

German Environment Agency

Umwelt
Bundesamt 

MEER:STARK Final Event, 2025 Berlin

Eutrophication and its impacts on the marine environment

Dr. Stephanie Helber

Section II 2.3 | Protection of the Seas and Polar Regions

Eutrophication in the Press

Zu warm, zu nährstoffreich

Braunalgen-Plage erstickt Leben in der Ostsee - Landwirtschaft mitschuldig?

In Teilen der Ostsee breitet sich die Braunalgen ihren klebrigen Schleim überdeckt sie den darunter stirbt ab.

Do., 22. Mai 2025, 06:25 Uhr



Ostsee-Urlaub breiten sich an schlagen Alarm

Vor Dänemark treiben kilometer auch vor der deutschen Küste v droht, das Leben im Meer zu er

So schön und so tödlich

Die Ostsee erstickt im Al Schleim



Schichten von fettigem Schleim, bei dem es sich um fadenförmige Algen handelt, legen sich wie eine erstickende Decke über die anderen Algen

Foto: Morten Rasmussen/Ritzau Scanpix/picture alliance/dpa

Braunalgen-Plage

Glitschiger brauner Schleim wabert in der Ostsee

Markus Brauer 20.05.2025 - 15:09 Uhr

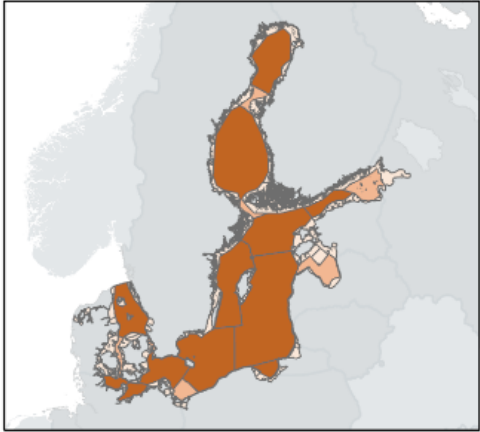


Die mehrjährige Braunalge – auch bekannt als Seetang – erreicht eine Länge von 10 bis 30 Zentimeter und ist beim Anfassen glitschig. Foto: Daniel Gastaldi/dpa

Die Ostsee gehört zu den mit am stärksten belasteten Meeresgewässern. Bei den derzeit warmen Frühjahrstemperaturen wird das „Mare balticum“ von einer Braunalgen-Plage heimgesucht.

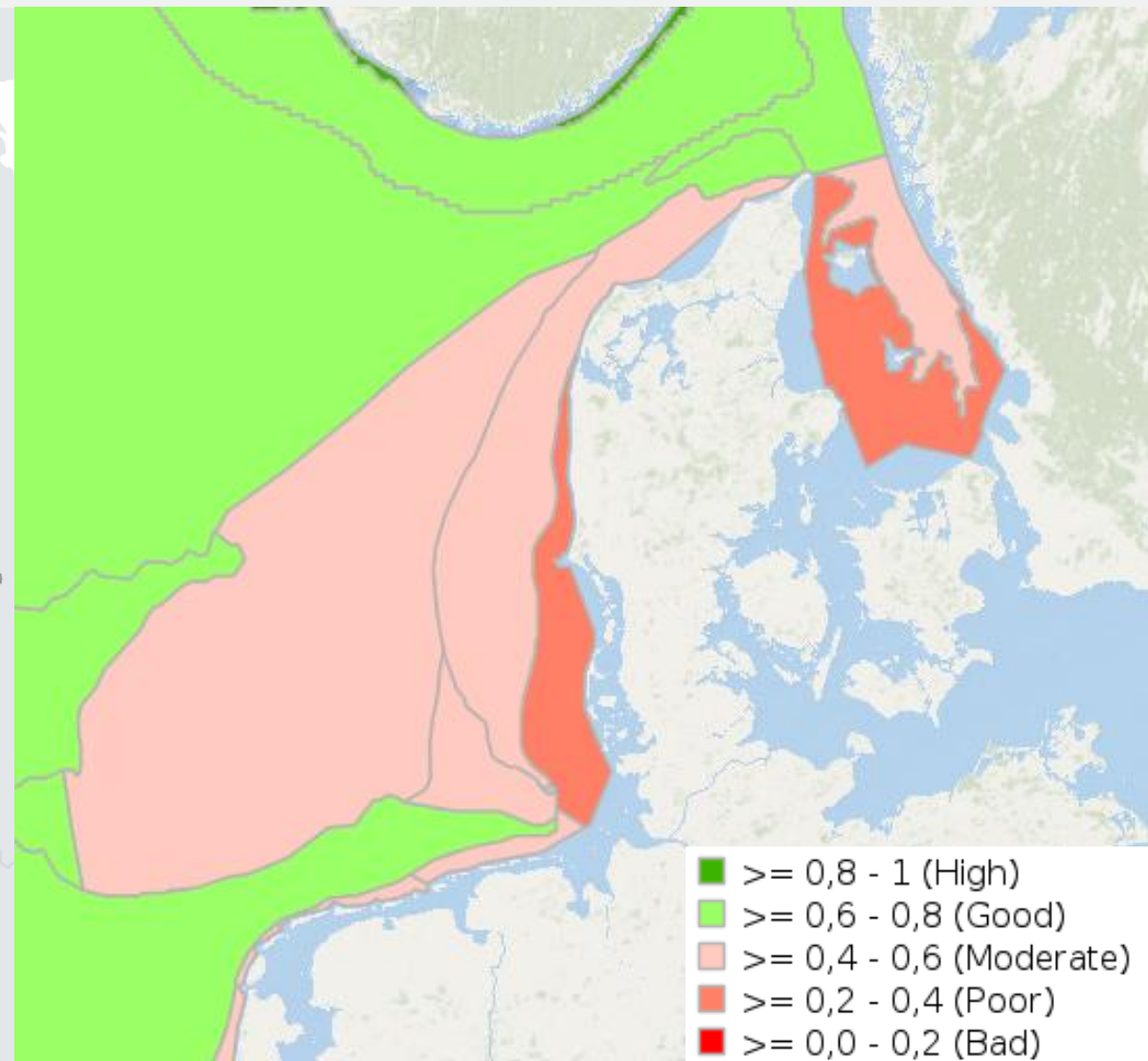
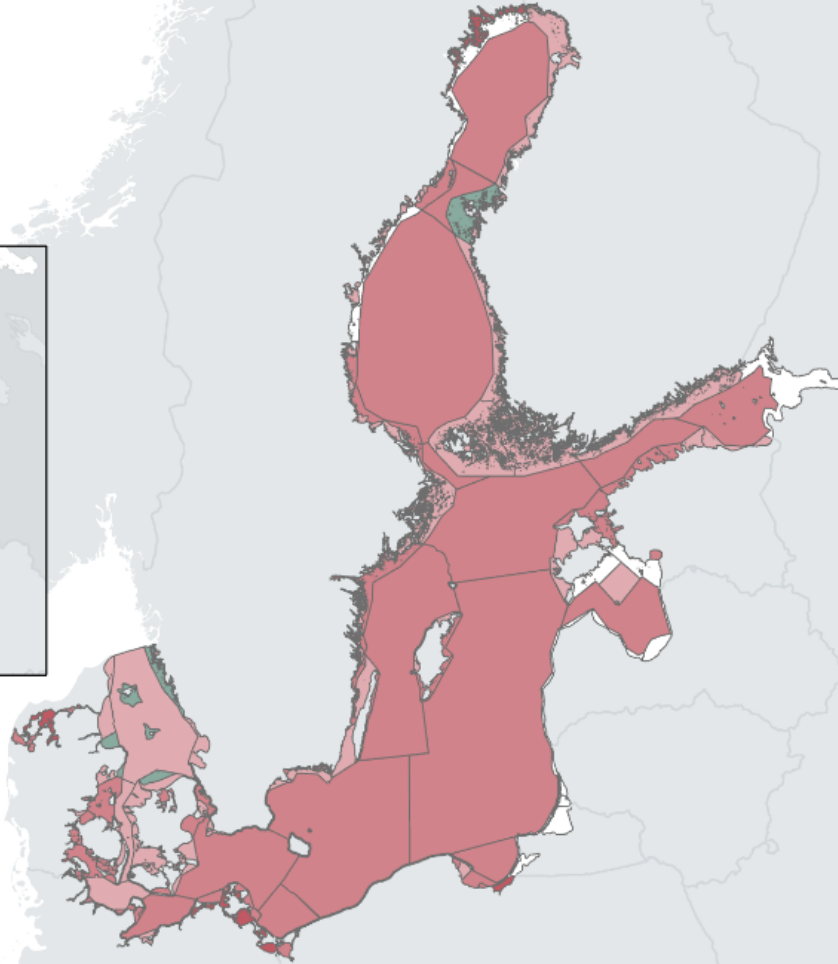
Integrated eutrophication status

- High
- Good
- Moderate
- Poor
- Bad
- Not assessed



Confidence

- High
- Moderate
- Low



https://odims.ospar.org/en/submissions/ospar_comp_eqrs_2020_06/

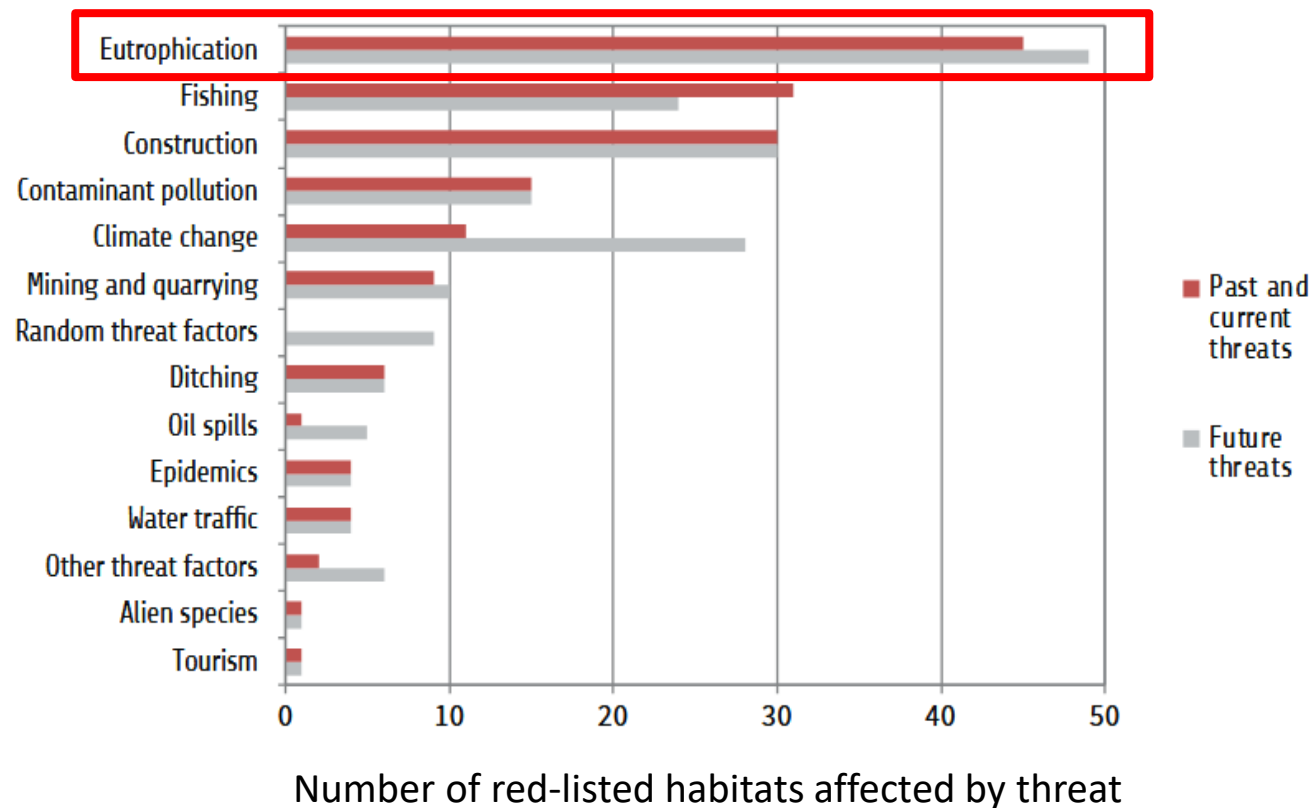
HELCOM HOLAS III: EUTROPHICATION

Assessment Period: 2016- 2021

OSPAR- EUTROPHICATION STATUS, QSR 2023

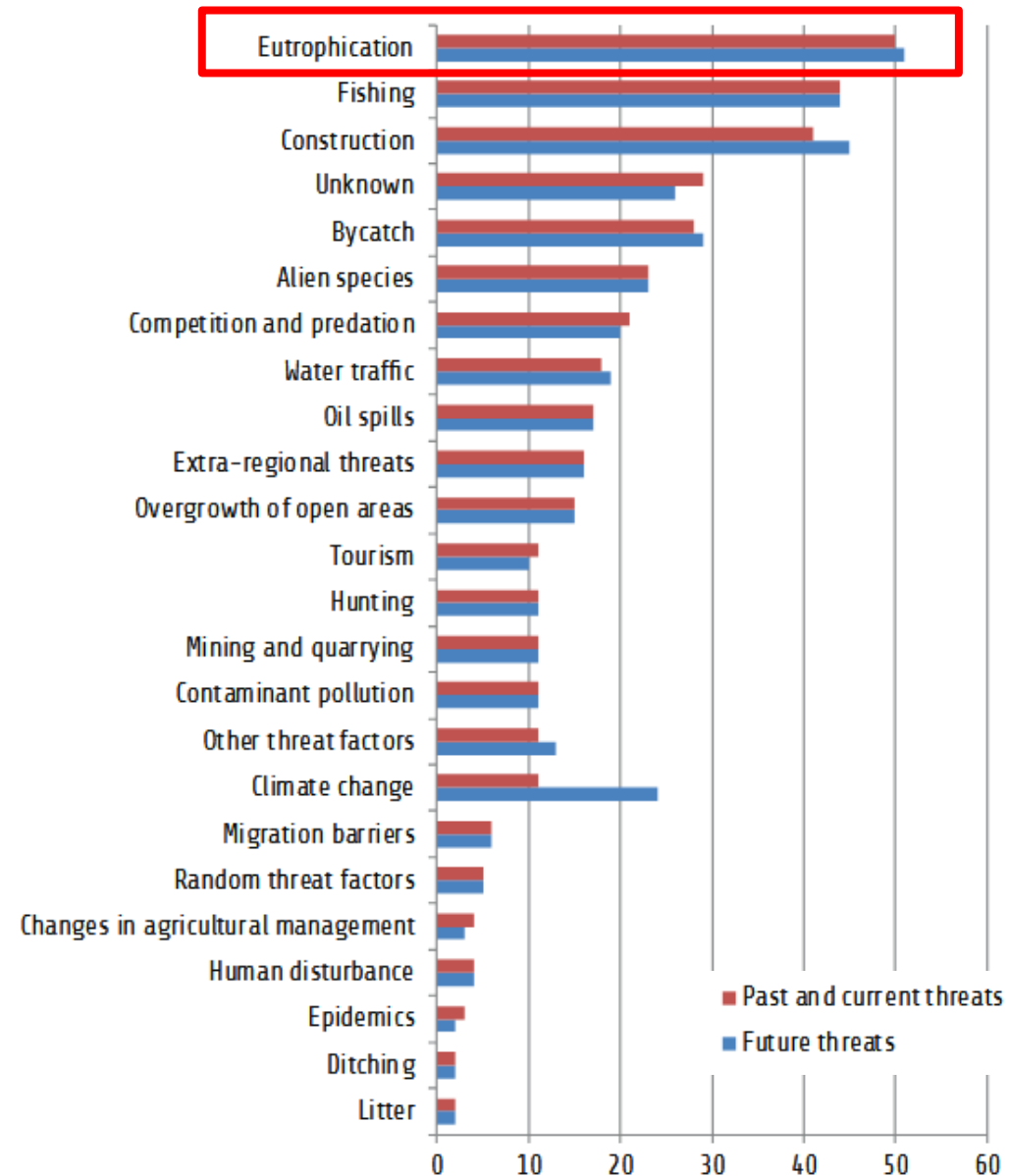
HELCOM (2023): State of the Baltic Sea. Third HELCOM holistic assessment 2016-2021. Baltic Sea Environment Proceedings n°194.

Eutrophication is the most common reason for becoming threatened



HELCOM (2025) HELCOM Red List II of the Baltic Sea underwater biotopes, habitats and biotope complexes at risk of collapse. Baltic Sea Environment Proceedings No.206.

HELCOM (2025) HELCOM Red List II of Baltic Sea species in danger of becoming extinct. Baltic Sea Environment Proceedings No.205.



Number of red-listed species affected by threat

Nutrient input into Baltic Sea

Agriculture

N: 70-90%

P: 60-80%

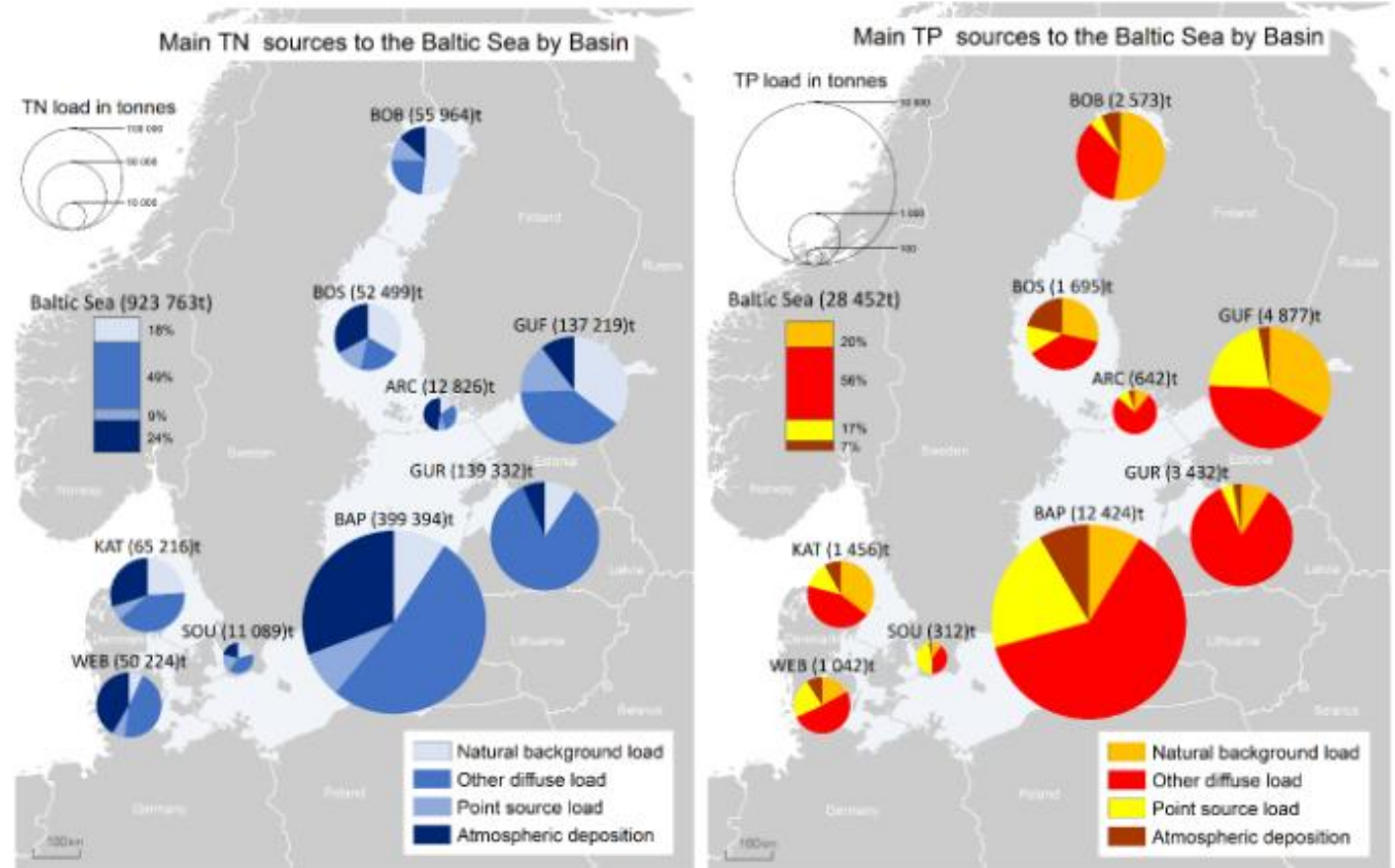
→ almost half of the total waterborne inputs to the sea (fertilizer consumption and manure input)

Wastewater

N: 69 800t

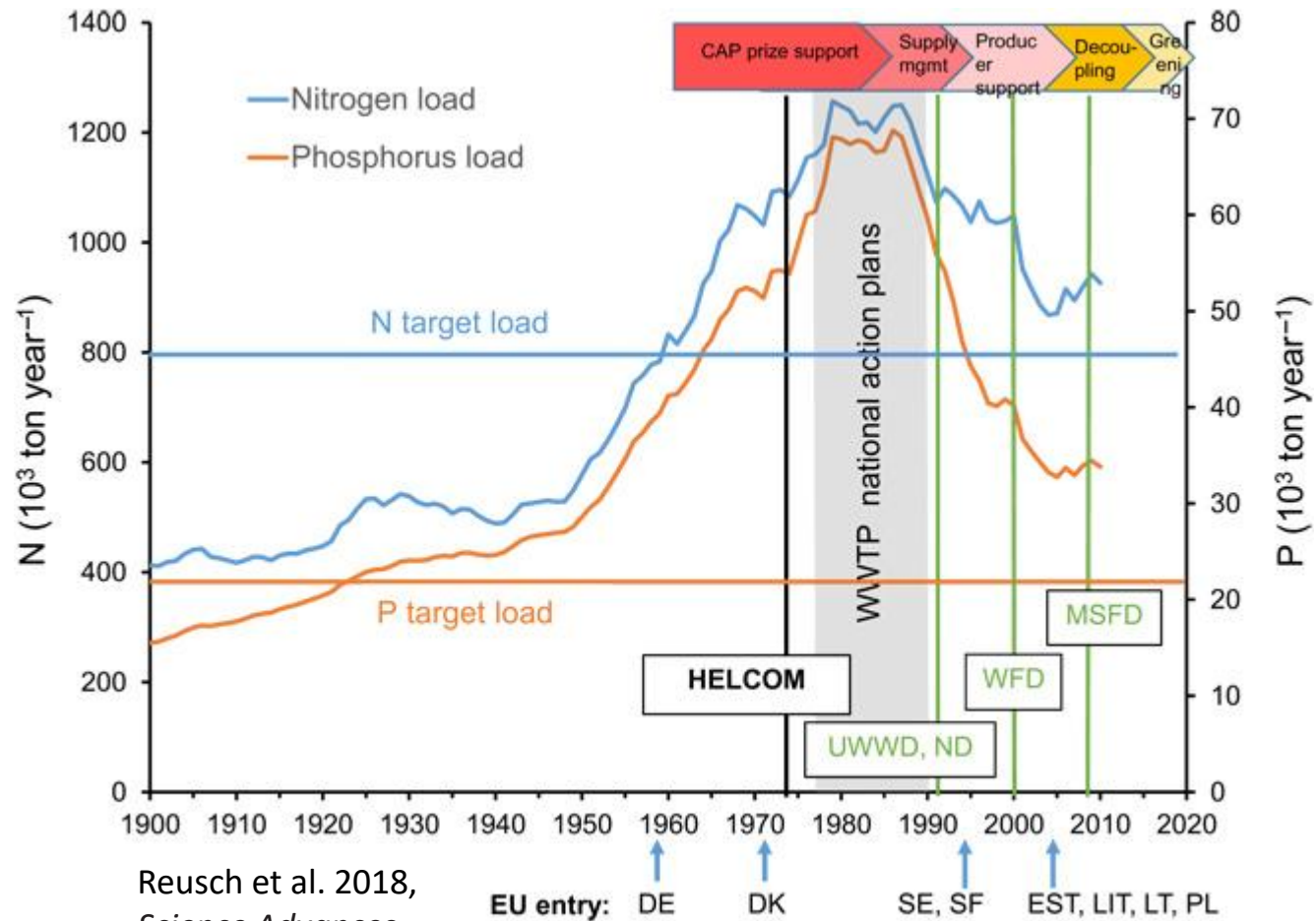
P: 4220 t

→ 72% of the total population connected to tertiary wastewater treatment facilities



HELCOM, 2022. Pollution load on the Baltic Sea. Summary of the HELCOM Seventh Pollution Load Compilation (PLC-7).

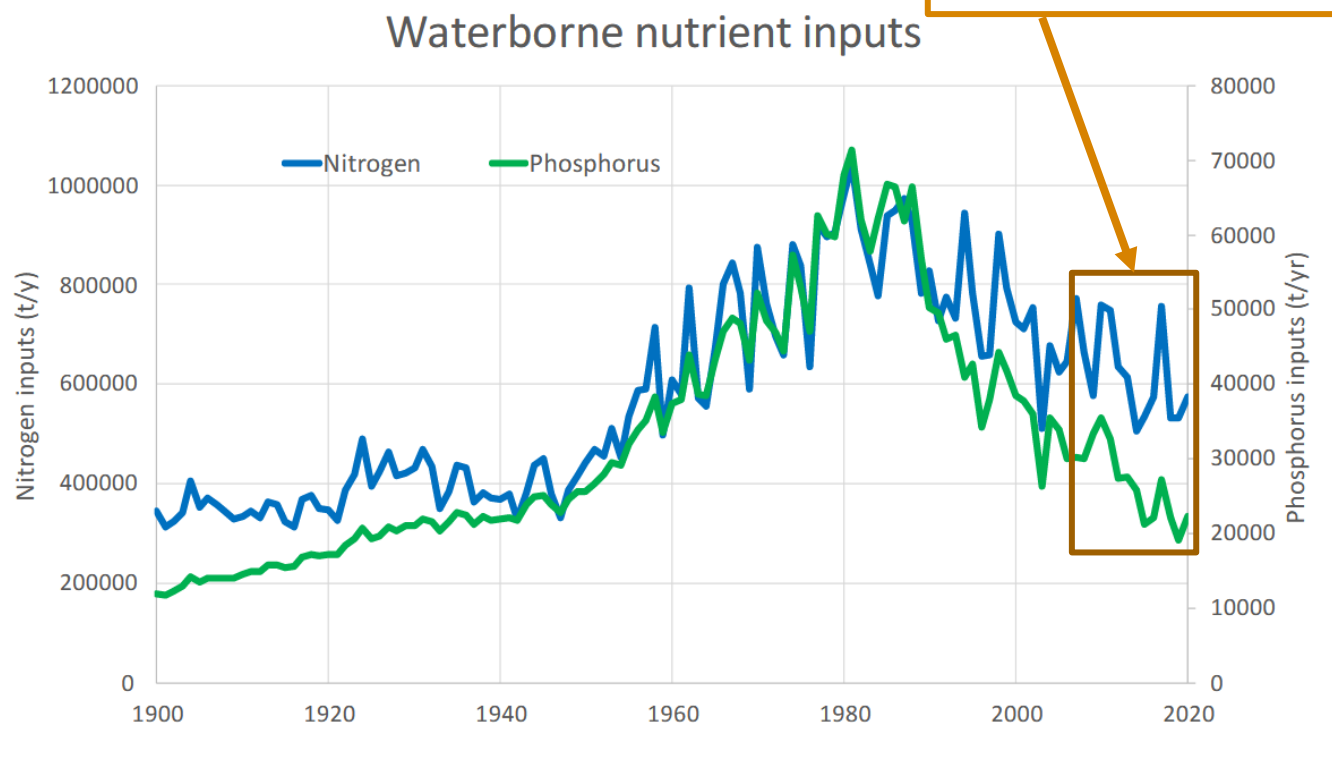
Nutrients inputs have been strongly reduced, but still too high



Reusch et al. 2018,
Science Advances

No decrease in dissolved inorganic P (DIP) despite input reductions

Last 10 years:
further P reductions,
stagnations in N

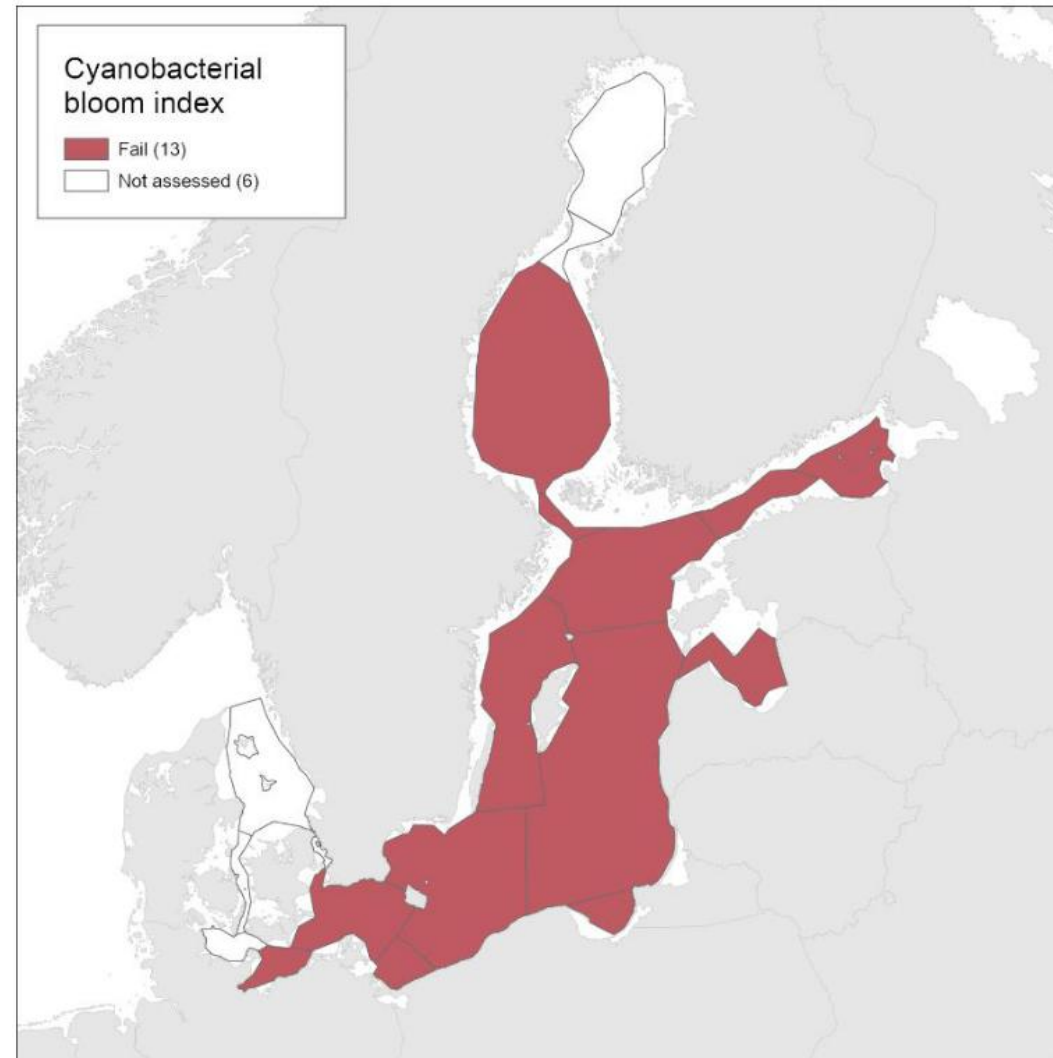


HELCOM 2023. Thematic Assessment of Eutrophication 2016- 2023.
Baltic Sea Environment Proceedings no. 192

HELCOM Assessment Unit name	HOLAS II 2011-2016 (EQRS)	HOLAS 3 2016-2021 (EQRS)	Distinct trend between current and previous assessment.
Kattegat	0.55	0.57	No distinct change
Great Belt	0.53	0.59	No distinct change
The Sound	0.27	0.34	Distinct improving change
Kiel Bay	0.52	0.51	No distinct change
Bay of Mecklenburg	0.35	0.31	No distinct change
Arkona Basin	0.22	0.25	No distinct change
Bornholm Basin	0.15	0.14	No distinct change
Pomeranian Bay	0.23	0.20	No distinct change
Gdansk Basin	0.39	0.18	Distinct deteriorating change
Eastern Gotland Basin	0.19	0.15	Distinct deteriorating change
Western Gotland Basin	0.17	0.17	No distinct change
Gulf of Riga	0.15	0.11	Distinct deteriorating change
Northern Baltic Proper	0.14	0.11	Distinct deteriorating change
Gulf of Finland Western	0.22	0.17	Distinct deteriorating change
Gulf of Finland Eastern	0.32	0.22	Distinct deteriorating change
Åland Sea	0.18	0.14	Distinct deteriorating change
Bothnian Sea	0.23	0.15	Distinct deteriorating change
The Quark	0.15	0.10	Distinct deteriorating change
Bothnian Bay	0.77	0.41	Distinct deteriorating change from GES to non-GES

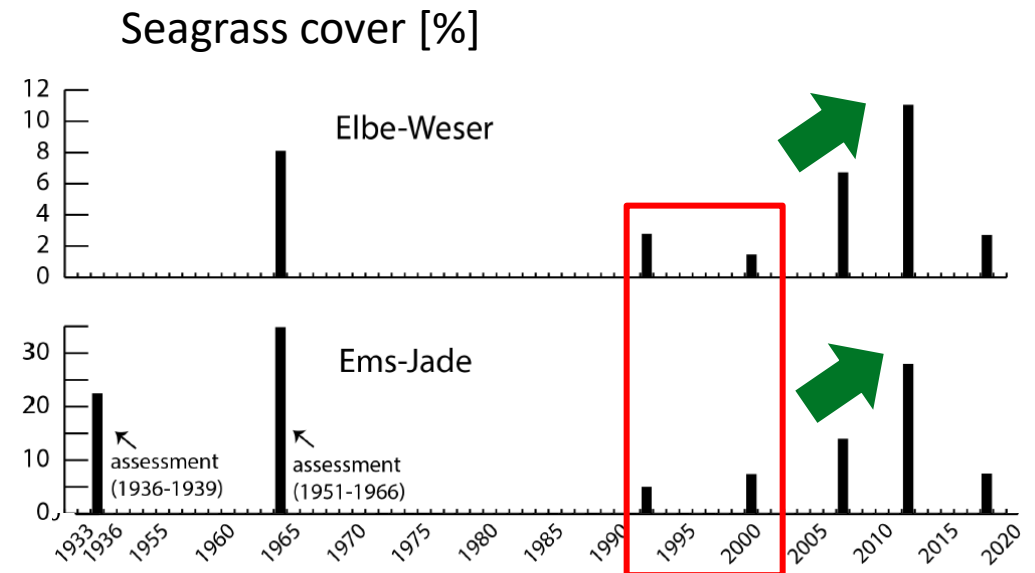
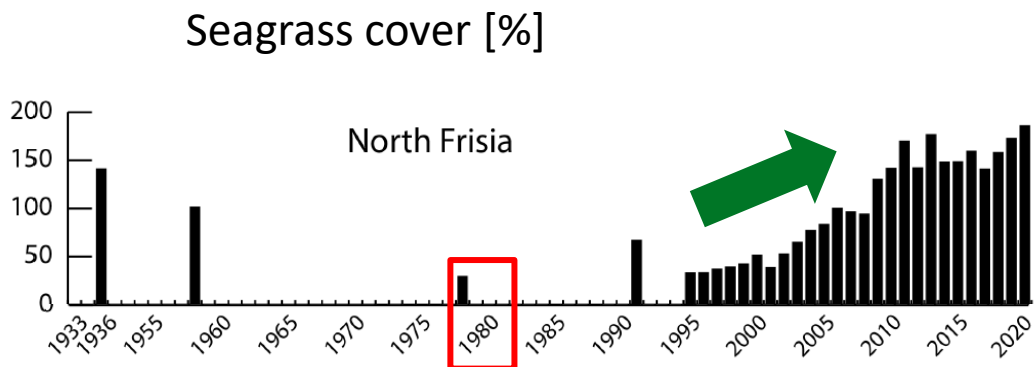
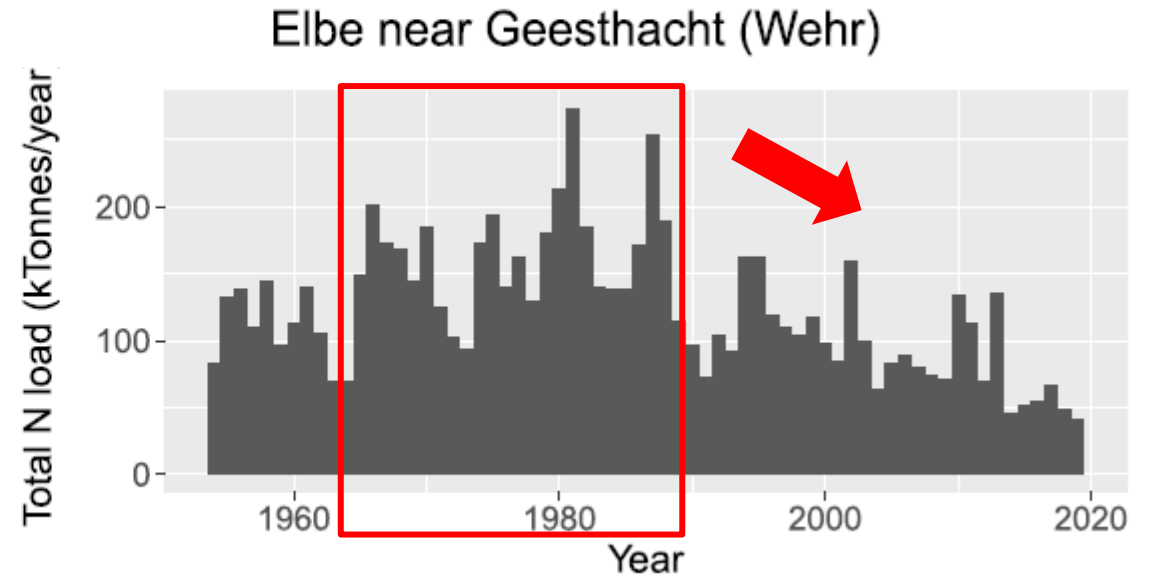
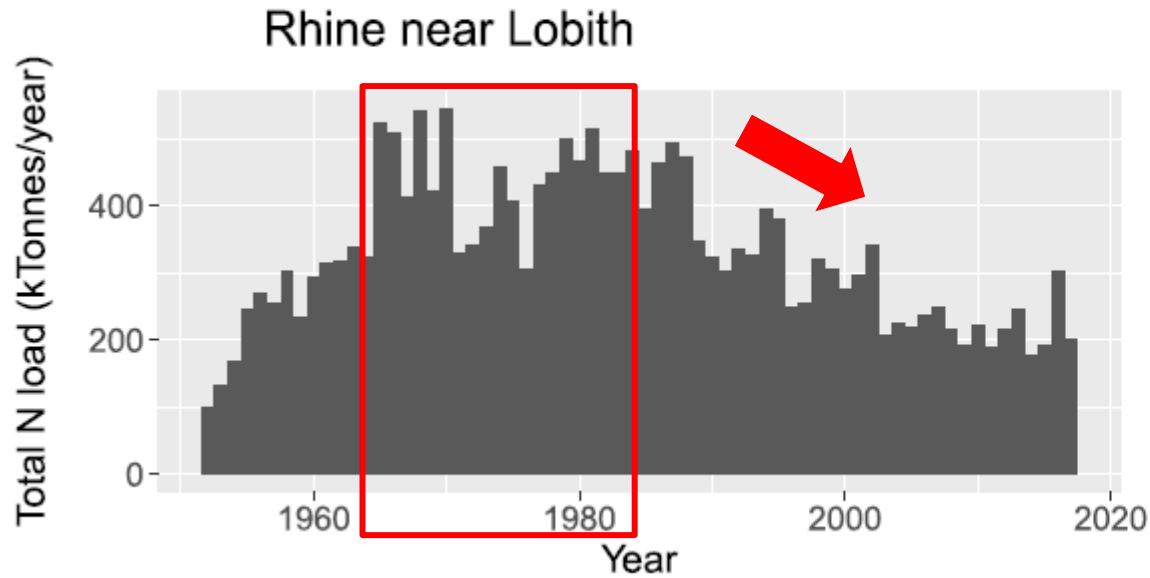
HELCOM 2023Dissolved inorganic phosphorus (DIP). HELCOM core indicator report.

Phosphorous leakage and cyanobacterial blooms seem to fuel eutrophication



HELCOM HOLAS III: Cyanobacterial Bloom Index (Pre-Core)

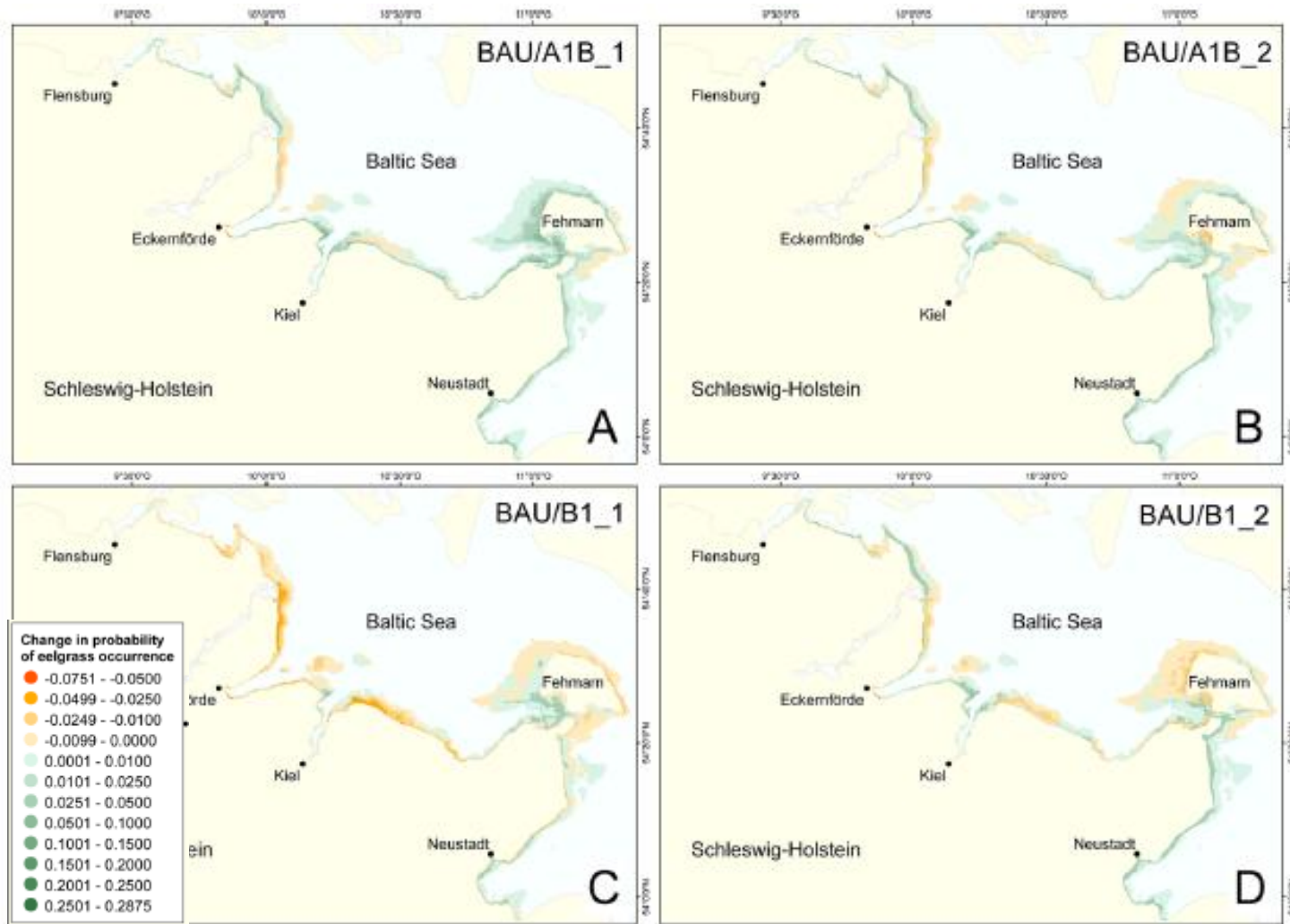
Seagrass recovery and nutrients – North Sea



Riverine nutrient loads ↓ ~40% for seagrass to come back

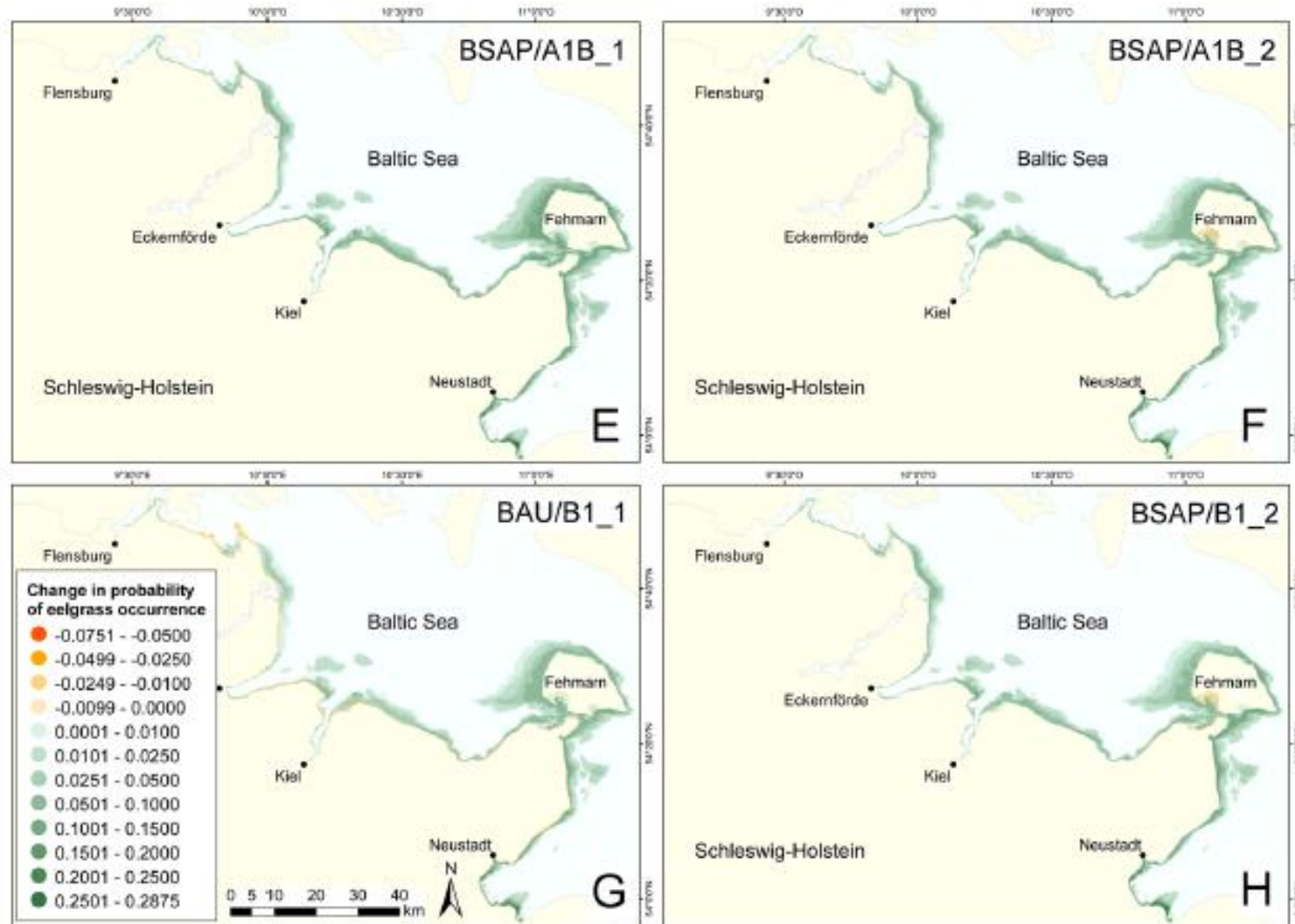
van Katwijk et al. 2024, *Journal of Applied Ecology*

Seagrass recovery and nutrients – Baltic Sea

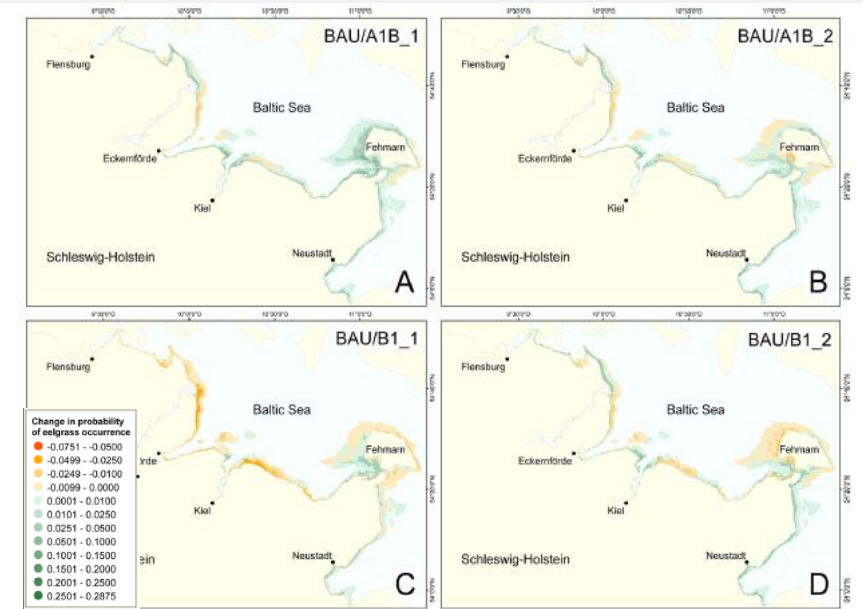


Bobsien et al. 2021, *AMBIO*

Seagrass recovery and nutrients



Bobsien et al. 2021, *AMBIO*



- Restoration efforts generally fail when eutrophication is not reduced sufficiently (van Katwijk et al., 2016)
- scattered recoveries are reported after nutrient reduction

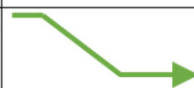
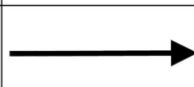
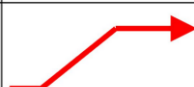
(de los Santos et al., 2019; Lefcheck et al., 2018; McCrackin et al., 2017; Riemann et al., 2016; Sherwood et al., 2017)

What can we do? – Reduce inputs

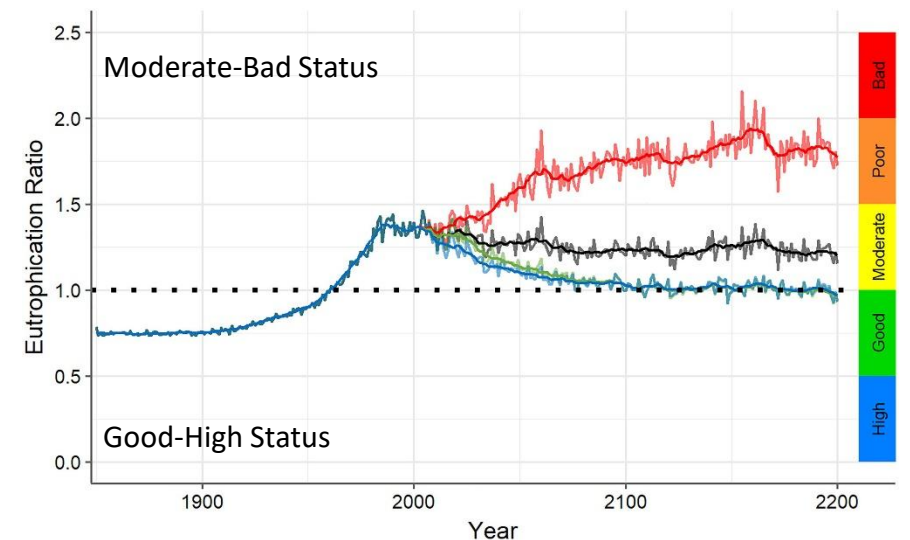
Urgent **implementation of BSAP & NEAES** needed to achieve nutrient input ceilings

- Further improve wastewater management
- Reduce nutrient surpluses and ammonia emissions in agriculture
- Reduce nitrogen oxide emissions in shipping
- Promote nutrient recycling in agriculture and in the wastewater sector
- Revise target concentrations → 1.8 mg N l^{-1} instead of 2.6 mg N l^{-1} at the limnic–marine border (Gericke et al. 2025)
- North Sea: Report & reduce nutrient inputs from marine aquaculture

BUT: decades until Good Environmental Status reached

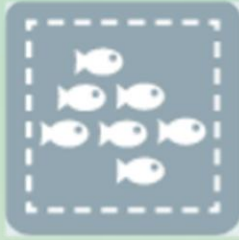
Name	Type
BSAP0	
BSAP30	
PLC5.5	
BAU30	

Nutrient load scenarios
(Murray et al. 2019)



Murray et al. 2019, *Frontiers in Marine Science*

What can we do? – Integrated evaluation and management of pressures



↔ eutrophication ↔ biodiversity



Thank you for your attention!

Dr. Stephanie Helber, Dr. Wera Leujak

Stephanie.helber@uba.de

wera.leujak@uba.de

<https://www.umweltbundesamt.de/en/topics/water/seas>