State and Conservation and PRESSURE, respectively (described as ‘relevant Working Group’ from here on). At this stage it should ideally also present the opportunity for the relevant Working Group to identify the lead and/or co-lead countries and the identified experts (indicator contacts) to further the development.

A candidate indicator is then developed further by the leads/co-leads, with the support of the ‘host’ Expert Group, before a more developed concept is available. Once the concept has been transferred to the indicator template and all components drafted, even if aspects such as threshold values or data flows may require further work/approval, then a version can be approved as a pre-core indicator by the relevant HELCOM Working Group. To achieve core indicator status the indicator in question should fulfil certain criteria (see below), though data availability and approved





threshold values are two critical components. Threshold values should be approved initially by the relevant HELCOM Working Group and subsequently by HELCOM HOD (or appropriate high-level sections, e.g. the HELCOM Commission meetings). The elevation of an indicator from pre-core to core itself is decided at the relevant HELCOM Working Group, with consideration given to the above. An indicator can also be converted to a core indicator by a Working Group on the understanding that HOD approval on the threshold value(s) is pending, the indicator only returning to the Expert and Working Groups as a pre-core if threshold value approval is not achieved.

2.2.1 Threshold values

Threshold values, or the accepted deviation from a defined reference value, are a critical component of an indicator evaluation, providing the demarcation value at which good status, indicative of a healthy Baltic Sea ecosystem, is achieved. In this way the threshold values utilise scientific knowledge (such as baselines, levels, concentrations, or historic data trends) to provide an understanding of each environmental component evaluated against a commonly agreed and scientifically founded concept that represents ecosystem health. Like so, aspects such as an ecosystem undisturbed by anthropogenic pressure are considered, with the threshold value in essence encompassing the delicate balance between a healthy Baltic Sea and the sustainable use of the marine environment.

Threshold values are generally specific to the indicator in question, and therefore approaches for setting these values and defining good status

will differ between indicators, topics or themes. Furthermore, threshold values (i.e. the quantitative value) may also differ spatially within a single indicator (i.e. between assessment units) to account for local and sub-regional biological, physical or hydrographical variation. In such cases the description of a clear harmonised threshold value setting approach is critical to the understanding of the indicator. There are also cases where an indicator may not be applicable in certain assessment areas or sub-regions (or remain under development) and this must also be clearly reflected in the indicator report.

Threshold values are applied within indicators to address State (i.e. status of the marine environment) or Pressure (such as targets or ceilings for inputs) components. Despite the described differences there are certain commonalities. Moreover, there is also effort made to utilise similar threshold values (where scientifically justifiable) or at least common threshold value setting approaches across broader regions, thereby facilitating comparisons across and between different sea areas. Threshold values should be developed with the following aspects in mind:

- the highest possible level of scientific justification,
- clear referencing to the relevant documentation,
- clear and understandable explanation (for policy, public and scientific community),
- direct relevance to policy requirements,
- where possible comparability across all relevant policy requirements.

The threshold value setting approach should be defined via the relevant 'host' Expert Groups and presented to the relevant HELCOM Working Group



Threshold values, or the accepted deviation from a defined reference value, are a critical component of an indicator evaluation, providing the demarcation value at which good status, indicative of a healthy Baltic Sea ecosystem, is achieved.

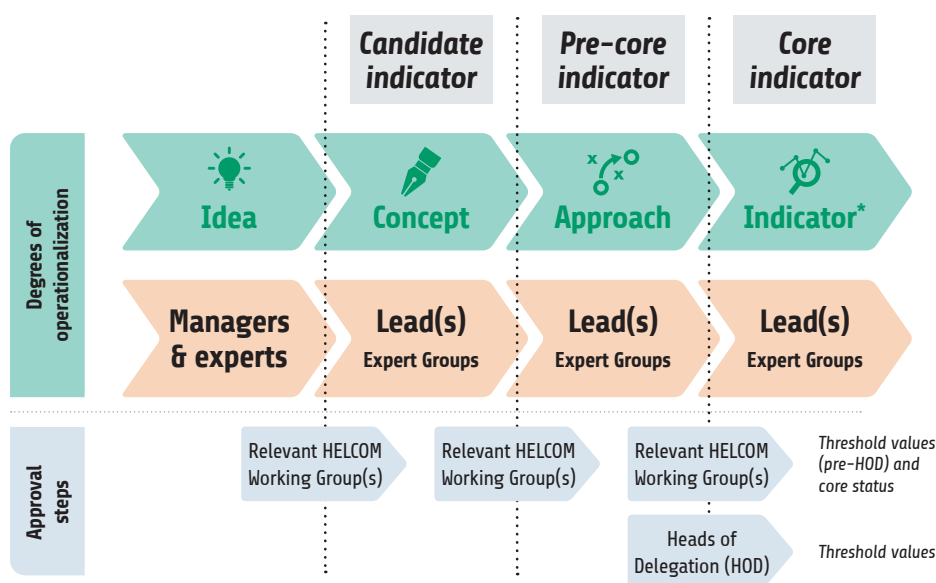


Figure 3. Generic overview of development and approval stages for HELCOM indicators. *) capable of an assessment



for approval at the earliest opportunity. The final approval of the threshold value takes place by HELCOM HOD, after recommendation from relevant Working Group. It is important to note that national approval processes related to threshold values can require a significant period of review (as much as three months), so early presentation of well-defined and justified threshold values is encouraged. Where possible, and to encourage effective approval, the relevant Working Group(s) should ideally be presented with the threshold value proposals three months in advance of the HOD meeting that will approve them. Within the indicator report this/these value(s) must be clearly presented, described in relevant detail, and be supported by referencing to the literature from which it was derived.

Where preliminary threshold values or trend-based threshold values are applied as a temporary approach, a review to assess the possibility to apply fully quantitative threshold values should be carried out prior to the following indicator evaluation phase (or update). There may also be cases where a quantitative threshold value is not possible to apply and precautionary qualitative or semi-quantitative approaches (e.g. no decrease) are applied, an aspect that should be well defined in the relevant section within the indicator report. Furthermore, during an update of the indicators (i.e. at a defined assessment or update) threshold values should be reviewed by the indicator leads/co-leads, supported by the 'host' Expert Group, to consider if they continue to reflect the best scientific knowledge available, and maintain the ambitious and precautionary ideals of HELCOM. It must also be noted that any proposed alteration in threshold values or the setting of these must follow due process and be approved by the

relevant Working Group(s) and subsequently endorsed by HOD. Any change in the approach or threshold value must also be reflected in the report with a section of text explaining how it influences the interpretation, in particular compared to any previous evaluation carried out (i.e. earlier archived versions of the indicator report).

2.2.2 Degrees of operationalisation

The specific functionality of the individual indicators making up the catalogue of HELCOM indicators will differ, partly due to the nature of the issues addressed but also due to the level of operationalisation per indicator. A HELCOM core indicator represents an indicator developed to a level of operationalisation that enables a full and functional assessment to take place based on the agreed and approved methodologies and threshold values. The core indicator status does not however directly address issues such as data availability, quality of data flows, or level of automation for carrying out an assessment.

Aspects related to data and data flows will be addressed below. In brief, the degree of operationalisation will likely be influenced by the data availability across the region, the implementation of best data flows, the development of appropriate and functional database solutions, and the automation of the assessment procedure (methodology) itself. These aspects often have significant resource implications (both for the Secretariat and the Contracting Parties of the Helsinki Convention) and while some core indicators may have sub optimal solutions the aspiration is to achieve more optimal solutions and improve the quality, functionality, and accessibility of the indicator evaluations and their underlying data.



3.

HELCOM structures and roles with relevance to HELCOM indicators



To achieve regional coherence in HELCOM monitoring and assessment, including for indicators, the Baltic Sea is sub-divided into defined assessment units covering major hydrographical divisions of the Baltic Sea as well as other relevant policy-related divisions.



The following section covers practical components such as scales of assessment used within HELCOM and the roles of different individuals or structures involved in indicator development.

3.1. Relevant scales for HELCOM indicator evaluations

To achieve regional coherence in HELCOM monitoring and assessment, including for indicators, the Baltic Sea is sub-divided into defined assessment units covering major hydrographical divisions of the Baltic Sea as well as other relevant policy-related divisions. The units represent different levels of detail, in a regionally agreed hierarchical, nested system with four assessment unit levels. The assessment unit levels currently used in HELCOM range from coastal water bodies (level 4, used e.g. by the Contracting Parties of the Helsinki Convention that are also EU Member States under the Water Framework Directive) to the entire region (level 1), and enable assessing each core indicator at its most relevant spatial scale, as well as making comparisons across indicators and geographical areas possible. The appropriate assessment scale for each core indicator is agreed on based on ecological relevance. The assessment units can also be further aggregated within one assessment scale to better reflect ecologically relevant scales or species management units where needed. For example, several sub-basins at a smaller division scale when taken together may comprise the assessment unit with respect to a certain indicator. This approach is applied for example in the case of core indicators representing the abundance and distribution of seal populations. Maps showing the delineation of assessment units at each of these scales are presented in attachment 4 of the HELCOM Monitoring and Assessment Strategy (also available through the HELCOM Map and Data Service). In thematic and holistic assessments, the status derived by an individual indicator is aggregated to provide an overarching status for a specific theme (e.g. the BSAP goals or objectives).

3.2. Development of indicators – the ‘lead country approach’

The indicators themselves are HELCOM ‘products’ (i.e. public products for all the Contracting Parties of the Helsinki Convention, see about HELCOM), but are inseparably linked to the regionally agreed and nationally implemented monitoring programmes, to the lead(s)/co-lead(s) that drive the practical development, and to the clusters of regional experts that foster them within HELCOM Expert Groups (Expert Groups, Expert Networks, Correspondence Groups and Intersessional Networks).

The roles of lead and co-lead country are provided through self-nominations within the HELCOM Working Groups or Heads of Delegation (HOD, see HELCOM at work). This process provides a form of adoption for an indicator, with one (or several) named experts assigned to act as contact point(s) and lead the work in practise.

The large majority of work on indicators is intersessional and carried out by a small number of nominated individuals, supported through relevant HELCOM Expert Groups. Descriptions of roles are set out below.

3.2.1 Lead country (and nominated experts)

The responsibility of the lead country (via the nominated expert(s)) is to drive the work on the individual indicator(s) under their auspices forward (be it development, evaluation or an update). The nominated indicator lead is responsible for leading the work in practical terms, for example: developing the evaluation approaches to be applied, preparing proposals for appropriate threshold value setting, providing background material explaining the approach, justification of the threshold value, and guidance for how to run the indicator evaluation etc. The lead(s) also carry out the regional evaluation for the indicator, however, for this task national Experts from across the region are needed to support the work, e.g. through review of the evaluation results. The Expert Group(s) function as a forum for this (see below). The lead(s) then prepare the textual information for the indicator report outlining the evaluation process and results. Where a co-lead country (or several) is appointed the lead should work closely with the co-lead(s) to share the work appropriately.

The lead(s) should develop indicator specific work plans outlining what is needed to order to operationalize or improve the indicator in question, including but not limited to identifying critical aspects where addition support will be required (from the Secretariat or other Experts, e.g. the Expert Group), identifying where





improvements are needed (e.g. data flows), as well as outline a timeframe for the work and any resource needs identified.

Existing 'host' Expert Groups should be used as a forum for discussing and reviewing the indicator work carried out by the lead(s). In this respect it is important that indicator lead(s) and co-leads are active participants of the relevant Expert Group(s). The HELCOM Secretariat will provide practical support and guidance where required (see more details below).

3.2.2 Co-lead country (and nominated experts)

Where only co-lead countries (i.e. the nominated expert(s)) are identified they will jointly take on the role described above for the lead country. Where a lead country exists and a co-lead country is also named the supporting role of the co-lead, and division of responsibilities and tasks, should be discussed internally within the indicator lead consortium and the outcome communicated to the Secretariat and Expert Group(s), as required. Overall, the co-lead should support the lead so as to ensure the tasks outlined in the section above can be effectively carried out.

3.2.3 Expert Groups

HELCOM Expert Groups offer a forum for scientific discussion by nominated Experts from across the region. These groups offer the opportunity for information exchange and the integration of best scientific knowledge, a foundation of the indicator work. The work is often guided by both the scientific input and direct guidance or requests from other HELCOM Groups (e.g. Working Groups), with a two-way exchange between Expert and Working Groups being vital. HELCOM Expert Groups provide the regional forum through which the indicator development should take place. All indicators submitted to HELCOM Working groups must be considered and supported by a suitable 'host' Expert Group prior to submission in order to secure regional coordination on the expert level.

Expert Groups are to support the work of the indicator leads and co-leads, in particular where sub-regional or national issues may be pertinent. The experts in the 'host' Expert Group should provide input, guidance, support, and critical review at all stages of the process, including: methodological development, threshold value identification, indicator evaluation (and update), and review of the indicator report. This process may take place through smaller teams within an Expert Group, as can be defined within an Expert Group, to foster a specific indicator or share tasks for several indicators. However, the Expert Group, as a whole,

needs to be kept informed of the work on indicators since the involvement of the Expert Group(s) is critical in the flow of information, understanding, acceptance, and approval at later stages of the process. Strong interaction, thorough review and integration of expert knowledge from across the region should facilitate a clear path towards an operational and accepted core indicator.

In addition, Expert Groups and indicator leads/co-leads will be requested, at designated points defined by HELCOM processes (e.g. as determined by Working Group or higher levels), to take part in review and evaluation processes to support the overall development of indicators (e.g. gap filling or fitness checks) and how to appropriately address the evaluation of good status in the marine environment. Furthermore, Expert Groups (and indicator leads/co-leads) will be integral to supporting other related processes such as thematic assessments or assessments of cumulative impact that may directly incorporate indicator data and evaluations. These aspects are introduced in greater detail at later stages within the document.

Not all HELCOM indicators currently have 'host' Expert Groups. While hosting within a suitable Expert Group is the primary aim the Secretariat will aim to identify alternative solutions that provide the input equivalent to Expert Groups.

3.2.4 Secretariat

The Secretariat will maintain the overall HELCOM indicator catalogue, support indicator leads with practical aspects (e.g. meetings, transferring relevant information to meetings, producing indicator evaluation maps), and guide the indicator leads and Expert Groups (e.g. aspects such as templates, deadlines, and input from relevant Working Groups or processes). The role will be dominantly one of facilitation to support the work of the Experts and lead(s) or co-leads.

The Secretariat will maintain the online catalogues of indicators so that they are up to date and publicly available, as well as available to the Contracting Parties of the Helsinki Convention. A list of leads and co-leads and the respective indicators will also be made available on the indicator site.

The Secretariat will maintain an archive of previous indicator evaluations, including data and results, so that all historic material is available. The Secretariat will also maintain an available reference and linkage to the threshold values used and their approval step within HELCOM.

The Secretariat will also document aspects that emerge and could, in the future or with additional resources, provide better solutions to existing indicator evaluations, for example database or data flow solutions that could strive towards greater automation of the process.





4.

Categories of HELCOM indicators and their definition



HELCOM indicators fall into two major categories: State and Pressure indicators. These indicators address either State or Pressure components. The development process towards an operational indicator follows three major steps (development phases): candidate, pre-core, and core.



HELCOM indicators fall into two major categories: State and Pressure indicators. These indicators address either State or Pressure components and are characterised by the aim to apply either threshold values (usually indicative of good status) or targets/ceilings (usually related to acceptable input levels defined through international or HELCOM initiatives, e.g. HELCOM recommendations) to the assessment of good status and thereby evaluate the health of the Baltic Sea ecosystem. These represent the 'key indicator types' used in evaluating good status in the Baltic Sea marine environment.

The development process towards an operational indicator follows three major steps (development phases): candidate, pre-core, and core.

There are however other relevant categories of indicator ('supporting indicators') that can provide vital information and support the overall assessment of good status in the Baltic Sea region, including: those used by selected Contracting Parties of the Helsinki Convention (Supplementary indicators), indicators that provide information about relevant drivers or activities (Drivers indicators), indicators that chronicle important processes (Element indicators), and indicators that act as early warning systems in the ecosystem (Surveillance indicators), or define progress towards other agreements (Aspiration indicators). Of these categories of indicators the Supplementary indicators would follow the development phases above (candidate, pre-core, to core) while other categories would be more representative of fact sheets (or supporting information) and go through approval and guidance steps at the relevant Working Groups (since the supporting indicators would not apply threshold values and carry out status evaluations per-se).

4.1. Key development phases of an indicator

The key development stages for an indicator include candidate, pre-core, and core HELCOM indicator stages. These three indicator categories represent differing levels of development for a single

indicator, from candidate through to core, and are key in evaluating good status (State or Pressure). Definitions are provided below.

4.1.1 Candidate indicator

A candidate indicator is an indicator with a concept that has been provisionally defined, that meets an assessment need, and where the concept has been approved for further development.

Candidate indicators are HELCOM indicators where a gap in the assessment of status of the Baltic Sea marine environment has been identified (by Experts or Managers), the concept for an indicator and evaluation has been established, and the relevant HELCOM Working Group has approved the concept for further development (i.e. approved the concept as a candidate indicator).

These indicators may not yet have a common understanding developed but the approved concept should identify critical aspects such as: the indicator name, the policy (e.g. BSAP and MSFD) and ecological significance, the activities and pressures involved, and the availability of data for an evaluation. Where possible the following aspects should also be addressed when the concept is provided to the relevant Working Group for approval: relevance for national monitoring programmes (i.e. if already monitored or requires additional monitoring to be discussed), an initial approach/methodology to be applied (including threshold values if already known), and an indication of resource requirements where possible (e.g. need for a lead, time required to develop, optimal data flows and practical intermediate solutions, monitoring requirements, analytical costs, etc as appropriate).

On approval as a candidate indicator the Working Group providing approval should seek to identify a lead/co-lead country(s) and contact persons to further the work, the 'host' Expert Group to foster the indicator development, and request a plan (time-line) for the development of the indicator to be prepared.

The list of candidate indicators thus represents a living list of potential indicators.

4.1.2 Pre-core indicator

A pre-core indicator is an indicator with a defined concept that has been elaborated significantly to provide a full indicator report (within the HELCOM indicator template) and a valid evaluation, yet may be lacking complete data (e.g. full monitoring data) or may not currently have full agreement and consensus on all components (e.g. threshold values).

Pre-core indicators should be adopted on the basis that they address an identified policy and/





Pressure indicators measure progress towards environmental targets or input targets, whereas State indicators evaluate state of the marine environment against the quantitative threshold value(s) defined as indicative of good status.

or ecological assessment component, and that the Contracting Parties of the Helsinki Convention aspire to compliment them with suitable national monitoring to fulfil further development, though in the mean-time relevant data compilations (e.g. via data calls) can be utilised. The pre-core category should be available and visible with the limitations clearly defined in the reports so that information and progress is clearly visible and can complement broad assessment initiatives within HELCOM.

4.1.3 Core indicator

A core indicator is an indicator that is adopted by all the Contracting Parties of the Helsinki Convention, utilises monitoring data, and carries out a scientifically justified evaluation against a well-defined, quantitative and approved threshold value(s) or environmental target(s).

Two major types exist, Pressure and State indicators. Pressure indicators measure progress towards environmental targets or input targets, whereas State indicators evaluate state of the marine environment against the quantitative threshold value(s) defined as indicative of good status. These targets or threshold values provide the possibility for carrying out an evaluation against a qualitative value.

Both types of indicator should, where possible, also provide information on trends (within the assessment period and over relevant longer scales). Trend data is a critical supporting parameter within an indicator. While an indicator evaluation generally defines the proximity (fail, achieve, distance from) of the current evaluation to the defined threshold value or target for a given assessment period (e.g. a six-year period) it does not directly address progress towards the relevant BSAP objectives. Trend data, and subsequent regular indicator evaluations, provide an additional indication of progress towards the BSAP objectives.

A HELCOM core indicator should consider and include the following aspects:

- A concise indicator name (and a longer indicator title, if required).
- A clearly defined and scientifically justified assessment concept.
- A clearly defined and scientifically justified assessment methodology (i.e. so as to enable the evaluation to be replicated or validated by external users).
- A clearly defined and scientifically justified threshold value(s) (see other details above under Threshold values section).
- Clear statement on the HELCOM assessment scale applied (any deviation from this).
- A clear description of any assumptions made in the assessment.
- Clear documentation of the results of the evaluation, description and presentation (visuali-

sation) of key data and result (snapshots and trends), and provision of all data via the appropriate channels (see also data section below).

- A clear statement on if the threshold value/target is achieved or failed, and where possible the distance to the threshold value.
- A clear statement on the ecological relevance of the assessment.
- A clear statement on the policy relevance of the assessment, including clear reference to the BSAP, MSFD, and United Nations Sustainable Development Goals or other policies deemed relevant.
- An indication of the pressures and activities related to the indicator, supported by data and a relevant overview wherever possible.
- A description of the data used in the evaluation, how it was collected (monitoring), how the data flows function (e.g. quality assurance, analysis, data hosting), and clear links to HELCOM Monitoring and Assessment Guidelines of relevance (or plans to develop such guidelines where not currently available).
- A description of how monitoring could be enhanced, if needed, to provide an improved evaluation.
- An overview of confidence in the indicator evaluation made, considering all relevant aspects, such as: data quality and spatial coverage (including an overview of all Contracting Parties providing data for the assessment or absent from a sub-region or assessment unit), the strength of the methodology applied, and the confidence in the threshold value setting approach. Where possible this confidence evaluation should be applied at the same assessment scale as the indicator evaluation itself is carried out.
- A complete indicator report, using the HELCOM template (see below), providing a description of each component of the indicator in a way that can be understood and utilised by scientists, managers and the general public.
- A collation of suitable reference material to justify and validate the approach, concept and methodology, and to provide relevant contextual information (e.g. place the evaluation within the broader ecological, scientific and policy landscape).
- Text should clearly address any changes between the new and previous indicator evaluation, for example changes in status or large changes in results data (e.g. changes of over 10%). In such cases this should be documented with an accompanying explanation if available.
- An additional text should be included should any methodological or threshold values changes be applied (having been approved by the relevant Working Group(s) and/or HOD) between assessment periods. This text should define how changes may have altered the





comparability of subsequent indicator evaluations. The text should also provide a comparison to earlier evaluations, where present, and discuss any changes (improvements or worsening) documented since the previous indicator evaluation.

4.1.4 Interlinkages between indicators

The specific interlinkages (crosscutting or horizontal issues) between state components are not addressed by single component indicator evaluations, nor directly addressed within this conceptual management frameworks or within thematic assessments. However, understanding these components can be critical and can provide a broad understanding of the impacts of multiple factors, offer insights into the appropriate setting of measures, as well as provide an opportunity to define broader state assessments for a specific habitat or species component. Moreover, understanding the interlinkages between different indicators should provide incentive and process through which threshold values for independent indicator components can be compared to identify if the independent components are appropriately calibrated through their threshold values (i.e. are good status threshold values offering comparable results for closely related and strongly interlinked components across multiple interlinked, but independent, indicators). A similar calibration between pressure indicators may also be relevant, though calibration between closely linked pressure and state indicators is also an important consideration. Additionally, some policy initiatives (e.g. the MSFD) require that specific interlinkages are addressed when assessing certain species or habitats.

This aspect should be considered for all state indicators, in particular those indicators that are well developed and operational.

4.2. Supporting indicator types

This group includes the supplementary indicators, causative factor indicators, element indicators, surveillance indicators, and aspiration indicators. These indicators provide more localised state or pressure evaluations, or offer significant insights into factors that are relevant for the interpretation of other indicators and assessments, for example characterising important drivers, environmental factors, or actions across the Baltic Sea region. While supplementary indicators would follow the key development phases, above, the other indicators would be more descriptive and generally not apply threshold values (e.g. more akin to fact sheets to support general information and inter-

pretation). Definitions are provided below.

4.2.1 Supplementary indicator

A supplementary indicator is an indicator generally in line with a core indicator, however, the significant difference is that it is devised and utilised by two or more (but not all) the Contracting Parties of the Helsinki Convention. The indicator should follow the guidance for a full core indicator (as above) but will only be applied in the relevant assessment units for the Contracting Parties of the Helsinki Convention using it. Supplementary indicators should be utilised where relevant, for example to address sub-region specific issues, pressures, or species ranges. A key consideration, should a supplementary indicator be expanded to a broader region (i.e. to encompass more Contracting Parties or assessment units), is that development aspects and approval processes (e.g. for methodology or threshold values) need to be repeated to gain the agreement of the additional Contracting Parties being incorporated.

4.2.2 Potential causative factors (i.e. Drivers and Activities)

A causative factors indicator is an indicator that provides an overview of a driver or activity, within the conceptual management framework concept, a driver or activity that is relevant and has the potential to result in down-stream impacts on the state of the Baltic Sea environment. The compiled data should provide an overview of drivers and/or the extent of an activity that is directly linked to potential or known impacts on the Baltic Sea marine environment, within the conceptual management framework or via a chain of relevant events. These indicators should provide clear support to the understanding of human activities as drivers within the conceptual management framework, in particular providing relevant trends. These indicators will thereby provide the possibility to link drivers/activities with state (and changes in state) of the marine environment (and potentially the measures applied). In their current form these compilations of data will support the contextual understanding of State and Pressure evaluations, though they will likely also contribute valuable information and data that can be utilised in the development of future Economic and Social Analyses as is being furthered within the HELCOM Expert Group on Economic and Social Analyses (EG ESA).

4.2.3 Element indicator

An elements indicator is an indicator that chronicles an important processes or factor of direct relevance to the marine environment, even though it may not specifically address human activities, may not be a specifically required evaluator of good





status, or may not directly fit into a conceptual management framework. These parameters, for example hydrological components or meteorological aspects, do however offer important contextual information into which any evaluation of good status must be placed and are vital components of understanding the marine ecosystem and its status in a broad holistic sense.

4.2.4 Surveillance indicator

A surveillance indicator is an indicator that can act as early warning systems in the ecosystem or provide supporting information that may subsequently trigger other processes, actions or assessments. Examples of such indicators could include initial overviews and surveillance of new issues (e.g. regional surveys of substances of potential concern, screening surveys, preliminary evaluations or data compilations/defined reviews) or surveillance of known issues (for example compilations of data from less frequent checks to confirm a substance or aspect remains at appropriate levels). These processes could for example provide an approach that would effectively address emerging issues, creating an option for new measures, actions or assessments to be triggered in response to the information collected. By their nature this category of indicators would be temporary, and likely change between major assessment events, since certain aspects may be deemed of no concern or others may be developed into full indicators on the basis of the findings. Other aspects may also be recurring and act as a way to maintain a good overview of potential risk and pick up early warning signs.

4.2.5 Aspiration indicator

An aspiration indicator is an indicator that defines progress or steps towards an identified agreement or initiative. In doing so these would reflect progress towards an aim or regional aspiration that is considered as indicative or supporting of good status. Examples might include regular updates or reviews of components within HELCOM such as the coverage of Marine Protected Areas (MPAs) or a comparative evaluation of Red Listed Species (e.g. identifying what has changed, improved worsened, or been achieved). Such information would support the overall evaluation of good status, provide valuable contextual information, and offer a possible link to new/alternative measures/actions that might be required.

4.3. Confidence

The confidence in any given indicator evaluation is a critical component offering the reader an immediate visualisation or impression of how the underlying components of an evaluation impact on the overall result. This should be provided where possible in all indicators and in all types of indicator, though is critical in any fully operational core indicator. The assessment of confidence should be complementary to the indicator evaluation (i.e. results). The assessment of confidence should consider important factors such as: data quality and spatial coverage, the strength of the methodology applied, and the confidence in the threshold value setting approach. Where possible this confidence evaluation should be applied at the same assessment scale as the indicator evaluation itself is carried out, should be reflected both in text and graphically (i.e. maps), and should be supported by a text on practical solutions for improvements in the future that would improve the indicator evaluation and thus confidence in it.



The confidence in any given indicator evaluation is a critical component offering the reader an immediate visualisation or impression of how the underlying components of an evaluation impact on the overall result.



5.

Review of HELCOM indicator catalogue



This section considers the need to maintain the environmental and policy relevance of the HELCOM indicator catalogue over extended time periods, and how to find suitable solutions in this respect.

5.1. Regular review of current catalogue

The catalogue of HELCOM indicators should be reviewed subsequent to any major update process, at the discretion of relevant HELCOM Working Groups, and considering appropriate timing (i.e. sufficient time for those involved to have completed related tasks resulting from the indicator update process (e.g. data handling, result and data reporting, policy requirements etc)). This review process will be driven by relevant HELCOM Working Groups and interact closely with indicator leads/co-leads and relevant host Expert Groups. The review process should consider the following issues: 1) are all indicators in the catalogue relevant and actively under development (including candidate) and where not remove to a 'concepts list', 2) are all listed indicators appropriately categorised (i.e. core, pre-core, candidate) and where not carry out a re-categorisation, 3) are all indicators in the catalogue complete and appropriately applied from the scientific and environmental relevance basis, 4) are all indicators in the catalogue complete and appropriately applied from the policy perspective, 5) what clear gaps or shortcoming are apparent from the assessment just carried out, and 6) what work is perceived to be of highest priority in advance of the next assessment.

This review component provides a key opening for policy input and prioritisation and where relevant a Working Group (e.g. State and Conservation or GEAR) may deem it valid to follow up on policy relevance aspects (especially at the early stages of an indicator development process) and request an allocation of time in an upcoming meeting of the relevant Expert Group (or a designated workshop) is reserved for discussion between technical and policy Experts. This crossover between the Expert and Working Group level, applied on a case-by-case basis (at the request for guidance of either) will help guide and foster the indicator development.

Other aspects that could also be addressed concurrently are considered in the section on 'Interim work, or first step in an update process,' below. These are important components to address that may go hand in hand with those issues listed here.

5.2. Gap filling strategies

To maintain a solid overview and fill gaps in the HELCOM indicator catalogue (gaps of policy and environmental relevance), the following process should be followed, ideally linked closely with the review above, and driven by requests from the relevant HELCOM Working Group(s). Such a process would appear valid at least once within a given assessment period (generally considered to be a 6-year period), ideally providing sufficient time for proposals to be developed further or tested by the following assessment event. The HELCOM Expert Groups, through a simple questionnaire, should be asked to identify any gaps where indicators might be needed (e.g. to policy and in light of scientific knowledge/developments), in addition already identified gaps, and to propose solutions to fill those gaps. The same questionnaire should be shared with relevant HELCOM Working Groups for distribution as required to their own national networks (e.g. Ministries, Agencies, Research Institutions). The Secretariat would provide a summary of the responses to State and Conservation so that discussion on aspects with validity to consider further (or requiring stronger input) could be identified and returned to the Expert Groups for discussion. This summary and review step via State and Conservation would provide a filtering step so that common aspects could be identified and that the catalogue of indicators was not unnecessarily swelled by individual proposals or suggestions that were not viable at the regional scale. Overall this process would maintain an concise overview of where new indicators might be needed and facilitate subsequent action identified as valid by the relevant Working Groups. An outcome of the process would also be for clear prioritisation on the work ahead (e.g. for a given time period) to be provided by the Working Groups, for example specific action or progress on a species, substance or policy initiative (e.g. primary criteria under the MSFD).





6.

Conceptual management
framework – HELCOM DAPSIM

DAPSIM:

Drivers
Activities
Pressures
State
Impact
Measures



The DAPSIM framework is presented here as a conceptual management framework primarily to support HELCOM indicator evaluations and holistic assessments. Causal analyses can also be applied with or in addition to this conceptual management framework to support a more detailed and stronger understanding of key aspects or to detail critical information that can support the goals and vision of the Baltic Sea Action Plan (BSAP).

The application of a conceptual management framework associated with the HELCOM indicators has a two-fold benefit. Firstly, it provides the data and trends that can be linked to State and Pressure variables (descriptively until a qualitative analysis can be achieved) and may help explain those indicator evaluations. Secondly, it provides data and information that can enlighten managers on routes of impact (environmental, social or economic) and thus appropriate measures, such aspects potentially also requiring additional specialised analyses. Thus, by utilising a common conceptual management framework within HELCOM work it can greatly increase the understanding of linkages and triggers that are key to achieving good status and a healthy Baltic Sea. For example, a component clearly not addressed here at this stage is the data/ information gaps and analyses that provide the direct causal links between each component (i.e. the arrows within the diagram), and such linking factors are critical for carrying out quantitative assessments. This simple conceptual management framework therefore allows harmonised assessments to be applied within a common framework. At the same time it allows for additional components or analyses to be utilised, where required, to construct and specify the interlinkages or causalities between components (e.g., for development of the assessment of Economic and Social Analyses, ESA).

The DAPSIM conceptual framework provides an overview approach that is aligned with other frameworks (e.g. DPSIR) and it has been adapted to utilise common HELCOM terminology. A visualisation of the HELCOM conceptual management framework – DAPSIM – is provided below in Figure 4.

All HELCOM indicators should be developed to provide information that contributes to an understanding of the evaluated factor within such frameworks. Furthermore, in addition to supporting a contextual understanding of the indicator evaluations a conceptual management framework can also support the understanding of how measures might be applied and what impact measures have (i.e. between subsequent assessments). Furthermore, collating such data could provide underlying data streams that would be valid in the assessment of economic and social aspects by interlinking the data on drivers, human activities, pressures, state and human welfare (i.e. fulfilling an assessment of impact on society within the framework).

Within such a framework, and considering the above factors, the following components together provide an overview within which assessments can be carried out:

Drivers may be represented by national, regional or global information/data (compiled into comparable regional overviews) and could cover aspects such as population changes, changes in population demographics, or other factors that provide a clear contextual starting point from which subsequent drivers, activities and pressures may be derived or associated. Trends would be good to characterise both in the short-term perspective (i.e. across the period of the assessment being carried out), but also for longer periods so that changes in drivers can also be associated to changes detected in subsequent components of the DAPSIM framework.

Activities should be represented by quantifiable representations of human activities that may respond to drivers and/or be determinants of pressures on the marine environment. Where possible these should be data driven evaluation compiling information on human activities that have direct or indirect effects, through pressures, on the status of the marine environment (biota or physicochemical). These should also consider trends so that changes can also be linked in a dual direction within the DAPSIM framework, i.e. changes in trend due to both measures or drivers and also how changes in activities alter pressure, state and impact variables.

Pressures should provide data driven evaluations that define the pressures associated with human activities. The indicators should provide supporting information that links from human activities to pressures (and where relevant state), and where the development of a relevant core indicator is viable should also incorporate quantitative targets or ceilings (e.g. input targets or al-





lowances) to which the Contracting Parties of the Helsinki Convention have agreed. Not only should this develop an understanding of pathways and linkages within a conceptual management framework but it should also define the achievement of targets with relevance for achieving good status.

State should be represented by indicators that are data driven and carry out evaluations against clearly defined, scientifically justified and regionally agreed threshold values. Where driver, activity and pressure aspects are not available as independent evaluations these components should be clearly defined within the indicator reports in the greatest detail possible.

Impact should provide an overview of changes in environmental state and key characteristics related to the links between society and the ecosystems, including changes within it (and the subsequent components within the framework). The information and data collected within this component of the framework, for example the comparison between the current status and the definition of good status (e.g., a threshold value) or the societal losses due to a failure to achieve good status, should increase understanding and provide context to support the holistic understanding required to achieve the BSAP vision of a healthy Baltic Sea environment. For some topics this may be a relatively simple evaluation (e.g., defining the gap between achieved status and the agreed threshold value), whereas for other topics (e.g., ESA) the required methodologies may be significantly more complex.

Measures (or actions) should be represented within the State and Pressure indicator reports in descriptive form where possible, but within the DAPSIM framework this aspect primarily enables a broader follow up approach under the BSAP (in direct relation to core indicators). For example, the development of regionally agreed measures on topics directly relevant to an indicator (as defined for example in the BSAP or documented in the HELCOM explorer), and future assessments on the implementation level of these measures/actions, can support an improved understanding of the effect of measures on state and pressure (and other components of the DAPSIM framework).

Overall, setting individual indicators (or components of indicators) within a conceptual management framework will support the BSAP by providing additional information that can facilitate the follow up on how actions and measures impact on socioeconomic and environmental variables. While such an overview may initially be descriptive in nature, future developments within EG ESA (e.g. ESA indicators and assessments), or other HELCOM Groups and processes, for example detailing the specific interlinkages between the components identified in the conceptual framework, may allow a more in-depth analysis overall.

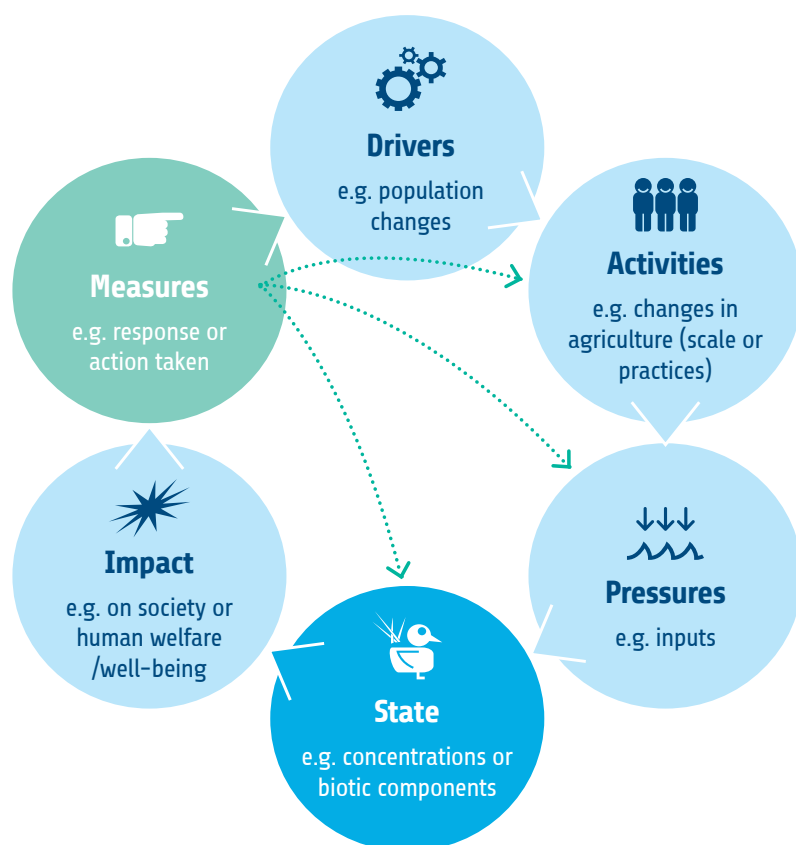


Figure 4. A conceptual management framework approach for HELCOM indicators and assessments – DAPSIM. Arrows points from circles indicate simplified pathways or interlinkages within the framework. Green arrows represent the potential role and targeting of measures to address components within the conceptual management framework. Note that this diagram provides a highly simplified conceptual framework and multiple additional arrows would be required to accurately depict the complexity of the system and aspects between the defined components. The connections within such frameworks are themselves complex and may contain entire topics or fields of research, for example ecosystem services which would be nestled between the State and Impact, and this conceptual management framework should thus be considered as a structure to support relevant HELCOM work and not a detailed description of the complexities of the Baltic Sea ecosystem and management.



7.

Data (and associated monitoring)



All data collection activities within HELCOM should be done in FAIR setting (data should be Findable, Accessible, Interoperable and Reusable).



The data requirements for all HELCOM indicators should adhere to the HELCOM data policy, as reflected in the Monitoring and Assessment Strategy (in particular attachments 2 and 3) and all data collection activities within HELCOM should be done in FAIR setting (data should be Findable, Accessible, Interoperable and Reusable). It is particularly important for the HELCOM indicators that aspects of transparency and data accessibility are followed as the indicators are significant assessments in their own right, and are predominant components of other reports and assessments (e.g. holistic assessments). Data should thus be made available in appropriate form (ideally raw input data and analysed results) and provide a clear representation of the data, calculations and result that is understandable and directly comparable with what is presented in the indicator report. This is relevant both for reasons of transparency and for facilitating the process of national checking of indicator assessments (see below).

Following the agreed thematic data guidelines requires that data utilised in the indicator assessments is provided to the Secretariat or placed in the appropriate database (as decided on within HELCOM) so that once an indicator assessment is completed and published it should be possible for the overall results to be repeated (based on the data made available) by external parties, if required. Underlying data and results of these indicator assessments will additionally be linked to within the indicator reports and made available for viewing and downloading through the HELCOM Map and Data Service (MADS). As with all HELCOM data and data products the aim is to transparently and openly provide the full assessment, inclusive of data and result, to the Contracting Parties of the Helsinki Convention (and the public). This is considered vital for developing a strong and well-respected assessment.

Certain exceptions may be applied to the above, if agreed on by the relevant HELCOM Working Group(s) or higher level HELCOM bodies

(e.g. HELCOM HOD). Exceptions should only be provided on the basis of ensuring protection of species or habitats, or other such noble aspirations. For example, data may be considered for exception if it identifies the exact point source of endangered, protected or breeding species. However, every effort should be made to provide data that is traceable and transparent and in cases where data are to be restricted it is requested that, if agreed on by the appropriate HELCOM body (Working Group or above), then the data underpinning the assessment for these components is provided in an appropriate form of amalgamation to make point source identification impossible (e.g. aggregation of data per assessment unit or within a suitable grid scale).

7.1. HELCOM Monitoring and Assessment Strategy

In order to comprehensively evaluate the progress towards set objectives and targets, a way of documenting effects of measures on the marine environment is needed. This in turn requires access to extensive temporal and spatial monitoring data, collected in a comparative fashion for the entire region. The HELCOM monitoring programme (and sub-programmes) are the source of data for indicator evaluations, and subsequent assessments of the state of the marine environment, pressures on the marine environment, as well as the analysis of long-term trends. The HELCOM Monitoring and Assessment Strategy, adopted by the 2013 Copenhagen HELCOM Ministerial Meeting, forms a major framework and outlines how core indicators are to be regularly updated and support periodic thematic and holistic assessments. The assessments are also supported by regionally agreed HELCOM Monitoring and Assessment Guidelines that provide guidance on the appropriate methodologies and analytical solutions to produce data that can enter the indicator evaluations.

Principles of the HELCOM Monitoring and Assessment Strategy are as follows:

1. National monitoring programmes use the principles of the Joint Monitoring System to achieve a high degree of coordination, cooperation, sharing and harmonization.
2. The Joint Monitoring System feeds a Data Pool that is the basis for the Assessment System.
3. This system (largely built around indicators) produces assessments of the health of the Baltic Sea that can be used by HELCOM countries as well as EU, observers, stakeholders, etc.





7.2. Data collection

Data collection should follow regionally agreed protocols, as defined within the HELCOM Monitoring Manual and HELCOM Monitoring and Assessment Guidelines. All relevant guidelines should remain closely interlinked with the indicator(s) in question so that critical components (e.g. supporting parameters required for indicator calculation) are reflected in the guidelines and good data is not lost. Coordinated monitoring and methodology is critical to providing a regional assessment with comparable data collection at its root. The above is particularly applicable for HELCOM core indicators, though other data specificities are reflected in the descriptions of other indicator categories above. Supporting indicators for example will follow an independent data collection process through agreed channels as defined by relevant HELCOM Working Groups (via relevant HELCOM Expert Groups).

7.3. Data reporting

Data reporting should be carried out at the earliest opportunity possible (i.e. once checked nationally etc) so that any lag between the assessment period and the presentation of the assessment and data can be minimised. This is clearly related to resources at the national level and also linked to seasonal timing of sampling and analysis, followed by national quality control approval processes. However, it is considered that where possible the aim should be that an assessment should ideally include data from the previous year (i.e. a 1-year time lag) most optimally, and where ever possible.

Data reporting should be carried out on a regular cycle, as defined for many indicators associated with the HELCOM Monitoring manual. Other indicators, especially those not fully operational, that rely on other data collection (e.g. data calls etc) should consider appropriate ways to collate the data systematically between indicator updates so that data calls do not require the Contracting Parties of the Helsinki Convention to

gather and report multiple years of data under the pressure of carrying out an assessment. It is proposed that data collection should occur as a minimum once per year for those indicators that are used or to be used in assessments. These ad hoc data aspects are considered temporary solutions in the overall scale of the indicator aims, but are important considerations for the immediate future of certain indicators.

7.4. Data hosting

Data hosting should ideally provide (or work towards) the most optimal solution for the simplest, most direct and most functional database or hosting solution. Such developments will strongly support the overall HELCOM data policy and indicator evaluation. While this aspect has distinct resource implications (e.g. developing or expanding databases or data harvesting options), and temporary or intermediate solutions are foreseen, then the below outlines a vision for optimal data hosting possibilities.

Data hosting should be carried out through flexible databases that can provide outputs required for indicator calculation and creating aggregated data products to be linked to or added to HELCOM MADS (i.e. making HELCOM data products more accessible). Furthermore, databases should contain all supporting information and metadata on sampling required for the indicator evaluation and where possible apply clear quality control routines. Data quality control rules would need to be developed per data strand due to the specificity of the data that is required for individual indicators. Suitable data quality control an early stage will facilitate greater automation of indicator evaluations at later steps.

Existing database solutions such as the HELCOM Biodiversity database and HELCOM COMBINE, the latter hosted by ICES, should be the primary choice for additional or new indicator requirements (unless revoked or changed by decisions within HELCOM). Where possible practical solutions to harvest data directly from existing databases (e.g. national databases) to prevent the need for double reporting should also be developed.





7.5. Data analysis

Data analysis protocols need to be clearly expressed and presented in the indicator reports. The HELCOM Monitoring and Assessment strategy outlines that all assessment scripts should be made publicly available e.g. via GitHub or other code repositories where the script can be accessed. Where possible the most automated approach for carrying out the analysis should also be aimed for (e.g. scripts or codes for carrying out the analysis in standardised and automated ways) in order to reduce manual effort required for indicator updates. If these can be linked to the database tools and services then this should also be applied.

7.6. Data archiving

Data and results for any given indicator evaluation will be collated under HELCOM MADS to provide a time shot or frozen data set that represents the data and result information from each given assessment. This data and result information will be linked to within the indicator report and be maintained within MADS so that information

can be traced back to the same data that entered any indicator evaluation. The archived data can be referenced with permanent URI (URL link to metadata record and dataset).

7.7. Overall

All data collection (and references, e.g. to Monitoring and Assessment Guidelines), data flows, and quality assurance procedures should be described in the indicator report(s). Codes and scripts for carrying out data collection, data harvesting and data analysis should also be made available through appropriate open access platforms or depositories. The indicator leads are invited to inform the Secretariat of the data related needs for specific indicators and the Secretariat will provide support where possible to attain improved and optimal solutions, including identifying or supporting the securing of resources for these aspects where possible. The section provided here related to data only covers the issue in brief and it should be noted that there are other important processes within HELCOM that address the topic in greater detail, but in general with the aims above in mind.





8.

Relevant processes and procedural aspects



The indicator update frequency will largely be a balance between policy decisions and scientific guidance on the appropriate frequency, in addition to consideration of the temporal scales at which a response in the indicator might be identified.



To maintain the regular update and a catalogued overview of HELCOM indicators certain procedural aspects are required, in addition to those issues described above.

8.1. Update frequency

The update frequency will be determined specifically by HELCOM processes, and decisions taken within HELCOM Working Groups and higher-level structures (e.g. HELCOM HOD or Ministerial Meetings). The update frequency will largely be a balance between policy decisions and scientific guidance on the appropriate frequency, in addition to consideration of the temporal scales at which a response in the indicator might be identified (i.e. a change in the result, in particular compared to the threshold value). In general a six-year update frequency is envisaged for all indicators from a policy perspective (e.g. times with regular holistic assessments of the Baltic Sea), though intermediate indicator evaluations outside of this frequency are considered valid and viable where the data is available, in particular where indicator evaluation is well automated, and where scientific guidance (e.g. by HELCOM Expert Groups) indicates an update is important. All indicator updates will be archived through the HELCOM indicator webpage (see below) and intermediate updates of an indicator (i.e. those not directly tied to a holistic assessment due to additional updates or new arrivals) will be identified within this archiving system. At any holistic assessment (or overall assessment defined by HELCOM processes) all available and operational indicators should be updated to provide a harmonised and current assessment of all available components. This final aspect will be guided by relevant Working Groups (e.g. State and Conservation and PRESSURE).

Intermediate updates (i.e. those outside of the major or holistic updates) may provide a full updated report or a shorter update that covers only the main evaluation and key information, as considered appropriate by the Experts (indicator lead(s) or co-lead(s) and Expert Groups) and if approved by relevant HELCOM Working

Groups. These could be implemented for example at a mid-point between holistic assessments, biannually or even annually for more automated indicators. If a shorter intermediate update is selected this report must closely reference to the preceding report and cover the key messages, main regional assessment and also identify the significant changes between the update and the preceding report.

8.2. Interim work, or first step in an update process

Between the cyclic updates of an indicator, or immediately at the start of an update process, the following issues should be considered by the indicator leads/co-leads, via the close association with a host Expert Group: does the indicator appropriately cover the required assessment, are there gaps that should be filled (and how), are there new or improved methods that should be considered (and reflected in the indicator and Monitoring and Assessment Guideline), are the threshold values appropriate or in need of review (including considering changes due to climate change), and how do/will any of these changes influence comparability between the update and prior assessments. Aspects identified as important should be discussed in the Expert Groups(s) and taken to relevant Working Groups (e.g. State and Conservation or PRESSURE) to approve the proposed changes. This component should be considered as an assurance of scientific and functional relevance of the indicator(s).

8.3. Approval steps for an indicator evaluation (or update)

An indicator evaluation or update must be carried out in full cooperation with the relevant HELCOM Working Group(s), and where possible have been reviewed by the host Expert Group. The relevant HELCOM Working Group (or their nominated representatives) are charged with approving the indicator(s) and their updated information, inclusive of results and evaluation carried out (i.e. the data, result and text), at each evaluation or update. This aspect is independent of the processes to approve threshold values or categories that are described above.

The process to carry out this will follow a standardised procedure (summarised in Figure 5), with the following steps (though some overlap in



time for the steps may also be valid, acknowledging that this may require additional changes for the final versions):

1. The indicator lead(s) or co-lead(s) will carry out the technical work required to produce results. This process should be also carried out in close association with the relevant HELCOM Expert Group and will be supported by the relevant HELCOM Secretariat staff.
2. The assessment data (clearly defined and presented, or linked to) and the results (clearly showing the evaluation carried out) will be shared with the relevant Expert Group(s) for brief discussion.
3. Subsequently, the results will be presented to the relevant HELCOM Working Group(s) for approval. This process will be carried out through a workspace where approval and comments can be added. The relevant HELCOM Working Group(s) will approve the data and results of the indicator evaluation(s) – ‘national checking’. This approval step acts as the national approval of the evaluation prior to the indicator report itself being updated (for submission of report to the relevant Working Group). Approval should consider the following aspects (in particular from the national perspective): is the data included complete, is the indicator evaluation carried out to the agreed methodologies (i.e. produces the correct result), and are there national/sub-regional specificities that need to be reflected in the indicator. The latter aspect should provide support for reflecting the complexities in the report text and does not provide an opportunity to adjust the indicator evaluation result based on the approved method and data available.
4. The indicator lead(s) or co-lead(s) will carry out an update of the HELCOM indicator report text (following the appropriate template, see below) that covers the required components and reflects the regional evaluation for the individual indicator. The approved results for the indicator evaluation must be presented in the report and the overall report should be prepared with the support of the relevant Expert Group(s).
5. The relevant HELCOM Working Group(s) will approve the final reports. The following aspects should be considered: are the approved results and data fully and appropriately presented (text, numeric and graphical), are relevant policy initiatives addressed, are regional, sub-regional and national aspects appropriately covered, and is the text clear in providing a proper overview of the indicator evaluation carried out and the results obtained.
6. Finalised reports will be provided to HELCOM HOD to maintain a full and transparent overview of the work carried out on HELCOM indicators. This will be in the form of information and not an approval step per report and is independent of processes described above where HELCOM HOD are to provide approval (i.e. threshold values).

Approval by HELCOM Working Groups for data and results will be carried out predominantly via State and Conservation and Pressure Working Groups.

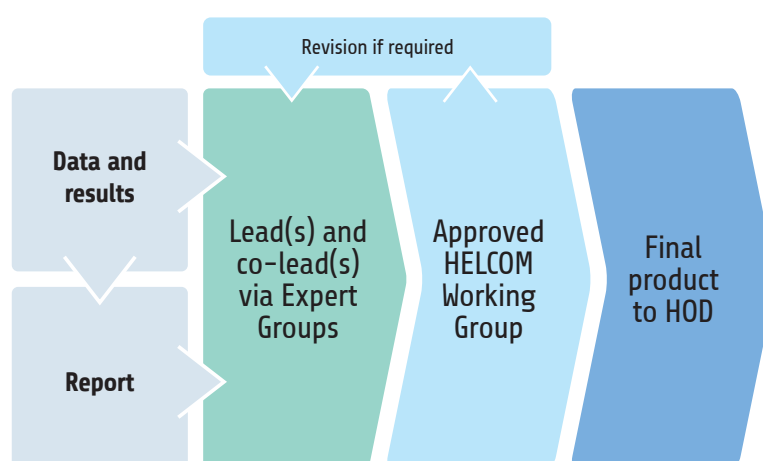


Figure 5. A schematic overview of the process for the procedural aspects of an indicator evaluation or update, highlighting the approval steps and responsibilities.



8.4. Publication and archiving

All approved indicator reports will be published and archived on the HELCOM website so that they are available to the Contracting Parties of the Helsinki Convention and the public. The full reports themselves will also include information on earlier versions from prior indicator evaluations. An online referencing and archiving tool will be implemented within the indicator webpage so that it is possible to define which versions are linked to a holistic assessment (e.g. utilised in a thematic assessment of such report) and which are intermediate or new indicator reports.

8.5. HELCOM indicator webpage

All HELCOM indicators carrying out an evaluation will be made available on the HELCOM indicator webpage. The category and level of operationalisation will be clearly shown. The website will be developed and maintained by the Secretariat to ensure all reports are accessible. The Contracting

Parties of the Helsinki Convention are invited to inform of any errors found at any time so that it can be corrected and the overall presentation and accessibility will be updated (including input by the Contracting Parties of the Helsinki Convention). The latter aspect may have to take into account certain technical constraints and resource issues.

8.6. Indicator template

An indicator template defining the general style and sections for the indicator report text will be provided by the Secretariat. Each defined section will contain a short guidance on the expected content. The following sections are envisaged within a single indicator report: Key message, Pressures, Components, Conclusions and Significance, Climate change, References, Archive and Acknowledgements. Within each 'component' section (for example a species may have a component for distribution, abundance, habitat, etc) the following sections will also be required: Threshold values, Results, Confidence, Data and Methodology.



9.

Other relevant downstream components



HELCOM indicators form a significant and clear evaluation and product in their own right. However, they additionally link directly to other important processes within HELCOM such as thematic assessments, holistic assessments and assessments of cumulative impacts (Figure 6). These downstream aspects build on the data collected for indicators or indicator evaluations carried out and are therefore consequently subsequent to the indicator evaluations themselves. Furthermore, the HELCOM indicators also provide support for the Contracting Parties of the Helsinki Convention in addressing other policy commitments, for example those that are also European Union Member States and their commitments under the MSFD. The aspects considered here in this section are only done so briefly, since they are independent processes for which indicators or their data and results can be utilised, however it is important to reflect the added value that can be gained from well-formed and functional indicators.



Indicators additionally link directly to other important processes within HELCOM such as thematic assessments, holistic assessments and assessments of cumulative impacts.

9.1. Holistic and thematic assessments

Indicator data and results have the potential to contribute directly to thematic assessments (reports and calculations) under the BSAP themes of Biodiversity, Eutrophication, Maritime Activities and Hazardous Substances. In the case of Biodiversity, Eutrophication and Hazardous Substances already existing integration tools exist (i.e. tools that integrate independent indicators or components to evaluate/categorise overall status by theme – the HELCOM BEAT, HEAT and CHASE tools, respectively. These tools integrate data or results from independent HELCOM indicators and provide the basis of integrated assessments, further providing information that is the backbone of thematic assessments and reports which are themselves the detailed supporting documentation for holistic assessments such as the State of the Baltic Sea reports (aka HOLAS report or Holistic Assessment of the Ecosystem Health of the Baltic Sea).

9.2. Cumulative impact assessments

Indicator data also has the potential to support the assessment of cumulative impacts on the marine environment (both for components, habitats or as a whole). The data generated for and within indicator assessments provides significant inputs for assessing cumulative impacts, for example within the HELCOM Baltic Sea Pressure Index (BSPI) and Baltic Sea Impact Index (BSII).

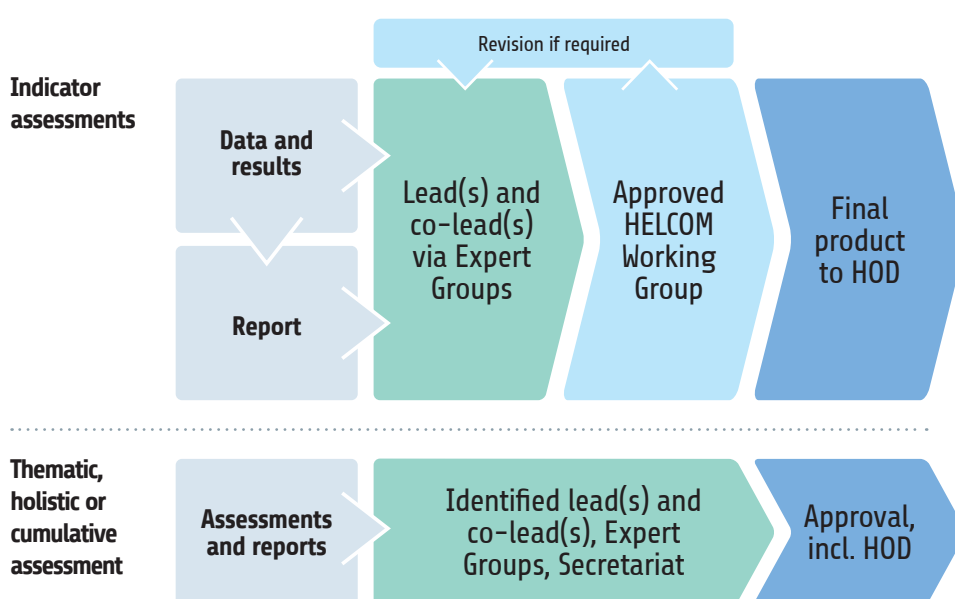


Figure 6. A schematic overview of the process for the procedural aspects of an indicator evaluation or update, highlighting the approval steps and responsibilities (as in Figure 3) but including additional downstream aspects for which indicator data, results and evaluations may be utilised.