WP4.2
WFD targets to achieve the HELCOM BSAP

Stella-Theresa Stoicescu and Urmas Lips

Tallinn University of Technology

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Aim and approach

The main aim was to compare the EU Water Framework Directive (WFD, 2000/60/EC) targets and the HELCOM Baltic Sea Action Plan (HELCOM BSAP, https://helcom.fi/baltic-sea-action-plan/) nutrient load reduction targets.

1. The nutrient loads per country and sub-basin which reflect the loads if rivers would be in good ecological status according to the WFD (**GES loads**) were compared with the maximum allowable inputs (**MAI and NIC**);
2. The **nutrient concentrations** in rivers/freshwater discharge to achieve **HELCOM reduction targets** were compared with the nutrient concentrations corresponding to **the boundary of good/moderate classes**.

Approach and data

An estimate of the annual load from a river into the Baltic Sea corresponding to Good Ecological Status of rivers (GES load) is calculated by **multiplying the runoff with the TN or TP concentration marking the boundary between the good and moderate ecological status** (for that specific river type).

Flow values used in GES load estimates were the average annual runoff values for the period 1995-2017. Data source: **PLC database** provided by Bo Gustafsson (Stockholm University) and available via meeting materials for HELCOM PRESSURE 12-2020. All initial data, including runoff estimates from the unmonitored coastal areas, were reported to the PLC database by the HELCOM countries.

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 and input ceilings

The MAI values used in the analysis should correspond to the share of **riverine loads in MAI** per country and sub-basin.

We used **waterborne MAI** values for total nitrogen and total phosphorus per country and sub-basin 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).

Maximum allowable inputs and input ceilings

In the process of the BSAP update, HELCOM is considering replacing MAI and CART with **nutrient input ceilings (NIC)**. Nutrient input ceilings are similar to MAI defined as maximum inputs via water and air to achieve good status with respect to eutrophication for the Baltic Sea sub-basins. To give an insight into how well the WFD targets correspond to the suggested NIC values, we also compared the estimated GES loads with the draft NIC values available from the HELCOM PRESSURE 12-2020 and HELCOM HOD 58-2020.

NIC and MAI are the same for the HELCOM sub-basins, but since the load estimates for the reference period 1997-2003 were recently updated, the NIC values for a country and sub-basin differ if compared with MAI adopted in 2013.

Maximum allowable inputs and input ceilings

We used two approaches to estimate NIC values:

1) We assumed the **proportional reduction of all loads**. For each country and sub-basin pair, the sub-basin-specific percentages of required reductions to achieve NIC were applied to the riverine loads in 1997-2003
2) We estimated average atmospheric deposition and direct loads for each country and sub-basin pair in the last five years with available data (2013-2017). Then, the **riverine NIC values were found by subtracting five-year average atmospheric and direct nutrient inputs from the draft NIC values**.

Nutrient concentrations in rivers to achieve nutrient input ceilings

Additional background information to assess the compatibility of targets under different policies was obtained by estimating the maximum allowable nutrient concentrations in rivers to achieve the HELCOM nutrient input ceilings.

The **maximum allowable TN and TP concentrations in rivers** were estimated by dividing the riverine NIC values by the average runoff.

These country and sub-basin specific TN and TP concentrations were compared with the type-specific good/moderate boundary according to the WFD classification system (if available).

Results on TN loads (1)

Sub-basin	Country	TN GES load (t year^{-1})	Waterborne MAI TN (t year^{-1})	Riverine NIC proportional TN (t year^{-1})	Riverine NIC left TN (t year^{-1})
GUR	Estonia	16048	12530	12816	12790
	Latvia	81777	65843	65274	66576
	SUM	97825	78373	78090	79366
GUF	Estonia	11747	10660	9451	9987
	Finland	11053	14451	12088	13130
	Russia	n/a	66309	56983	56205
	SUM	79005*	91419	78522	79322
BAP	Denmark	1878	1468	1547	2775
	Estonia	1370	893	849	785
	Germany	4097	5391	5685	5747
	Latvia	13916	7979	8675	8494
	Lithuania	60616	33493	30666	30208
	Poland	231119	151833	140418	137961
	Russia	n/a	8622	7316	6080
	Sweden	12492	24710	20696	20336
	SUM	331568*	234388	215852	212386

Results on TN loads (2)

Sub-basin	Country	TN GES load (t year^{-1})	Waterborne MAI TN (t year^{-1})	Riverine NIC proportional TN (t year^{-1})	Riverine NIC left TN (t year^{-1})
KAT	Denmark	15726	23817	22389	23686
	Sweden	12742	33287	29912	30367
	SUM	28468	57104	52301	54053
DS	Denmark	15116	23276	20787	22439
	Germany	6069	12843	12048	14200
	Sweden	230	5486	4552	4895
	SUM	21415	41605	37387	41534
BOS	Finland	11318	25641	23561	25274
	Sweden	25587	28965	26407	27166
	SUM	36905	54606	49968	52440
BOB	Finland	47506	32625	30857	31100
	Sweden	16588	16813	15724	15875
	SUM	64094	49438	46581	46975

Results on TP loads (1)

Sub-basin	Country	TP GES load (t year^{-1})	Waterborne MAI TP (t year^{-1})	Riverine NIC proportional TP (t year^{-1})	Riverine NIC left TP (t year^{-1})
GUR	Estonia	428	240	177	182
	Latvia	2629	1699	1594	1691
	SUM	3057	1939	1771	1873
GUF	Estonia	501	242	199	200
	Finland	558	305	255	239
	Russia	n/a	2981	1818	2587
	SUM	3646*	3528	2272	3026
BAP	Denmark	n/a	24	17	18
	Estonia	37	9	8	8
	Germany	158	70	68	64
	Latvia	420	108	182	188
	Lithuania	2829	1059	941	955
	Poland	17761	4946	4421	4409
	Russia	n/a	386	213	97
	Sweden	596	339	270	217
	SUM	21916*	6941	6120	5956

Results on TP loads (2)

Sub-basin	Country	TP GES load (t year^{-1})	Waterborne MAI TP (t year^{-1})	Riverine NIC proportional TP (t year^{-1})	Riverine NIC left TP (t year^{-1})
KAT	Denmark	n/a	829	744	766
	Sweden	581	740	657	705
	SUM	1347*	1569	1401	1471
DS	Denmark	n/a	1040	675	733
	Germany	238	351	380	386
	Sweden	15	105	82	93
	SUM	986*	1496	1137	1212
BOS	Finland	561	1255	1178	1178
	Sweden	997	1125	936	977
	SUM	1558	2380	2114	2155
BOB	Finland	2107	1668	1617	1629
	Sweden	1106	826	775	761
	SUM	3213	2494	2392	2390

Results on HES and Ref loads (GoR)

	Country	HES load (t year^{-1})	Ref load (t year-1)	Waterborne MAI (t year^{-1})	Riverine NIC proportional (t year^{-1})	Riverine NIC left (t year^{-1})
TN	Estonia	8024	6419	12530	12816	12790
	Latvia	52571	52571	65843	65274	66576
	SUM	60595	58990	78373	78090	79366
TP	Estonia	267	214	240	177	182
	Latvia	1314	1314	1699	1594	1691
	SUM	1581	1528	1939	1771	1873

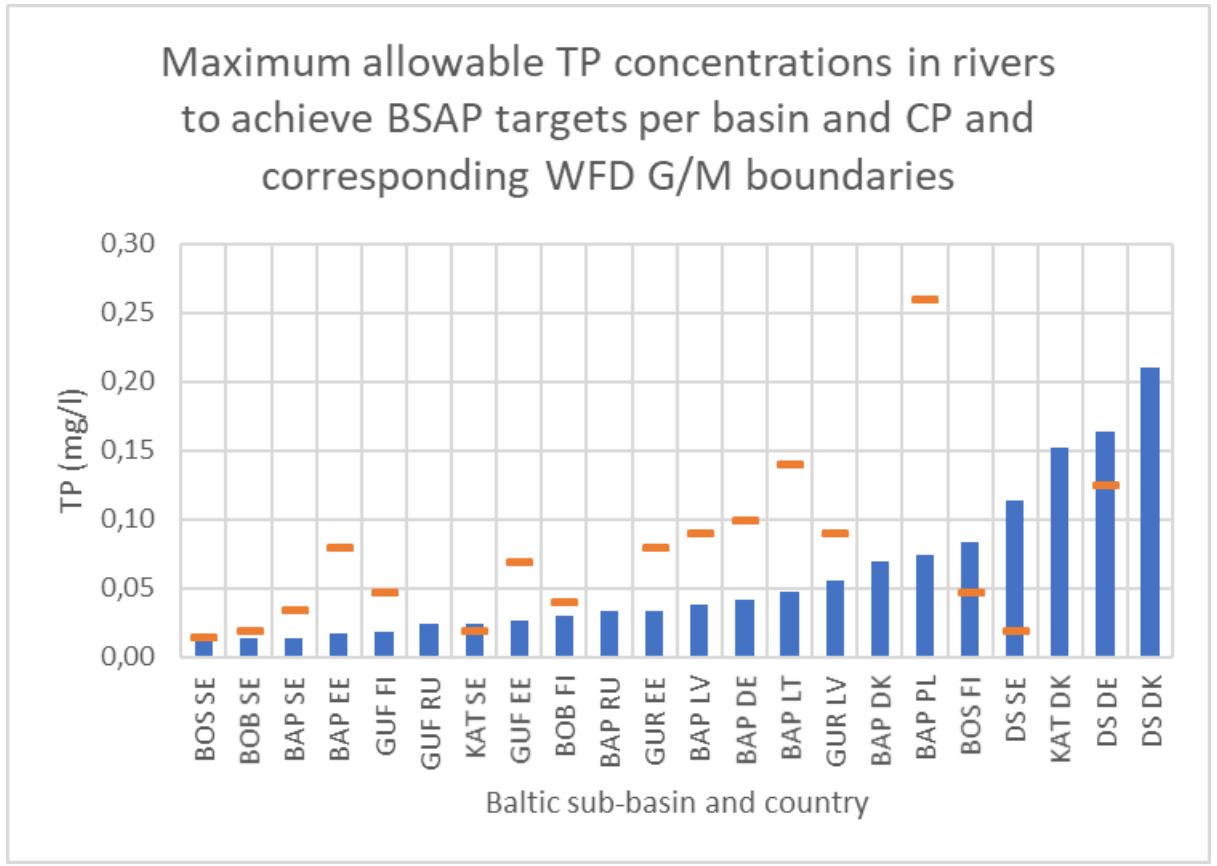
Results on maximum TN and TP conc (1)

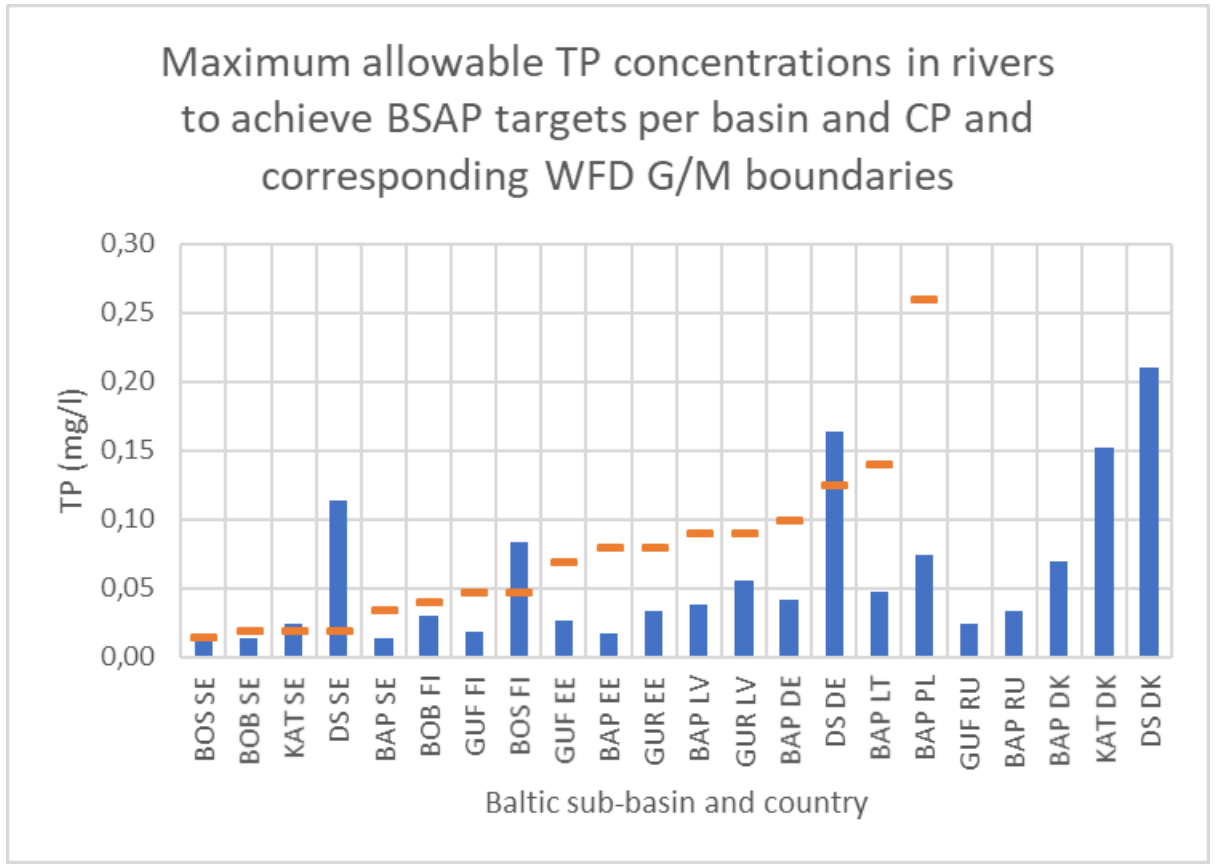
Sub-basin	Country	Average flow (m^3 s^{-1})	Riverine NIC prop TN (t $year^{-1}$)	Riverine NIC left TN (t $year^{-1}$)	Maximum allowable TN conc (mg N l^{-1})	G/M boundary TN conc (mg N l^{-1})	Riverine NIC prop TP (t $year^{-1}$)	Riverine NIC left TP (t $year^{-1}$)	Maximum allowable TP conc (mg P l^{-1})	G/M boundary TP concentration (mg P l^{-1})
GUR	Estonia	169.6	12816	12790	2.40-2.39	3.0	177	182	0.033-0.034	0.08
	Latvia	926.1	65274	66576	2.23-2.28	2.8	1594	1691	0.055-0.058	0.09
	SUM	1095.7	78090	79366	2.26-2.30		1771	1873	0.051-0.055	
GUF	Estonia	234.4	9451	9987	1.28-1.35	0.7-3.0	199	200	0.027-0.027	0.06-0.08
	Finland	438.1	12088	13130	0.87-0.95	0.8	255	239	0.018-0.017	0.035-0.06
	Russia	2956.4	56983	56205	0.61-0.60	n/a	1818	2587	0.020-0.028	n/a
	SUM	3628.9	78522	79322	0.69-0.69		2272	3026	0.020-0.026	
BAP	Denmark	8.0	1547	2775	6.10-10.94	n/a	17	18	0.067-0.072	n/a
	Estonia	14.5	849	785	1.86-1.72	3.0	8	8	0.017-0.017	0.08
	Germany	50.0	5685	5747	3.61-3.65	2.6	68	64	0.043-0.040	0.10
	Latvia	157.6	8675	8494	1.75-1.71	2.8	182	188	0.037-0.038	0.09
	Lithuania	640.7	30666	30208	1.52-1.50	3.0	941	955	0.047-0.047	0.14
	Poland	1890.1	140418	137961	2.36-2.31	2.7-4.1	4421	4409	0.074-0.074	0.21-0.31
	Russia	144.3	7316	6080	1.61-1.34	n/a	213	97	0.047-0.021	n/a
	Sweden	580.3	20696	20336	1.13-1.11	0.5-0.8	270	217	0.015-0.012	0.03-0.04
	SUM	3485.5	215852	212386	1.96-1.93		6120	5956	0.056-0.054	

Results on maximum TN and TP conc (2)

Sub-basin	Country	Average flow (m^3 s^{-1})	Riverine NIC prop TN (t $year^{-1}$)	Riverine NIC left TN (t $year^{-1}$)	Maximum allowable TN conc (mg N l^{-1})	G/M boundary TN conc (mg N l^{-1})	Riverine NIC prop TP (t $year^{-1}$)	Riverine NIC left TP (t $year^{-1}$)	Maximum allowable TP conc (mg P l^{-1})	G/M boundary TP concentration (mg P l^{-1})
KAT	Denmark	157.7	22389	23686	4.50-4.76	n/a	744	766	0.150-0.154	n/a
	Sweden	921.5	29912	30367	1.03-1.04	0.3-0.5	657	705	0.023-0.024	0.02
	SUM	1079.2	52301	54053	1.54-1.59		1401	1471	0.041-0.043	
DS	Denmark	106.1	20787	22439	6.21-6.71	n/a	675	733	0.202-0.219	n/a
	Germany	74.0	12048	14200	3.61-3.65	2.6	380	386	0.163-0.165	0.10-0.15
	Sweden	24.3	4552	4895	5.94-6.39	0.3	82	93	0.107-0.121	0.02
	SUM	204.4	37387	41534	5.80-6.44		1137	1212	0.176-0.188	
BOS	Finland	439.3	23561	25274	1.70-1.82	0.8-0.9	1178	1178	0.081-0.085	0.035-0.06
	Sweden	2476.2	26407	27166	0.34-0.35	0.3-0.4	936	977	0.012-0.013	0.01-0.02
	SUM	2915.5	49968	52440	0.54-0.57		2114	2155	0.023-0.023	
BOB	Finland	1704.0	30857	31100	0.57-0.58	0.8-0.9	1617	1629	0.030-0.030	0.035-0.04
	Sweden	1753.4	15724	15875	0.28-0.29	0.3	775	761	0.014-0.014	0.02
	SUM	3457.4	46581	46975	0.43-0.43		2392	2390	0.022-0.022	

Results on maximum TP conc vs G/M boundary





Recommendations

- Where possible, evaluate the nutrient input ceilings to the coastal water bodies.
- Promote co-operation between the countries to analyse nutrient concentrations for reference conditions in different types of rivers.
- Take steps towards harmonized WFD classification schemes for nutrient concentrations in rivers and/or methodology to define nutrient input ceilings for coastal water bodies.
- Conduct further analyses to estimate the proportion of anthropogenic and natural loads in the riverine input of nutrients.
- Consider nutrient concentrations for reference conditions and the proportion of anthropogenic and natural background loads when re-calculating nutrient input ceilings per country and Baltic Sea sub-basin.

PROCESS SO FAR

Progress reported at:

- HELCOM SOM Platform meeting 2-2019 in Helsinki, 16-17 September 2019
- HELCOM River basin workshop in Riga, 18 September 2019
- HELCOM Pressure 11-2019 in Tallinn, 23-25 October 2019

First draft sent to HELCOM PRESSURE contacts in January 2020, comments received from Germany and Poland

State of the report presented at HELCOM PRESSURE 12-2020 on 21-24 April 2020

PROCESS SO FAR

Second draft delivered to the HELCOM PRESSURE contacts in July 2020

Comments received by 01.09.2020 from Germany, Latvia and Poland

Almost all comments taken into account, and the revised final version presented to HELCOM PRESSURE 13-2020

We invite the meeting to endorse the report for publication

Thank you for your attention!

Stella-Theresa Stoicescu (stella.stoicescu@taltech.ee)

Urmas Lips (urmas.lips@taltech.ee)

Tallinn University of Technology

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