WP4.2
WFD targets to achieve the HELCOM BSAP

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AIM AND STATUS

The aim is to find nutrient loads per country and sub-basin which reflect the loads if rivers would be in good ecological status (**GES loads**) according to Water Framework Directive (WFD, 2000/60/EC).

We have contacted all HELCOM countries to gather necessary information for estimating GES loads per country and Baltic sub-basin.

Data needs for the analysis

For GES load estimates, we needed **flow data from monitored rivers and unmonitored coastal areas** and concentrations of total nitrogen (**TN**) and phosphorus (**TP**) corresponding to the **boundary between good and moderate ecological status** for the rivers (river mouths) according to WFD classification.

Flow data were obtained from the PLC database (Stockholm University, provided by Bo Gustafsson) as average flow for the period 1995-2017.

Data on WFD ecological status classes

The ecological quality criteria as TN and TP concentrations in rivers, were available from Finland, Estonia, Latvia, Lithuania, and Poland.

In Germany, boundary values between good and moderate status were available for TP; for TN a management value that was set for the rivers so that the coastal and marine waters reach good status with respect to eutrophication is used in the analysis.

Denmark has set total nitrogen loads per year for sub-watersheds, which correspond to the achieving good ecological status of coastal water bodies. We assigned these loads manually to the HELCOM sub-basins (borders were not always coinciding).

Data on WFD ecological status classes

For Sweden, the values are derived from WFD based targets for the coastal areas which are salinity related. It is assumed that water exiting land has a salinity of 0 g/kg and therefore, that end-member concentration could be used to give total N and total P loads.

Russia has provided allowable concentrations in river mouths for inorganic nutrients which could be recalculated to TN and TP concentrations. However, these concentrations are not set for ecological quality status assessment rather as quality standards for admissible impact of chemical substances (impact on human health). These values cannot be used for the purpose of this analysis.

Maximum allowable inputs

To determine if GES loads would be appropriate to achieve/maintain good environmental status in the sub-basins, we compared the estimated **GES loads** with maximum allowable inputs (**MAI**) of nutrients to the sub-basins.

The MAI values used in the analysis should correspond to the share of **riverine loads in MAI** per country and sub-basin. As a first approximation, we used the waterborne MAI values.

These **waterborne MAI** values for total nitrogen and total phosphorus per country and sub-basin are based on information in the annexes of the Summary Report on MAI and CART (Country Allocated Reduction Targets). We assumed that the share of waterborne loads is the same as during the reference period (HELCOM, 2013).

HELCOM: Summary report on the development of revised Maximum Allowable Inputs (MAI) and updated Country Allocated Reduction Targets (CART) of the Baltic Sea Action Plan., 2013.

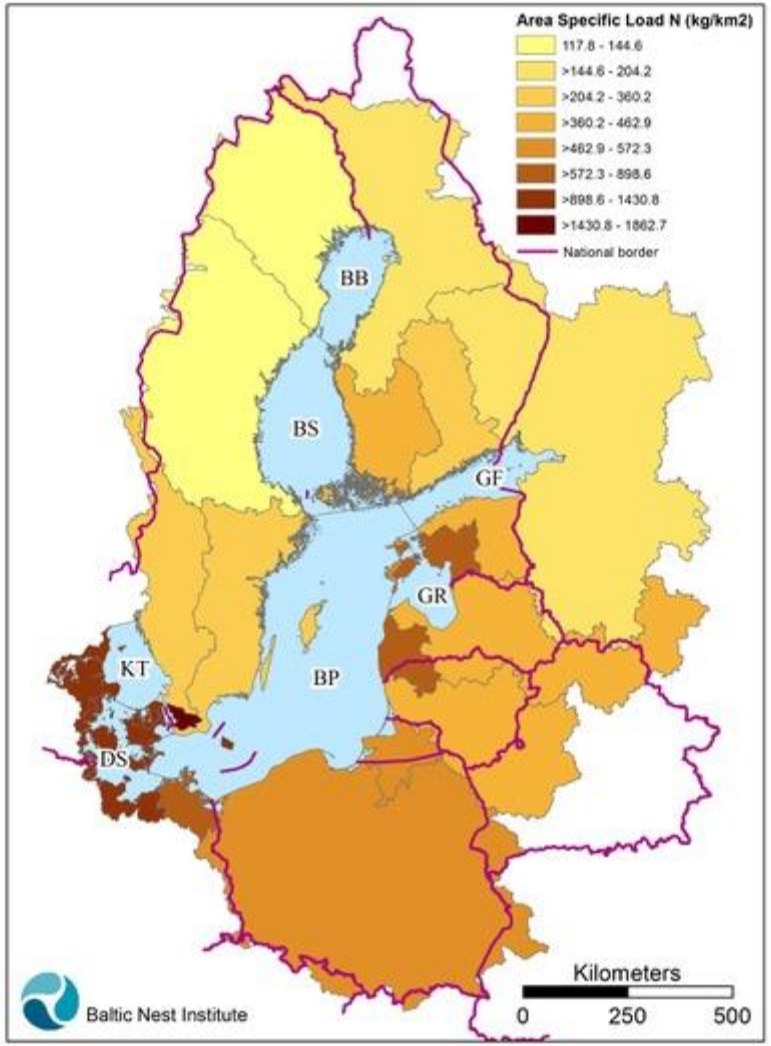
Calculated GES loads and MAI

First, we calculated the **GES load from monitored rivers**

Total GES load was estimated by adding to the GES load from monitored rivers

- either the **average load for the period 1995-2017** from unmonitored coastal areas
- or the **GES load** from unmonitored coastal areas calculated using runoff and nutrient concentrations corresponding to the good/moderate boundary for a selected river type (or an average for sub-basin)

Waterborne MAI [t year^{-1}]

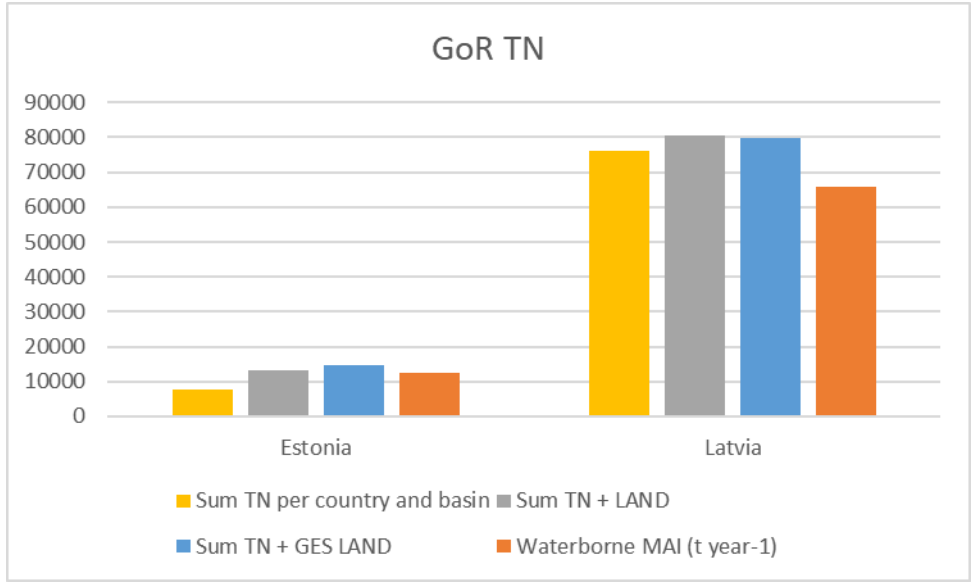


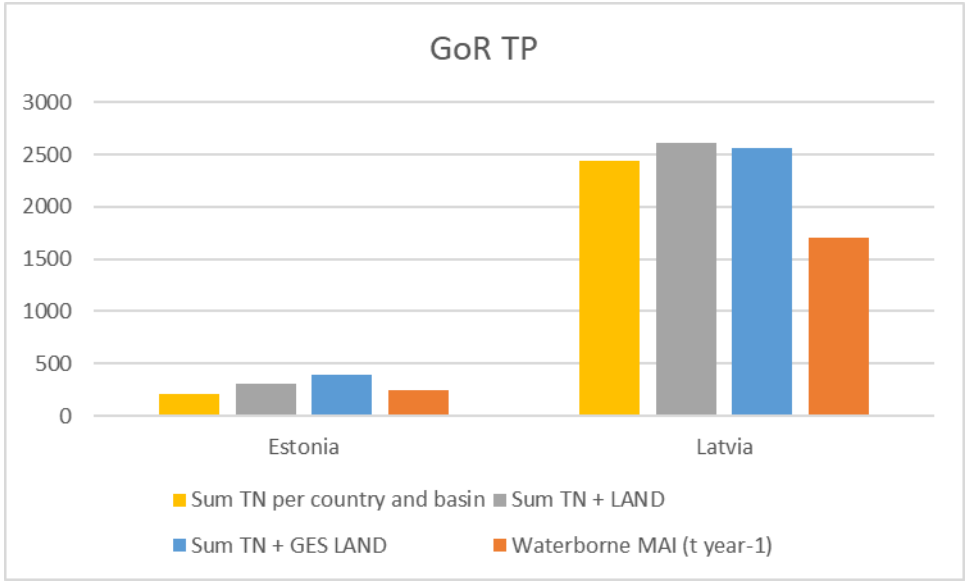
Gulf of Riga

Gulf of Riga TN load (t year^{-1})	Estonia	Latvia
Riverine GES load	7881	**76009**
Riverine GES + average load	**13081**	**78389**
Riverine GES + estimated GES load	**14872**	**79612**
Waterborne MAI	12530	65843

Gulf of Riga TP load (t year^{-1})	Estonia	Latvia
Riverine GES load	210	**2443**
Riverine GES + average load	**306**	**2522**
Riverine GES + estimated GES load	**397**	**2559**
Waterborne MAI	240	1699

Country	G/M boundary for TN	G/M boundary for TP
Estonia	3.0 mg N l^{-1}	0.08 mg P l^{-1}
Latvia	2.8 mg N l^{-1}	0.065-0.09 mg P l^{-1}





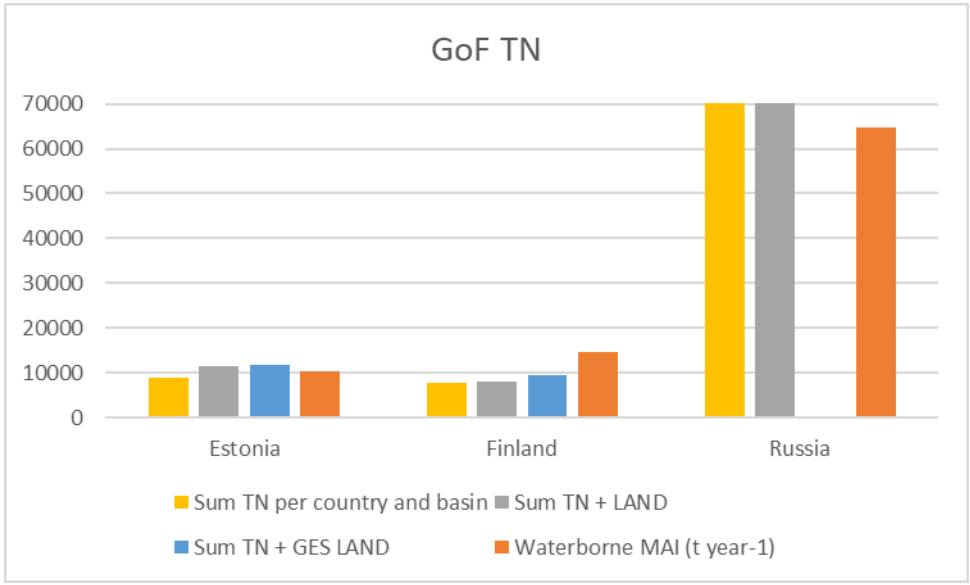
Gulf of Finland

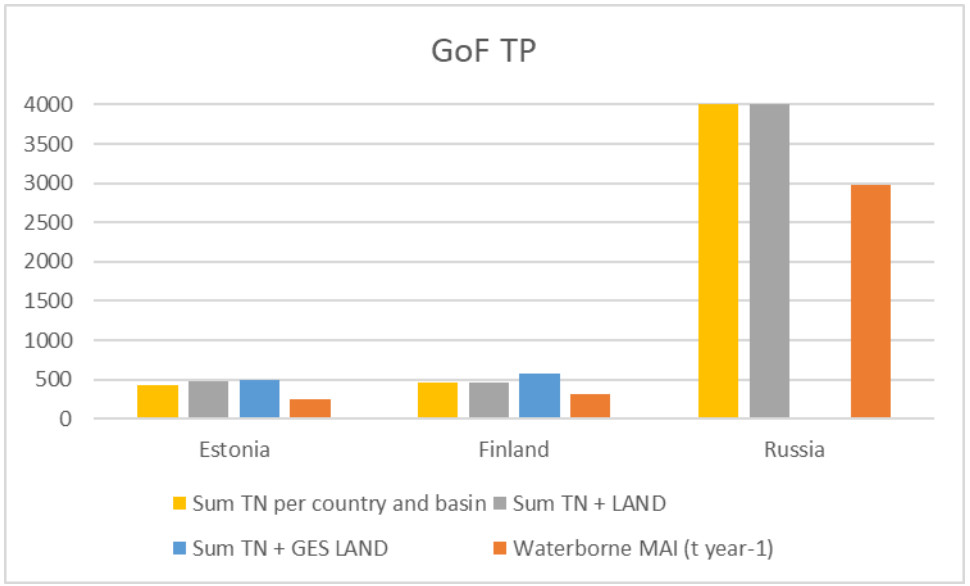
Gulf of Finland TN load (t year^{-1})	Estonia	Finland	Russia
Riverine GES load	8978	7833	
Riverine GES + average load	**11428**	11753	
Riverine GES + estimated GES load	**11740**	9525	
Waterborne MAI	10511	14807	64806

Gulf of Finland TP load (t year^{-1})	Estonia	Finland	Russia
Riverine GES load	**427**	**458**	
Riverine GES + average load	**484**	**644**	
Riverine GES + estimated GES load	**500**	**569**	
Waterborne MAI	242	305	2981

Country	G/M boundary for TN	G/M boundary for TP
Russia*	9.42-9.53 mg N l^{-1}	0.079-0.918 mg P l^{-1}
Finland	0.8-0.9 mg N l^{-1}	0.035-0.04 mg P l^{-1}
Estonia	0.7-3.0 mg N l^{-1}	0.06-0.08 mg P l^{-1}

* For Russia, numbers correspond to inorganic nutrients and health criteria





Baltic Proper

Baltic Proper TN load (t year^{-1})	Denmark	Estonia	Germany	Latvia	Lithuania	Poland	Russia	Sweden
Riverine GES load		-	2876	**10905**	**48230**	**217584**		8649
Riverine GES + average load		**986**	5136	**12365**	**48912**	**224704**		21849
Riverine GES + estimated GES load	**1878**	**1372**	4097	**13386**	**49299**	**226232**		12454
Waterborne MAI	1429	869	5249	7768	32610	147834	8395	24060

Baltic Proper TP load (t year^{-1})	Denmark	Estonia	Germany	Latvia	Lithuania	Poland	Russia	Sweden
Riverine GES load		-	**111**	**334**	**2251**	**16696**		**358**
Riverine GES + average load		**20**	**166**	**391**	**2278**	**17141**		**598**
Riverine GES + estimated GES load		**37**	**158**	**407**	**2301**	**17514**		**503**
Waterborne MAI	24	9	70	108	1059	4946	386	339

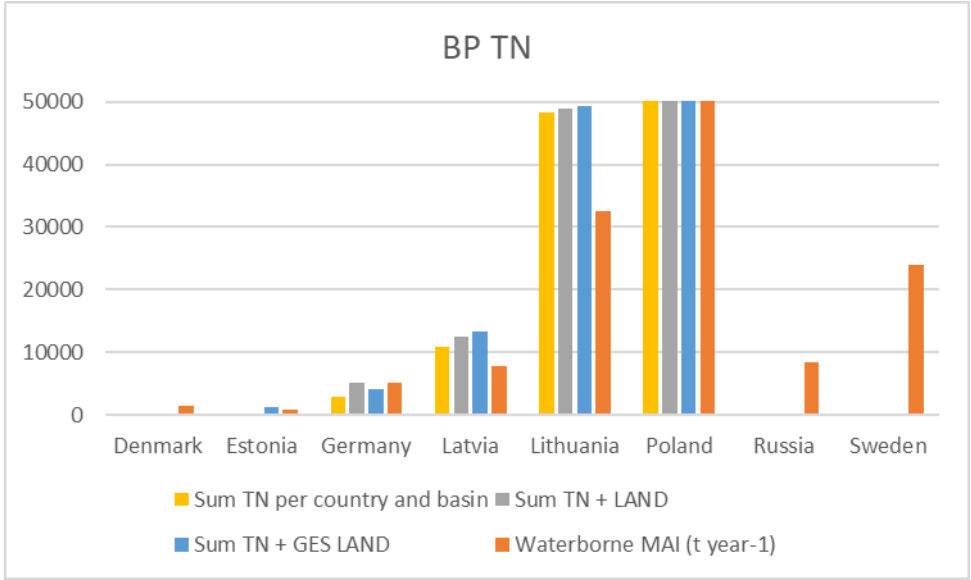
Baltic Proper

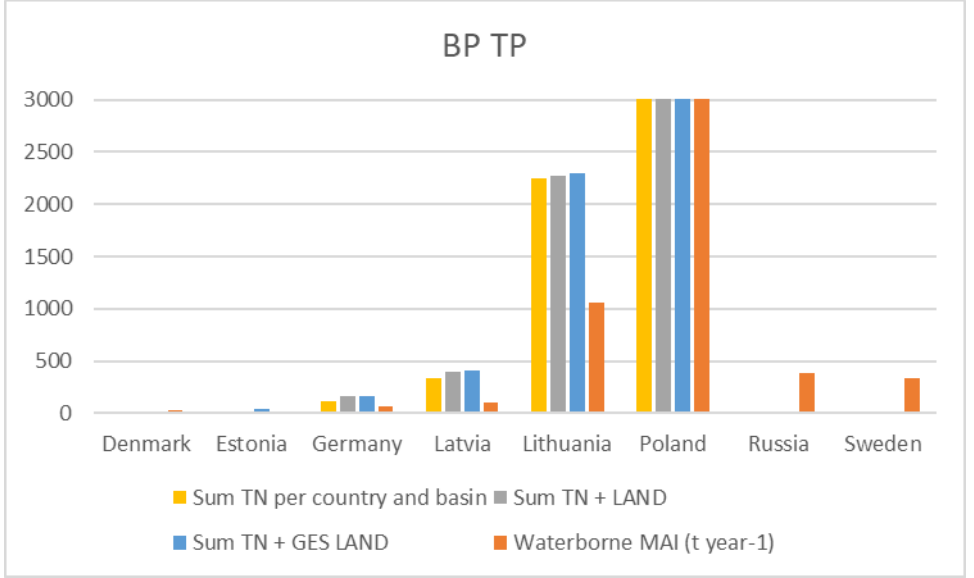
Country	G/M boundary for TN	G/M boundary for TP
Denmark	-	-
Estonia	3.0 mg N l^{-1}	0.08 mg P l^{-1}
Germany	*2.6 mg N l^{-1}*	0.10-0.15 mg P l^{-1}
Latvia	2.8 mg N l^{-1}	0.065-0.09 mg P l^{-1}
Lithuania	3.0 mg N l^{-1}	0.14 mg P l^{-1}
Poland	2.7-4.1 mg N l^{-1}	0.21-0.31 mg P l^{-1}
Russia	-	-
Sweden	-	-

One of the reasons of higher GES loads than MAI according to the Baltic Sea Action Plan could be too high concentrations corresponding to the WFD good/moderate boundary

For TN, the boundary concentrations are quite similar, only a bit higher values are set in Poland, e.g., 4.0 mg N l^{-1} for Odra and Vistula rivers

TP good/moderate boundaries have a bit higher values in the south, but about 2 times higher for Polish rivers





Gulf of Riga based on good/very good boundary and reference conditions

Gulf of Riga TN load (t year^{-1})	**Estonia**	**Latvia**
Total GES load	**14872**	**79612**
Total load corresponding to good/very good boundary	7436	
Total load corresponding to reference conditions	5999	51179
Waterborne MAI	12530	65843

Gulf of Riga TP load (t year^{-1})	**Estonia**	**Latvia**
Total GES load	**397**	**2559**
Total load corresponding to good/very good boundary	**248**	
Total load corresponding to reference conditions	214	1279
Waterborne MAI	240	1699

Loads corresponding to the reference conditions lower than MAI, especially for TN load

Loads calculated using concentrations corresponding to the WFD good/very good boundary comparable to MAI for TP loads (in this example)

COMMENTS SO FAR

The estimated nutrient loads corresponding to the defined good ecological status in river mouths are mostly larger than maximum allowable inputs per country and sub-basin.

In some cases, the boundaries (used in this study) diverse between the countries in the same region.

Estimates of loads corresponding to the reference conditions are lower than waterborne MAI.

COMMENTS SO FAR

Estimates in this study are based on differently defined boundary conditions.

MAI and CART are set as total yearly loads. We estimated the loads as average run-off multiplied by boundary concentrations (where such good/moderate boundaries were set for TN and TP).

Defined allowable loads for coastal basins or sub-watersheds could be directly compared with the BSAP targets.

A question to be discussed – the box model was used to estimate the MAI and CART, it means the coastal zones were not explicitly taken into account

PRESENTATIONS and DISCUSSION

HELCOM SOM Platform meeting 2-2019 in Helsinki, 16-17 September 2019

HELCOM River basin workshop in Riga, 18 September 2019

HELCOM Pressure 20-2019 in Tallinn, 23-25 October 2019

Draft report was sent to the HELCOM contacts to verify the used data and calculations

COMMENTS FROM COUNTRIES

Poland: units for boundary concentrations should be as mg N l^{-1} and mg P l^{-1} (corrected)

New typology of rivers and boundary concentrations will be in force in 2022

Germany: There are two main issues with this report. The first one is that it seems like this is not the final version of the report, since a summary and conclusions are missing.

The second issue is that we cannot verify whether the calculations for Germany are correct. In particular, we would like to see the calculation that was made for the unmonitored areas.

Since these calculations are politically quite sensitive we do not agree with the results provided for Germany unless we have been able to check the calculation details.

Thank you for your attention!

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