Document title	Introduction to the Eutrophication segment
Code	3-1
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Agenda Item	3 – Segment introduction
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Submitted by	Secretariat
Reference	

Background

Guidance by HOD 59-2020

HOD 59-2020 discussed the introductions and the descriptions of the current and desired state for the segments on eutrophication, hazardous substances and litter, sea-based activities, and biodiversity and provided the following general guidance for the Segment Teams for further drafting in spring 2021:

- A stronger link between the goals, objectives and actions and the content of the introduction of the respective segment is needed with the segment introduction providing clear links to the goals, management objectives and actions for the segment in question. The goal and ecological objectives should function as the basis for presenting the desired state.
- The introductions should, wherever possible, strive to outline the strategic framing of the segment and include aspirations and strategic agreements. Actions under each segment formulated in a general way could be used as a starting point for formulating such strategic statements. The final placement of aspirations and strategic agreements within the segments will be decided later on.
- Wherever possible harmonization across segments should be strived for, though the length of the introductions may vary, and appropriate covering of MAI/NIC commitments in the eutrophication segment should be ensured. The same subheadings should be used for each section to guide the drafting, ensuring that an uninitiated reader can follow the content across segment. These sub-headings function as place holders but could be considered for removal at a later stage, once the texts are in place.
- The section on Current state (currently included as part of the Operative section of each segment) should be moved to the general introduction and included as general background for each segment
- Introductions should be kept as short as possible and be drafted under the assumption that the reader is informed regarding the topics. To this end, the following concretized guidance was provided:
    - Topics included in the visualization/text box should not be repeated in the text of the introduction (i.e. objectives, climate change, SDGs, addressed activities, addressed pressures and cross-referencing to other segments);
    - Wherever possible visualization should be preferred over text, e.g. *Action areas* currently presented as part of the introductory text could also be included as part of the visualization/information box.
    - The section on links to other treaties should be as short as possible.
- How to present the content of the current text box needs further development as part of the further process, e.g. SDG targets could be presented in relation to which specific objectives they relate to.

Process in spring 2021

HOD 59-2020 noted the study reservations by Estonia and Denmark regarding the content of the segment introductory texts. HOD 59-2020 acknowledged that the introductions will be presented for final approval at HOD 60-2021 and, taking this into consideration, agreed that further work on the texts can continue in spring 2021 under the auspice of DG BSAP and the respective DG BSAP Segment Teams, with support from the Secretariat.

HOD 59-2020 agreed on the following process for further work:

- The Secretariat is to implement editorial changes and harmonize content across segments, based on this guidance from HOD 59-2020, prior to submission of the introductions to respective Segment Team meetings in early 2021.
- The introductions will be further considered and developed in the respective Segment Teams in spring 2021, based on the guidance from HOD 59-2020 and comments received in the review processes in 2020. Special focus in the Segment Teams should be on identifying strategic decisions.
- Further developed drafts will be presented for review by DG BSAP and guidance by HELCOM 42-2021.
- The segment introductions will be drafted further by DG BSAP Segment Teams and DG BSAP based on guidance by HELCOM 42-2021.,
- Final approval of the introductions will take place at HOD 60-2021.

Consideration of the segment introduction in DG BSAP EUTRO 3-2021

The attached document includes the segment introduction and the description of the desired state that has been edited by the Secretariat based on the guidance by HOD 59-2020. Two versions, one with and one without comments are included. A version without comments is also attached in Word format.

The members of the Segment Team may provide comments to the introduction to the Secretariat (susanna.kaasinen@helcom.fi) **by 11 January 2021**.Comments received by the deadline will be presented to the Meeting.

Action requested

The Meeting is invited to consider and develop further the segment introduction for the eutrophication segment based on the guidance from HOD 59-2020 and comments received in the review processes in 2020.

Segment Eutrophication - A Baltic Sea unaffected by Eutrophication - continued and renewed actions to limit inputs of nutrients and organic matter

Visualizations/text boxes to be added to include the following information:

Goal: Baltic Sea unaffected by eutrophication

Ecological objectives:
- Concentrations of nutrients close to natural levels
- Clear waters
- Natural level of algal blooms
- Natural distribution and occurrence of plants and animals
- Natural oxygen levels

Management objectives:
- Minimize input of nutrients from human activities

Links to climate change effects and impacts: (to be added based on work by EN CLIME)

SDG targets addressed:
14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

Pressures addressed (*to be added)*:

Activities addressed by HELCOM actions (*to be added)*:

Cross reference with other segments:
- Reaching the objectives for eutrophication is a necessity to meet the goal of a 'Baltic Sea ecosystem is healthy and resilient';
- Reaching the goal and objectives for sea-based activities is a requirement for reaching the goal for eutrophication.

Description of current state

Eutrophication is a condition where high nutrient concentrations stimulate the excessive growth of primary producers resulting in an imbalanced functioning of the aquatic ecosystem. In the Baltic Sea, symptoms of eutrophication include intense algal growth, increase in oxygen consumption and oxygen deficiency. Eutrophication contributes to the depletion of oxygen on the bottom of the sea, leading to vast areas with anoxic or hypoxic conditions in the central Baltic Sea. These changes in the environment further affect the functioning of the entire ecosystem.

There has been a slight long-term improvement in many of the assessed indicators, which reflects an improved eutrophication management. However, 96% of the region is still below good eutrophication status, including all of the open sea area and 86% of the coastal waters (assessment years 2011-2016). Further, the eutrophication status has deteriorated lately in four of the 17 sub-basins, which might be attributed to temporal variability in climate and hydrography.

Inputs of nutrients have decreased significantly to almost all sub-basins. Maximum allowable inputs of both nitrogen and phosphorus have been achieved in the Bothnian Sea, the Kattegat and the Danish straits. Nonetheless, remaining reductions for the whole Baltic Sea are still 13 percent of MAI for nitrogen and 38 percent for phosphorus. The highest reduction requirements remain for the Baltic Proper.

Most of the reduction so far has been achieved through measures addressing direct point sources, such as municipal and industrial sewerage systems and wastewater treatment facilities in the coastal areas. No visible reduction of diffuse loads has been achieved in the last two decades, though, diffuse nutrient run off contributes almost 35 percent of the riverine input. Agriculture is the main contributor to the diffuse load of nutrients to the Baltic Sea with the highest reduction potential. There is also a reduction potential for point sources in the upper parts of the river catchments, including non-HELCOM countries in the Baltic Sea watershed. Another important source is untreated sewage from scattered dwellings. Reductions of the deposition of airborne nitrogen, which constitutes almost a third part of total nitrogen load, have mainly been achieved in the energy and transport sectors. Emissions of ammonia remain at the same level and have even increased recently, indicating a need for more effective emission reduction measures in the agricultural sector.

Eutrophication is caused by excessive inputs of nitrogen and phosphorus

Nutrients reach the Baltic Sea via water and air. Waterborne input includes transport by rivers and direct discharges from point sources. The riverine input is dominating for both nitrogen and phosphorus, constituting [69 and 95] percent respectively. Airborne transport plays a significant role for the input of nitrogen contributing [27] percent of the total load. The remaining are supplied by Direct sources. Only play a minor role and contribute 3 percent of nitrogen and 5 percent of phosphorus.

Total input of nutrients consists of natural losses constituting natural background and inputs originating from various human activities on land and at sea. The anthropogenic part was estimated for waterborne input. It varies widely across the region constituting from [30] to [90] percent of the total waterborne input in different sub-basins.

Excessive input of nutrients to the Baltic Sea in the past have led to an accumulation of huge phosphorus resources in the bottom sediments. When phosphate is released from the sediments under hypoxic conditions it contributes to the total nutrient load to the marine ecosystem, thereby fuelling the vicious circle of Baltic Sea eutrophication.

ACTION AREAS/STRATEGIC DECISIONS

The management objective of the Baltic Sea Action Plan in respect to eutrophication is to minimize inputs of nutrients from human activities. Significant reductions have been achieved by all HELCOM Contracting Parties in the past two decades, amounting to [14%] for nitrogen and [24%] for phosphorus. Nevertheless, the original goal set by the Baltic Sea Action Plan adopted in 2007 [will not be] achieved by 2021.

NUTRIENT REDUCTION TARGETS

The regional targets to reach good environmental status of the Baltic Sea are the maximum allowable inputs of nutrients (MAI) - indicating the maximal level of inputs of water and airborne nitrogen and phosphorus to Baltic Sea sub-basins. The maximum input to the Baltic Sea that can be allowed so that good environmental status regarding eutrophication can still be reached is 792,209 tons of nitrogen and 21,716 tons of phosphorus. The maximum allowable inputs of nitrogen and phosphorus to the Baltic Sea sub-basins, based on the most recent available data on fluxes in the marine ecosystem, are given in the table.

Baltic Sea Sub-basin	**Maximum Allowable Inputs (MAI)**	
	TN, tonnes	*TP, tonnes*
Kattegat	74,000	1,687
Danish Straits	65,998	1,601

Baltic Proper	325,000	7,360
Bothnian Sea	79,372	2,773
Bothnian Bay	57,622	2,675
Gulf of Riga	88,417	2,020
Gulf of Finland	101,800	3,600
Baltic Sea	**792,209**	**21,716**

Net nutrient input ceilings define maximum inputs via water and air to achieve good status with respect to eutrophication for Baltic Sea sub-basins for each country. They are calculated as shares of the maximum allowable inputs to each sub-basin using the proportions of nitrogen and phosphorus inputs in the reference period 1997- 2003. The agreed net input ceilings (NIC) are given in the table. Nitrogen and phosphorus input ceilings are also calculated for non-HELCOM countries in the Baltic Sea catchment area, other countries with airborne input (OC), Baltic Sea shipping (BSS) and North Sea shipping (NOS).

Net input ceilings for nitrogen [numbers are to be double checked]

	BOB	BOS	BAP	GUF	GUR	DS	KAT
DE	946	3923	34077	1645	1747	23647	4662
DK	281	1149	9026	420	463	28067	28525
EE	113	404	1478	11330	13099	22	24
FI	35086	28677	1827	20482	295	76	89
LT	108	495	26661	305	7226	65	80
LV	74	330	5673	246	44669	31	34
PL	668	3127	151998	1406	1595	1481	1444
RU	839	1994	10316	61482	3296	238	246
SE	17718	32651	30691	625	525	6056	32810
BY			13456		12820		
CZ			3551				
UA			1693				
OC	1375	5008	26947	2985	2188	4933	4502
BSS	284	1141	5180	675	345	651	701
NOS	131	475	2427	196	150	729	884

Net input ceilings for phosphorus [numbers are to be double checked]

	BOB	BOS	BAP	GUF	GUR	DS	KAT
DE			109			401	
DK			21			979	815
EE			9	225	185		
FI	1683	1245		317			
LT			709		142		
LV			162		1095		
PL			4293				
RU			242	2909	99		
SE	811	1134	318			116	754
BY			349		407		
CZ			57				

UA			47				

Net input ceilings for each country and sub-basin incorporate also national shares in the input ceilings identified for transboundary rivers. For these transboundary rivers, net input ceilings are provided in the Annex to this segment.

The input ceilings for nitrogen and phosphorus are based on current scientific knowledge and are subject to uncertainties. Thus, following the precautionary principle, inputs of nitrogen or phosphorus to a basin should not increase until both MAI and [good status with respect to eutrophication] have been reached, even in basins where inputs are already below the input ceilings.

As reductions in nutrient inputs in sub-basins may have wide-spread effects, extra reduction – reduction below the national input ceiling for a sub-basin - can be accounted for, in proportion to the effect on a neighbouring basin, by the countries in reaching their input ceilings for nitrogen and phosphorus, respectively. Such accounting follows agreed principles given in the Annex to the segment.

Connection to other treaties

The achievement of good environmental status in relation to eutrophication in the Baltic Sea also relies on additional reduction required by non-Contracting Parties as follows:

- 52758 tons of airborne nitrogen since the reference period (1997- 2003) assuming full implementation of the Gothenburg Protocol of the UNECE Convention on Long-range Transboundary Air Pollution and National Emissions Ceilings (NEC) Directive until 2030,
- 5561 tons of waterborne nitrogen and 930 tons of waterborne phosphorus since the reference period (1997-2003) assuming that non-Contracting parties take the same responsibility to reduce nutrients input as the Contracting Parties,
- 16803 tons of airborne nitrogen from shipping due to the implementation of the IMO decision to establish a NECA in the Baltic Sea and North Sea.

Implementation of the EU Marine Strategy Framework Directive, Water Framework Directive, Nitrates Directive, Urban Wastewater Treatment Directive and the Industrial Emissions Directive, as well as the Water Code and Law on Environment protection of the Russian Federation are prerequisites to the success of the Baltic Sea Action Plan. Achievement of the BSAP goals for this segment is also dependent on regulations and targets under global treaties.

Operative section - Further efforts to achieve the BSAP goal are needed

Description of desired state

Maximum allowable nutrient inputs have been reached for all sub-basins, and the targets are continuously evaluated based on the best available scientific knowledge considering also the effects of external drivers including climate change.

A circular economy, promoting sustainable production and consumption, is one of the keys to achieve and maintain the eutrophication objectives. The HELCOM regional nutrient recycling strategy supplements the Baltic Sea Action Plan, including measures to be applied for smart nutrient management to close nutrient cycles. When nutrients are recycled to a greater extent within the production systems, fewer virgin raw materials are needed. The development of a circular economy may also contributes to climate change mitigation by cutting the dependency on fossil materials and fuels.

Continuous cooperation with the River Basin Authorities is established to ensure that river basin management plans incorporate the nutrient input ceilings set by the HELCOM Baltic Sea Action Plan and measures in the plans are sufficient to achieve the BSAP goals. Official agreements between relevant authorities, to address transboundary waterborne nutrient inputs from non-Contracting Parties according to the HELCOM BSAP environmental targets are signed and cooperation continues with a focus on a harmonized implementation of measures to achieve the targets.

It should also be acknowledged that achieving of the maximum allowable inputs to all sub-basins does not imply an immediate achieving of a eutrophication situation with acceptable nutrient concentrations, water clarity, algal blooms, and status for benthic plants and animals, as well as oxygen levels. The ecosystem, which has been under anthropogenic pressure for more than a century, may require from a few to a dozen of decades to recover after nutrient inputs have been reduced.

Input ceilings for transboundary rivers and other sources and principles to reallocate extra reduction

Almost half of the waterborne input of nutrients enters the Baltic Sea via transboundary rivers, which requires setting nutrient input ceilings for 9 major transboundary rivers, addressing inputs from the whole river catchment areas, separately from other sources.

The National net nutrient input ceiling for each sub-basin is the sum of the national share in the transboundary river ceiling and ceiling for remaining sources of input to the respective sub-basin. The input ceilings for transboundary rivers are not additional requirement but an integral part of the national net input ceiling and, thus, countries are free to implement measures where they are most appropriate to meet their net input ceilings.

Nutrient input ceilings for transboundary rivers and other sources, including input ceilings for national parts of transboundary river catchments, are given in the tables below.

Nutrient input ceilings for nitrogen for HELCOM countries, transboundary rivers and other sources:

	BOB	BOS	BAP	GUF	GUR	DS	KAT	BAS
DE	946	3923	32281	1645	1747	23647	4662	68852
DK	281	1149	9026	420	463	28067	28525	67931
EE	113	404	1478	11330	13099	22	24	26471
FI	35086	28677	1827	15627	295	76	89	81677
LT	108	495	3620	305	462	65	80	5135
LV	74	330	2789	246	12223	31	34	15727
PL	668	3127	35486	1406	1595	1481	1444	45206
RU	839	1994	7321	22875	662	238	246	34175
SE	17718	32651	30691	625	525	6056	32810	121076
OC	1375	5008	26947	2985	2188	4933	4502	47938
BSS	284	1141	5180	675	345	651	701	8978
NOS	131	475	2427	196	150	729	884	4992
NEMUNAS			29338					29338
BARTA			957					957
VENTA			6033					6033
LIELUPE					15864			15864
DAUGAVA					38801			38801
ODER			49298					49298
VISTULA			74808					74808
PREGOLYA			5494					5494
NEVA				43462				43462
MAI	**57622**	**79372**	**325000**	**101800**	**88417**	**65998**	**74000**	**792209**

Waterborne nitrogen input ceilings for HELCOM and non-HELCOM countries within transboundary river basins:

River	Basin	NIC	DE	FI	LT	LV	PL	RU	BY	CZ	UA
NEMUNAS	BAP	29338			18934				10404		
BARTA	BAP	957			377	581					
VENTA	BAP	6033			3730	2303					
LIELUPE	GUR	15864			5867	9996					
DAUGAVA	GUR	38801			897	22450		2634	12820		
ODER	BAP	49298	179				43951			3551	
VISTULA	BAP	74808					70063		3052		1693
PREGOLYA	BAP	5494					2498	2995			
NEVA	GUF	43462		4855				38607			

Nutrient input ceilings for phosphorus for HELCOM countries, transboundary rivers and other sources:

	BOB	BOS	BAP	GUF	GUR	DS	KAT	BAS
DE			71			401		472
DK			21			979	815	1815
EE			9	225	185			418
FI	1683	1245		297				3224
LT			50					50
LV			62		499			560
PL			543					543
RU			146	1531				1677
SE	811	1134	318			116	754	3133
OC	181	394	1046	150	93	105	118	2087
NEMUNAS			914					914
BARTA			25					25
VENTA			106					106
LIELUPE					302			302
DAUGAVA					942			942
ODER			1554					1554
VISTULA			2350					2350
PREGOLYA			147					147
NEVA				1398				1398
MAI	**2675**	**2773**	**7360**	**3600**	**2020**	**1601**	**1687**	**21716**

*Sources of atmospheric deposition of phosphorus cannot be allocated to countries.

Waterborne phosphorus input ceilings for HELCOM and non-HELCOM countries within transboundary river basins:

RIVER	BASIN	NIC	DE	FI	LT	LV	PL	RU	BY	CZ	UA
NEMUNAS	BAP	914			628				286		
BARTA	BAP	25			5	20					
VENTA	BAP	106			26	80					
LIELUPE	GUR	302			109	193					
DAUGAVA	GUR	942			33	403		99	407		
ODER	BAP	1554	38				1459			57	
VISTULA	BAP	2350					2240		63		47
PREGOLYA	BAP	147					51	96			
NEVA	GUF	1398		20				1378			

Application of the mechanism for reallocation of extra reduction is to be based on the following principles:

1. **Accounting should be based on countries individually**

This implies that countries can plan and implement measures across basins at their own discretion as long as it results in conforming to CART after accounting of extra reduction is performed.

2. **Countries could claim accounting for missing reductions even if MAI is exceeded due to inputs from other countries**

No country should need to wait for any other country before claiming themselves fulfilment of CART.

3. **Any relocation of measures should lead to at least the same environmental improvement as if CART were implemented**

This is imperative for the GES to be achieved eventually. Inevitably, using extra reductions will lead to less inputs than MAI as seen as a total for the Baltic Sea, but its distribution need to be such that GES will be achieved everywhere.

4. **The effect of extra reductions on neighboring basins with missing reductions should be estimated given that these are minor deviations from MAI**

The Baltic Sea is a strongly perturbed system and hence, functioning quite different today compared to how it will function when measures been implemented and status approach GES. The whole calculation of MAI is taking this into account and when deviations to MAI are to be analysed, it should be done assuming that we are close to GES.

5. **Accounting for extra reductions in connection with CART follow-up assessments are to be performed in a uniform way supervised by RedCore DG**

Accounting for extra reductions should be included in the regular CART assessment using a common and harmonized methodology. RedCore DG is the forum that supervises development of methodology and, after appropriate approval, implementation of this in the assessment.

6. **The Archipelago Sea phosphorus input reductions should be accounted in the Finnish CART for Gulf of Finland (cf. BSAP 2007)**

Already in BSAP 2007, Finland pointed out that models failed to separate the Archipelago Sea from Bothnian Sea and that this should be taken into account at a later stage. Also in the 2013 revision of the nutrient reduction scheme, model limitations failed to address separate MAI calculations for the Archipelago Sea. However, within the context of accounting for extra reduction can be an opportunity to take into account separately the nutrient inputs to Archipelago Sea from the remaining Bothnian Sea inputs.

7. **In the context of extra reduction accounting, reductions of phosphorus to Baltic Proper could be accounted as input reduction in Gulf of Finland**

In the calculations of MAI, the most limiting targets affecting the distribution of MAI for phosphorus were the winter nutrient concentrations in the Baltic Proper. Strictly following the principle of "maximum" inputs, led to a situation where this gave an optimal solution resulting in removal of virtually all phosphorus inputs to the Baltic Proper and barely any reductions to Gulf of Finland. This solution clearly violated the principle of cost-efficiency so additional calculations based on cost functions for phosphorus input reductions were performed to distribute reductions between Baltic Proper and Gulf of Finland in a cost-efficient way. The obtained MAI results in conforming to phosphorus target in Baltic Proper, but in Gulf of Finland the resulting phosphorus concentrations will be significantly less than target. In line with this, it could be argued for states having phosphorus inputs both to Baltic Proper and Gulf of Finland, that *extra reductions* to Baltic Proper could be deducted from missing reductions in Gulf of Finland with 100% efficiency. However, one should keep in mind that the MAI for nitrogen to Gulf of Finland was determined from applying the HEAT approach, balancing nitrogen and phosphorus concentrations, so if MAI for phosphorus to Gulf of Finland is not achieved fully additional reductions on nitrogen inputs might be necessary.

8. **Following the precautionary principle, re-allocation of extra reductions cannot be used to purposely increase inputs to a neighbouring basin**

Following the precautionary principle, extra reductions achieved in a specific basin cannot be used to purposely increase inputs to a neighbouring basin beyond the national input ceilings for basins with reduction targets and beyond the inputs in the reference period 1997-2003 for basins without reduction targets, taking statistical uncertainties into account.

Possible use of extra reductions to increase inputs up to the national input ceilings within a basin are not within the scope of the re-allocation principles. This issue is to be further discussed.

Although the re-allocation methodology is based current scientific knowledge and modelling, it comes with significant uncertainty and will sooner or later be subject of improvement. Therefore, it would be a risk for the environment to increase inputs to neighbouring basins based on this methodology. In addition, a prerequisite for the calculations here is an environment close to GES.

Segment Eutrophication - A Baltic Sea unaffected by Eutrophication - continued and renewed actions to limit inputs of nutrients and organic matter

Visualizations/text boxes to be added to include the following information:

Goal: Baltic Sea unaffected by eutrophication

Ecological objectives:
- Concentrations of nutrients close to natural levels
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Cross reference with other segments:
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Description of current state

Eutrophication is a condition where high nutrient concentrations stimulate the excessive growth of primary producers resulting in an imbalanced functioning of the aquatic ecosystem. In the Baltic Sea, symptoms of eutrophication include intense algal growth, increase in oxygen consumption and oxygen deficiency. Eutrophication contributes to the depletion of oxygen on the bottom of the sea, leading to vast areas with anoxic or hypoxic conditions in the central Baltic Sea. These changes in the environment further affect the functioning of the entire ecosystem.

There has been a slight long-term improvement in many of the assessed indicators, which reflects an improved eutrophication management. However, 96% of the region is still below good eutrophication status, including all of the open sea area and 86% of the coastal waters (assessment years 2011-2016). Further, the eutrophication status has deteriorated lately in four of the 17 sub-basins, which might be attributed to temporal variability in climate and hydrography.

Inputs of nutrients have decreased significantly to almost all sub-basins. Maximum allowable inputs of both nitrogen and phosphorus have been achieved in the Bothnian Sea, the Kattegat and the Danish straits. Nonetheless, remaining reductions for the whole Baltic Sea are still 13 percent of MAI for nitrogen and 38 percent for phosphorus. The highest reduction requirements remain for the Baltic Proper.

Commented [SK1]: LT: could be represented by the chart.

Commented [SK2]: FI: On the other hand, inputs to several Bothnian Sea coastal water bodies at least on the Finnish coast are still too high. Should this be mentioned somehow? (that achieving MAI doesn't mean that nutrient inputs have reduced enough also locally)

Most of the reduction so far has been achieved through measures addressing direct point sources, such as municipal and industrial sewerage systems and wastewater treatment facilities in the coastal areas. No visible reduction of diffuse loads has been achieved in the last two decades, though, diffuse nutrient run off contributes almost 35 percent of the riverine input. Agriculture is the main contributor to the diffuse load of nutrients to the Baltic Sea with the highest reduction potential. There is also a reduction potential for point sources in the upper parts of the river catchments, including non-HELCOM countries in the Baltic Sea watershed. Another important source is untreated sewage from scattered dwellings. Reductions of the deposition of airborne nitrogen, which constitutes almost a third part of total nitrogen load, have mainly been achieved in the energy and transport sectors. Emissions of ammonia remain at the same level and have even increased recently, indicating a need for more effective emission reduction measures in the agricultural sector.

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Excessive input of nutrients to the Baltic Sea in the past have led to an accumulation of huge phosphorus resources in the bottom sediments. When phosphate is released from the sediments under hypoxic conditions it contributes to the total nutrient load to the marine ecosystem, thereby fuelling the vicious circle of Baltic Sea eutrophication.

Commented [LK3]: Secretariat: Propose to combine with 'current state'

ACTION AREAS/STRATEGIC DECISIONS

The management objective of the Baltic Sea Action Plan in respect to eutrophication is to minimize inputs of nutrients from human activities. Significant reductions have been achieved by all HELCOM Contracting Parties in the past two decades, amounting to [14%] for nitrogen and [24%] for phosphorus. Nevertheless, the original goal set by the Baltic Sea Action Plan adopted in 2007 [will not be] achieved by 2021.

NUTRIENT REDUCTION TARGETS

The regional targets to reach good environmental status of the Baltic Sea are the maximum allowable inputs of nutrients (MAI) - indicating the maximal level of inputs of water and airborne nitrogen and phosphorus to Baltic Sea sub-basins. The maximum input to the Baltic Sea that can be allowed so that good environmental status regarding eutrophication can still be reached is 792,209 tons of nitrogen and 21,716 tons of phosphorus. The maximum allowable inputs of nitrogen and phosphorus to the Baltic Sea sub-basins, based on the most recent available data on fluxes in the marine ecosystem, are given in the table.

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Net input ceilings for nitrogen [numbers are to be double checked]

Commented [SK4]: DE: The tables need to be checked regarding the use of units (unit is probably tons as in the MAI table, but this is not mentioned in the NIC tables, and it remains unclear for somebody not familiar with MAI/NICs whether the numbers stand for tons per year or e.g. total amount of tons to be reduced by the year 20xx in comparison to the reference period.

	BOB	BOS	BAP	GUF	GUR	DS	KAT
DE	946	3923	34077	1645	1747	23647	4662
DK	281	1149	9026	420	463	28067	28525
EE	113	404	1478	11330	13099	22	24
FI	35086	28677	1827	20482	295	76	89
LT	108	495	26661	305	7226	65	80
LV	74	330	5673	246	44669	31	34
PL	668	3127	151998	1406	1595	1481	1444
RU	839	1994	10316	61482	3296	238	246
SE	17718	32651	30691	625	525	6056	32810
BY			13456		12820		
CZ			3551				
UA			1693				
OC	1375	5008	26947	2985	2188	4933	4502
BSS	284	1141	5180	675	345	651	701
NOS	131	475	2427	196	150	729	884

Net input ceilings for phosphorus [numbers are to be double checked]

	BOB	BOS	BAP	GUF	GUR	DS	KAT
DE			109			401	
DK			21			979	815
EE			9	225	185		
FI	1683	1245		317			
LT			709		142		
LV			162		1095		
PL			4293				
RU			242	2909	99		
SE	811	1134	318			116	754
BY			349		407		
CZ			57				

UA			47				

Net input ceilings for each country and sub-basin incorporate also national shares in the input ceilings identified for transboundary rivers. For these transboundary rivers, net input ceilings are provided in the Annex to this segment.

The input ceilings for nitrogen and phosphorus are based on current scientific knowledge and are subject to uncertainties. Thus, following the precautionary principle, inputs of nitrogen or phosphorus to a basin should not increase until both MAI and [good status with respect to eutrophication] have been reached, even in basins where inputs are already below the input ceilings.

As reductions in nutrient inputs in sub-basins may have wide-spread effects, extra reduction – reduction below the national input ceiling for a sub-basin - can be accounted for, in proportion to the effect on a neighbouring basin, by the countries in reaching their input ceilings for nitrogen and phosphorus, respectively. Such accounting follows agreed principles given in the Annex to the segment.

Commented [SK5]: EE: Partly it is in contradiction with the previous paragraph. I am not sure it is relevant in the main part. Discussion on it could be included in the Annex (not here)

Connection to other treaties

Commented [SK6]: EU: It important to give a perspective behind the figures and to make meaningful comparisons of different contributions, for example a NECA gives very small contributions in perspective which could be much higher if the requirement was applied to existing ships as well.

The achievement of good environmental status in relation to eutrophication in the Baltic Sea also relies on additional reduction required by non-Contracting Parties as follows:

- 52758 tons of airborne nitrogen since the reference period (1997- 2003) assuming full implementation of the Gothenburg Protocol of the UNECE Convention on Long-range Transboundary Air Pollution and National Emissions Ceilings (NEC) Directive until 2030,
- 5561 tons of waterborne nitrogen and 930 tons of waterborne phosphorus since the reference period (1997-2003) assuming that non-Contracting parties take the same responsibility to reduce nutrients input as the Contracting Parties,
- 16803 tons of airborne nitrogen from shipping due to the implementation of the IMO decision to establish a NECA in the Baltic Sea and North Sea.

Implementation of the EU Marine Strategy Framework Directive, Water Framework Directive, Nitrates Directive, Urban Wastewater Treatment Directive and the Industrial Emissions Directive, as well as the Water Code and Law on Environment protection of the Russian Federation are prerequisites to the success of the Baltic Sea Action Plan. Achievement of the BSAP goals for this segment is also dependent on regulations and targets under global treaties.

Operative section - Further efforts to achieve the BSAP goal are needed

Description of desired state

Maximum allowable nutrient inputs have been reached for all sub-basins, and the targets are continuously evaluated based on the best available scientific knowledge considering also the effects of external drivers including climate change.

A circular economy, promoting sustainable production and consumption, is one of the keys to achieve and maintain the eutrophication objectives. The HELCOM regional nutrient recycling strategy supplements the Baltic Sea Action Plan, including measures to be applied for smart nutrient management to close nutrient cycles. When nutrients are recycled to a greater extent within the production systems, fewer virgin raw materials are needed. The development of a circular economy may also contributes to climate change mitigation by cutting the dependency on fossil materials and fuels.

Continuous cooperation with the River Basin Authorities is established to ensure that river basin management plans incorporate the nutrient input ceilings set by the HELCOM Baltic Sea Action Plan and measures in the plans are sufficient to achieve the BSAP goals. Official agreements between relevant authorities, to address transboundary waterborne nutrient inputs from non-Contracting Parties according to the HELCOM BSAP environmental targets are signed and cooperation continues with a focus on a harmonized implementation of measures to achieve the targets.

It should also be acknowledged that achieving of the maximum allowable inputs to all sub-basins does not imply an immediate achieving of a eutrophication situation with acceptable nutrient concentrations, water clarity, algal blooms, and status for benthic plants and animals, as well as oxygen levels. The ecosystem, which has been under anthropogenic pressure for more than a century, may require from a few to a dozen of decades to recover after nutrient inputs have been reduced.

Commented [MHL7]: SE: Consider another wording? The content below is broader than state. Desired "state and management"?

Commented [MHL8]: SE: A lot of detail – could be omitted or shortened?

Commented [SK9]: EU: This paragraph suggest that nutrient recycling is the key to reverse eutrophication trends and mentions that when nutrients are recycled to a greater extent within the production systems, fewer virgin raw materials are needed. Besides nutrient recycling, nutrient better management in general is also a key factor and it is not mentioned. This paragraph should include some development about the need for actions aiming at a more efficient use of fertilisers; better manure management avoiding air and water losses, precision farming, landscape measure (wetland creation and restoration, buffer strips), with reference to a better implementation the nitrate Directive. These actions are already well reported in the table of the paragraph 'Input ceilings for transboundary rivers and other sources and principles to reallocate extra reduction'.

Commented [MHL10]: SE: Is it formulated like this in the strategy? It is quite impossible to close the cycle (to avoid all emissions), so a rephrasing should be considered. E.g. to "..improve the efficiency and minimize losses"

Commented [MHL11]: SE: Recycling may also result in a high energy consumption.

Commented [LDW12]: This should focus on good status and not only on an acceptable status

Commented [LDW13]: Would the nutrient reduction scheme not better be placed after this paragraph to show that it closes the gap between current and desired state?

Input ceilings for transboundary rivers and other sources and principles to reallocate extra reduction

Almost half of the waterborne input of nutrients enters the Baltic Sea via transboundary rivers, which requires setting nutrient input ceilings for 9 major transboundary rivers, addressing inputs from the whole river catchment areas, separately from other sources.

The ~~n~~National net nutrient input ceiling for each sub-basin is the sum of the national share in the transboundary river ceiling and ceiling for remaining sources of input to the respective sub-basin. The input ceilings for transboundary rivers are not additional requirement but an integral part of the national net input ceiling and, thus, countries are free to implement measures where they are most appropriate to meet their net input ceilings.

Nutrient input ceilings for transboundary rivers and other sources, including input ceilings for national parts of transboundary river catchments, are given in the tables below.

Nutrient input ceilings for nitrogen for HELCOM countries, transboundary rivers and other sources:

Commented [LDW14]: Do we need this table again? I think the table below is enough.

	BOB	BOS	BAP	GUF	GUR	DS	KAT	BAS
DE	946	3923	32281	1645	1747	23647	4662	68852
DK	281	1149	9026	420	463	28067	28525	67931
EE	113	404	1478	11330	13099	22	24	26471
FI	35086	28677	1827	15627	295	76	89	81677
LT	108	495	3620	305	462	65	80	5135
LV	74	330	2789	246	12223	31	34	15727
PL	668	3127	35486	1406	1595	1481	1444	45206
RU	839	1994	7321	22875	662	238	246	34175
SE	17718	32651	30691	625	525	6056	32810	121076
OC	1375	5008	26947	2985	2188	4933	4502	47938
BSS	284	1141	5180	675	345	651	701	8978
NOS	131	475	2427	196	150	729	884	4992
NEMUNAS			29338					29338
BARTA			957					957
VENTA			6033					6033
LIELUPE					15864			15864
DAUGAVA					38801			38801
ODER			49298					49298
VISTULA			74808					74808
PREGOLYA			5494					5494
NEVA				43462				43462
MAI	**57622**	**79372**	**325000**	**101800**	**88417**	**65998**	**74000**	**792209**

Waterborne nitrogen input ceilings for HELCOM and non-HELCOM countries within transboundary river basins:

River	Basin	NIC	DE	FI	LT	LV	PL	RU	BY	CZ	UA
NEMUNAS	BAP	29338			18934				10404		
BARTA	BAP	957			377	581					
VENTA	BAP	6033			3730	2303					
LIELUPE	GUR	15864			5867	9996					
DAUGAVA	GUR	38801			897	22450		2634	12820		
ODER	BAP	49298	179				43951			3551	
VISTULA	BAP	74808					70063		3052		1693
PREGOLYA	BAP	5494					2498	2995			
NEVA	GUF	43462		4855				38607			

Nutrient input ceilings for phosphorus for HELCOM countries, transboundary rivers and other sources:

	BOB	BOS	BAP	GUF	GUR	DS	KAT	BAS
DE			71			401		472
DK			21			979	815	1815
EE			9	225	185			418
FI	1683	1245		297				3224
LT			50					50
LV			62		499			560
PL			543					543
RU			146	1531				1677
SE	811	1134	318			116	754	3133
OC	181	394	1046	150	93	105	118	2087
NEMUNAS			914					914
BARTA			25					25
VENTA			106					106
LIELUPE					302			302
DAUGAVA					942			942
ODER			1554					1554
VISTULA			2350					2350
PREGOLYA			147					147
NEVA				1398				1398
MAI	**2675**	**2773**	**7360**	**3600**	**2020**	**1601**	**1687**	**21716**

*Sources of atmospheric deposition of phosphorus cannot be allocated to countries.

Waterborne phosphorus input ceilings for HELCOM and non-HELCOM countries within transboundary river basins:

RIVER	BASIN	NIC	DE	FI	LT	LV	PL	RU	BY	CZ	UA
NEMUNAS	BAP	914			628				286		
BARTA	BAP	25			5	20					
VENTA	BAP	106			26	80					
LIELUPE	GUR	302			109	193					
DAUGAVA	GUR	942			33	403		99	407		
ODER	BAP	1554	38				1459			57	
VISTULA	BAP	2350					2240		63		47
PREGOLYA	BAP	147					51	96			
NEVA	GUF	1398		20				1378			

Application of the mechanism for reallocation of extra reduction is to be based on the following principles:

1. **Accounting should be based on countries individually**

This implies that countries can plan and implement measures across basins at their own discretion as long as it results in conforming to CART after accounting of extra reduction is performed.

2. **Countries could claim accounting for missing reductions even if MAI is exceeded due to inputs from other countries**

No country should need to wait for any other country before claiming themselves fulfilment of CART.

3. **Any relocation of measures should lead to at least the same environmental improvement as if CART were implemented**

This is imperative for the GES to be achieved eventually. Inevitably, using extra reductions will lead to less inputs than MAI as seen as a total for the Baltic Sea, but its distribution need to be such that GES will be achieved everywhere.

4. **The effect of extra reductions on neighboring basins with missing reductions should be estimated given that these are minor deviations from MAI**

The Baltic Sea is a strongly perturbed system and hence, functioning quite different today compared to how it will function when measures been implemented and status approach GES. The whole calculation of MAI is taking this into account and when deviations to MAI are to be analysed, it should be done assuming that we are close to GES.

5. **Accounting for extra reductions in connection with CART follow-up assessments are to be performed in a uniform way supervised by RedCore DG**

Accounting for extra reductions should be included in the regular CART assessment using a common and harmonized methodology. RedCore DG is the forum that supervises development of methodology and, after appropriate approval, implementation of this in the assessment.

6. **The Archipelago Sea phosphorus input reductions should be accounted in the Finnish CART for Gulf of Finland (cf. BSAP 2007)**

Already in BSAP 2007, Finland pointed out that models failed to separate the Archipelago Sea from Bothnian Sea and that this should be taken into account at a later stage. Also in the 2013 revision of the nutrient reduction scheme, model limitations failed to address separate MAI calculations for the Archipelago Sea. However, within the context of accounting for extra reduction can be an opportunity to take into account separately the nutrient inputs to Archipelago Sea from the remaining Bothnian Sea inputs.

7. **In the context of extra reduction accounting, reductions of phosphorus to Baltic Proper could be accounted as input reduction in Gulf of Finland**

In the calculations of MAI, the most limiting targets affecting the distribution of MAI for phosphorus were the winter nutrient concentrations in the Baltic Proper. Strictly following the principle of "maximum" inputs, led to a situation where this gave an optimal solution resulting in removal of virtually all phosphorus inputs to the Baltic Proper and barely any reductions to Gulf of Finland. This solution clearly violated the principle of cost-efficiency so additional calculations based on cost functions for phosphorus input reductions were performed to distribute reductions between Baltic Proper and Gulf of Finland in a cost-efficient way. The obtained MAI results in conforming to phosphorus target in Baltic Proper, but in Gulf of Finland the resulting phosphorus concentrations will be significantly less than target. In line with this, it could be argued for states having phosphorus inputs both to Baltic Proper and Gulf of Finland, that *extra reductions* to Baltic Proper could be deducted from missing reductions in Gulf of Finland with 100% efficiency. However, one should keep in mind that the MAI for nitrogen to Gulf of Finland was determined from applying the HEAT approach, balancing nitrogen and phosphorus concentrations, so if MAI for phosphorus to Gulf of Finland is not achieved fully additional reductions on nitrogen inputs might be necessary.

8. **Following the precautionary principle, re-allocation of extra reductions cannot be used to purposely increase inputs to a neighbouring basin**

Following the precautionary principle, extra reductions achieved in a specific basin cannot be used to purposely increase inputs to a neighbouring basin beyond the national input ceilings for basins with reduction targets and beyond the inputs in the reference period 1997-2003 for basins without reduction targets, taking statistical uncertainties into account.

Possible use of extra reductions to increase inputs up to the national input ceilings within a basin are not within the scope of the re-allocation principles. This issue is to be further discussed.

Although the re-allocation methodology is based current scientific knowledge and modelling, it comes with significant uncertainty and will sooner or later be subject of improvement. Therefore, it would be a risk for the environment to increase inputs to neighbouring basins based on this methodology. In addition, a prerequisite for the calculations here is an environment close to GES.