

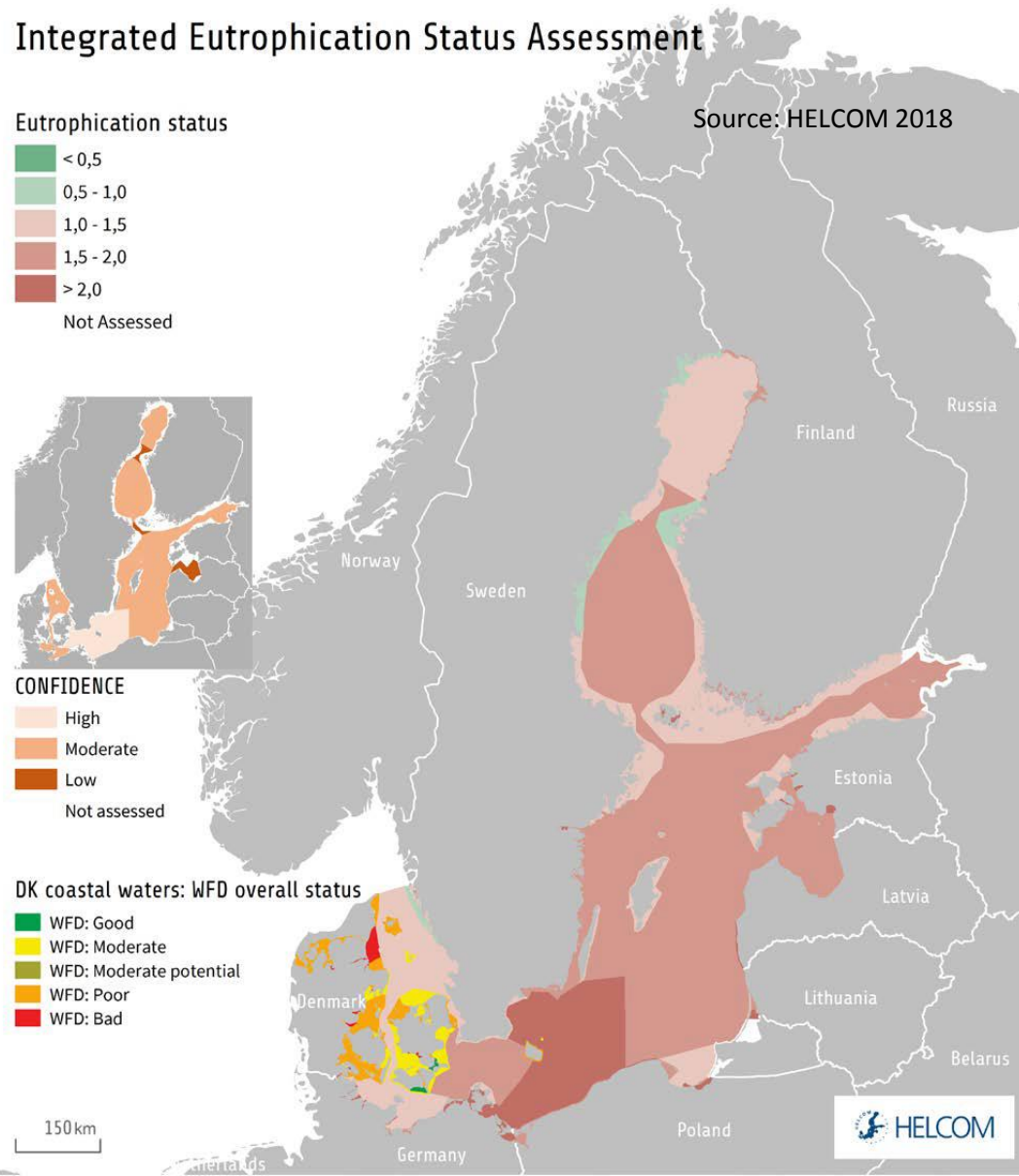
Siting of marine finfish aquaculture operations in the Baltic Sea taking account of the eutrophication status

Wera Leujak, German Environment Agency

Possibilities for siting

- In general, there are 3 possibilities for siting finfish aquaculture operations taking account of the eutrophication status of the Baltic Sea
 - Considering the eutrophication status of the basin
 - Considering the maximum allowable inputs for basins
 - Considering the country-allocated reduction targets
- These possibilities differ in their degree of precaution

1) Considering the eutrophication status



- According to the HOLAS II assessment of the eutrophication status, based on data from 2011-2016, 97% of the Baltic Sea are eutrophied
- The whole open Baltic Sea is eutrophied and 86% of the coastal waters
- This would leave an area of only 3% of the Baltic Sea where finfish aquaculture could be established (some Swedish, Finnish and Danish coastal waters)
- Taking the eutrophication status into account constitutes the most precautionary approach, since the focus is on the actual status of the sea, which is based on many different indicators

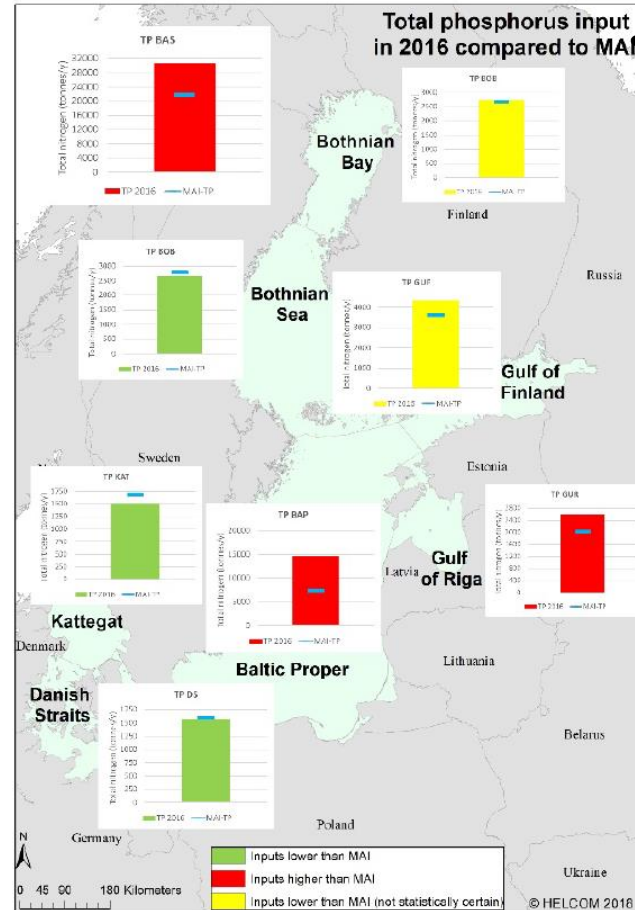
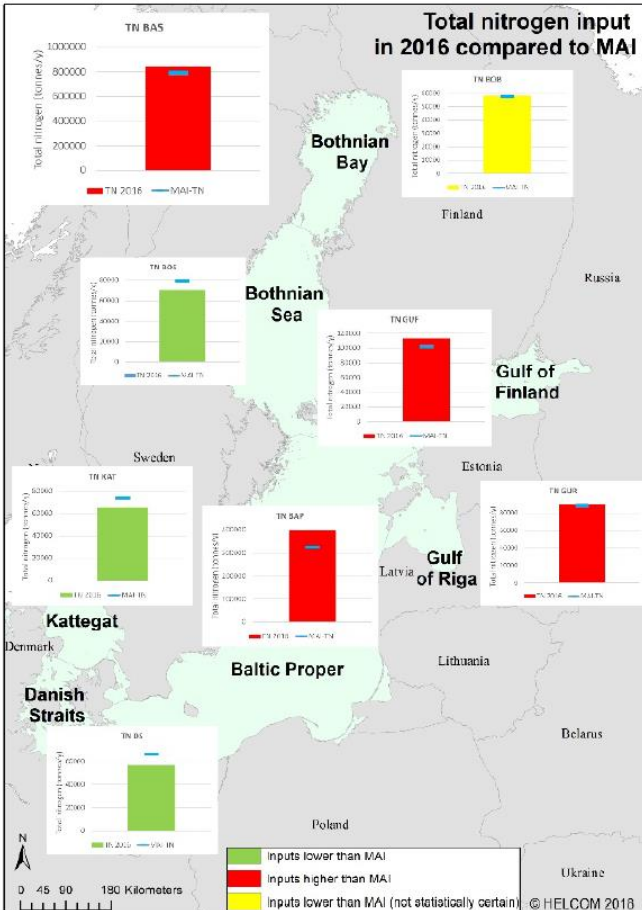
2) Considering the Maximum Allowable Inputs (MAI)

Baltic Sea Sub-basin	Maximum Allowable Inputs		Reference inputs 1997-2003		Needed reductions	
	TN, tons	TP, tons	TN, tons	TP, tons	TN, tons	TP, tons
Kattegat	74,000	1,687	78,761	1,687	4,761	0
Danish Straits	65,998	1,601	65,998	1,601	0	0
Baltic Proper	325,000	7,360	423,921	18,320	98,921	10,960
Bothnian Sea	79,372	2,773	79,372	2,773	0	0
Bothnian Bay	57,622	2,675	57,622	2,675	0	0
Gulf of Riga	88,417	2,020	88,417	2,328	0	308
Gulf of Finland	101,800	3,600	116,252	7,509	14,452	3,909
Baltic Sea	792,209	21,716	910,344	36,894	118,134	15,178

- MAI have been agreed at the 2013 Copenhagen Ministerial Meeting
- Are based on a modelling approach (BALTSEM model of the Baltic Nest Institut) and on the eutrophication targets (nutrients, chlorophyll-a, secchi depth, oxygen)
- Are supposed to constitute the maximum airborne and waterborne input of nutrients the Baltic Sea Basins can tolerate before eutrophication effects occur
- Annual follow-up in HELCOM

2) Considering the Maximum Allowable Inputs (MAI)

Rec 37/3 refers to MAI as follows: „permits or regulations should aim at limiting emissions and discharges of phosphorus and nitrogen, thus striving to contribute, together with other sectors, to keeping the inputs within the Maximum Allowable Inputs as agreed in the HELCOM Ministerial Declaration 2013 (and following updates) in order to enable and not jeopardize the achievement of a good environmental/ecological/chemical status ...”



There are currently 3 basins where MAI are not exceeded with statistic certainty – Bothnian Sea, Danish Straits and Kattegat

2) Considering the Maximum Allowable Inputs (MAI)

Baltic Sea Sub-basin	MAI*	P input 2016	Statistical uncertainty 2016	P input including stat. uncert. 2016	Exceedance of MAI	Input 2016 incl. stat. uncertainty in % of MAI	Classification of achieved reduction	
Bothnian Bay (BOB)	2675	2598	140	2738	63**	102		
Bothnian Sea (BOS)	2773	2533	126	2658		96		115 tons below MAI
Baltic Proper (BAP)	7360	14014	636	14650	7290	199		
Gulf of Finland (GUF)	3600	2810	1520	4330	730**	120		
Gulf of Riga (GUR)	2020	2378	211	2589	569	128		
Danish Straits (DS)	1601	1522	51	1574		98		27 tons below MAI
Kattegat (KAT)	1687	1451	55	1506		89		181 tons below MAI
Baltic Sea (BAS)	21716	29415	1181	30596	8880	141		

- The margin to MAI is small, especially for phosphorus
- According to the precautionary principle there should not be an increase in nutrient inputs
- HELCOM CPs also committed in the Ministerial Declaration 2013 to implement nutrient reductions even if the modelling approach taken did not establish reduction requirements
- MAI constitute a good yardstick for the management of nutrient inputs but should not be taken as absolute numbers that can be safely filled-up
- The approach is less precautionary because the MAI are based on a modelling approach
- At least MAI ensure a **collective sharing** of nutrient reductions

3) Considering the Country-Allocated Reduction Targets (CART)

	Nitrogen	Phosphorus
Denmark	2890	38
Estonia	1800	320
Finland	2430 +600*	330 +26*
Germany	7170 +500*	110 +60*
Latvia	1670	220
Lithuania	8970	1470
Poland ²	43610	7480
Russia	10380*	3790*
Sweden	9240	530

- CART have been agreed at the 2013 Copenhagen Ministerial Meeting
- Are based on the same approach as MAI; to obtain CART the needed reductions have been distributed among all CPs sharing a basin based on the polluter pays principle
- Based on CART, input ceilings can be calculated as follows: Input ceiling = net reference inputs – CART
- There is a regular follow-up of the input ceilings in HELCOM

3) Considering the Country-Allocated Reduction Targets (CART)

Input ceiling fulfillment for nitrogen by 2014

Country/basin	BOB	BOS	BAP	GUF	GUR	DS	KAT
Denmark	↓	↓	↓	↓	↓	↓	↓
Estonia	↓	↓	↓			↓	
Finland			↓		↓	↓	↓
Germany	↓	↓	↓	↓	↓	↓	↓
Latvia	↓	↓				↓	↓
Lithuania	↓	↓		↓		↓	↓
Poland	↓	↓	↓	↓	↓	↓	↓
Russia	↓	↓	↑			↓	
Sweden	↓	↓	↓	↓	↓		↓
Belarus							
Czech Republic							
Ukraine			↑				
Baltic Sea shipping							
Other countries	↓	↓	↓	↓	↓	↓	↓
MAI	↓	↓	↓			↓	↓

Input ceiling fulfillment for phosphorus by 2014

Country/basin	BOB	BOS	BAP	GUF	GUR	DS	KAT
Denmark			↓				↓
Estonia				↓			
Finland	↓						
Germany							
Latvia							
Lithuania			↓		↓		
Poland							
Russia			↑	↓			
Sweden		↓	↓			↓	
Belarus							
Czech Republic							
Ukraine			↑				
Baltic Sea shipping							
Other countries				↓			
MAI				↓			↓

3) Considering the Country-Allocated Reduction Targets (CART)

Denmark

Nitrogen

Denmark fulfil nitrogen reduction requirements to all basins.

Denmark TN	BOB	BOS	BAP	GUF	GUR	DS	KAT
Extra reduction	57	252	433	51	99	6148	3126
Missing reduction							

Phosphorus

Denmark have an extra reduction of 1 ton/yr that in principle can be used for compensating a part of the missing reduction to BAP, but in practice the change is insignificant since the extra reduction is so small.

Denmark TP	BOB	BOS	BAP	GUF	GUR	DS	KAT
Extra reduction						1	119
Missing reduction			47				

- Finfish aquaculture could be established by those CPs that have fulfilled their CART für phosphorus and nitrogen for a certain basin if the nutrient discharge from the aquaculture operation will not lead to an exceedance of the nutrient inputs ceilings (if extra reductions exist)
- This would constitute the least precautionary approach since it will be assumed that all CPs can achieve their CART for a respective basin

Conclusion

- It is recommended to base the site selection for finfish aquaculture operations in the Baltic Sea on the eutrophication status of the respective location
- If the status is not good, new finfish aquaculture operations should not be established