Meteorologisk institutt

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

Interreg Baltic Sea Region

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CSHIPP

Air quality benefits and their impacts on human health and ecosystems

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The results are based on:

- EMEP model calculations. an open source Chemical Transport Model (Regional 2014 versus 2016 Baltic Sea Ship emissions.
  Global CAP 2020 vs pre CAP2020)
- Calculation of health outcomes based on EMEP model calculated $PM_{2.5}$, population density and cohort studies on health effects from exposure.
- Monetarization of SOx deposition based on EMEP model for countries around the Baltic Sea and the sea itself
- Exceedances of critical loads for acidification

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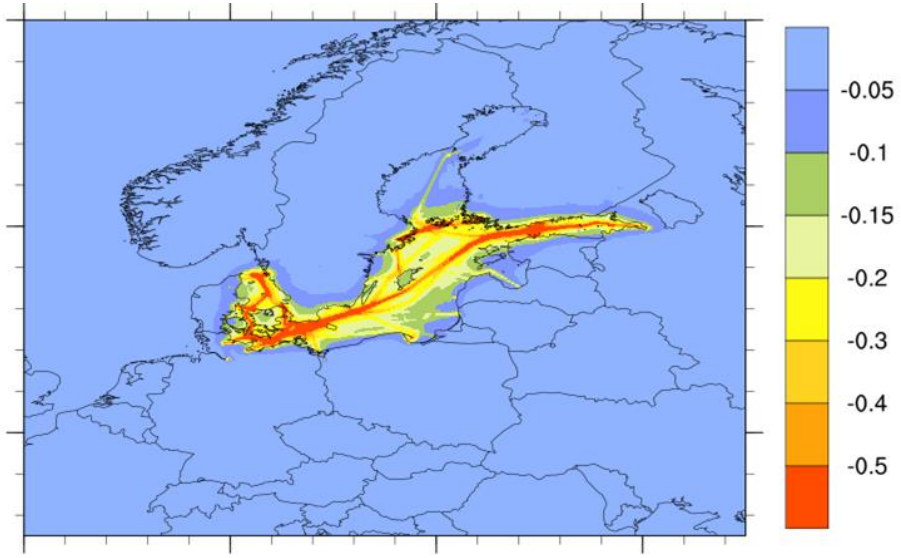
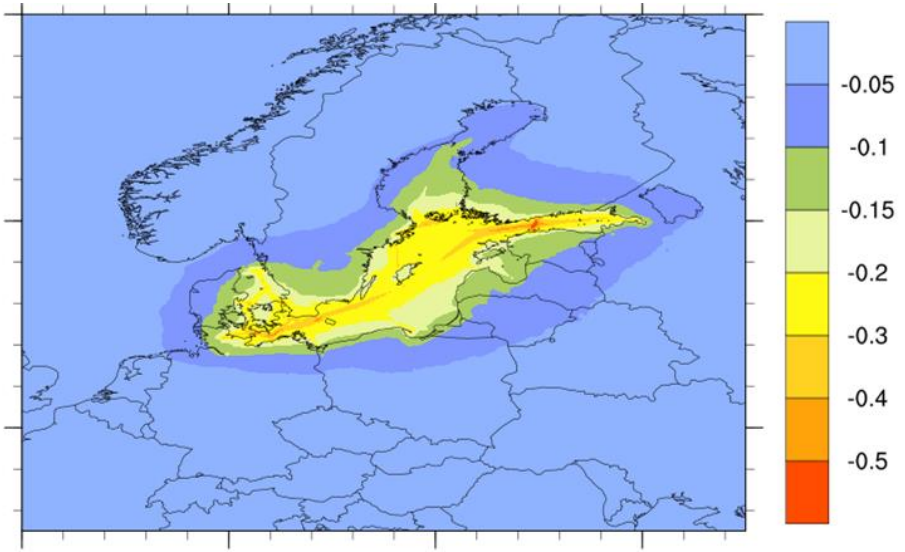
Effect of the 2015 SECA rule on sulphur



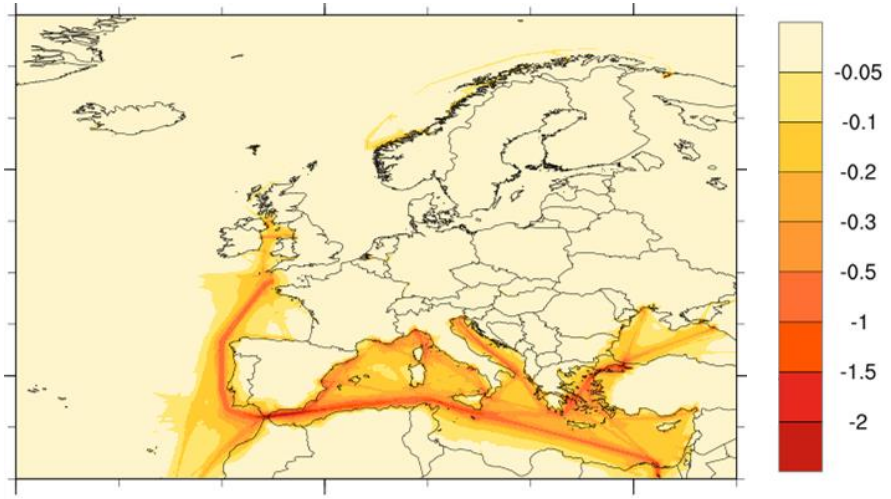
Reductions in SO_2 ($\mu g/m^3$)



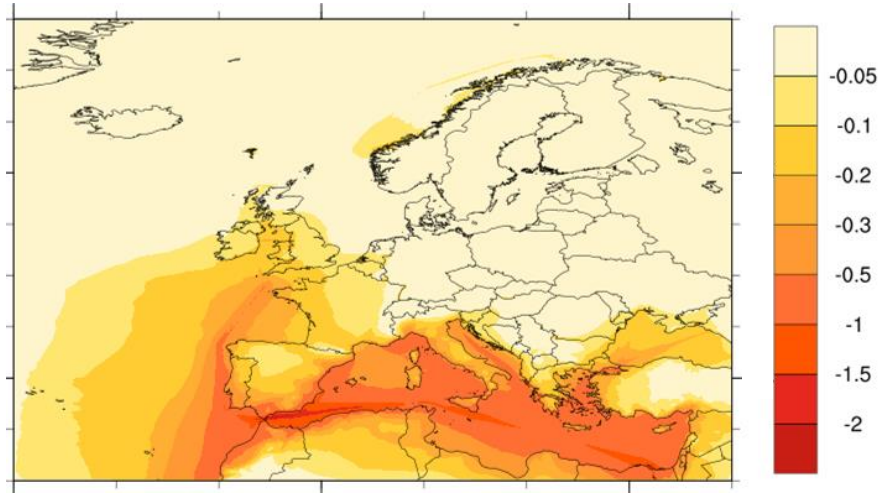
Reductions in $PM_{2.5}$ ($\mu g/m^3$)

Note: Only the effects of changes in the Baltic Sea are taken into account here.

Effects of the 2020 global sulfur cap



Reductions in SO_2 (µg/m^3)

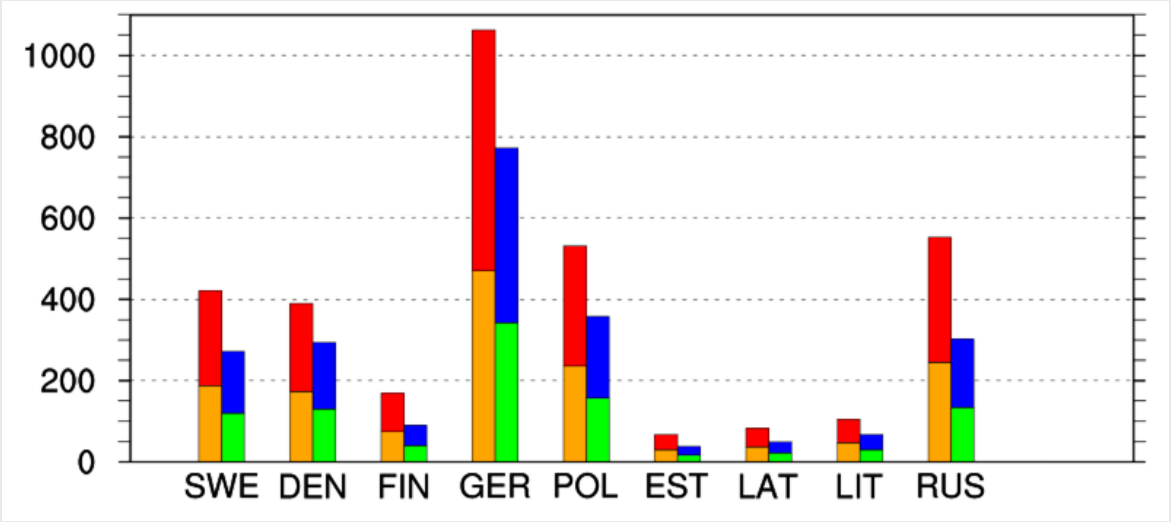


Reductions in $PM_{2.5}$ (µg/m^3)

Health (premature deaths) outcomes from $PM_{2.5}$ with high and low sulphur:

Calculated with 2 alternative Expose-response functions

RUS: Only European part of Russia



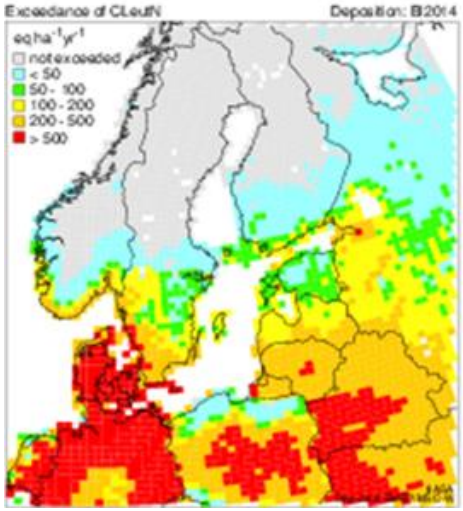
High sulphur (2014 BLS emissions)

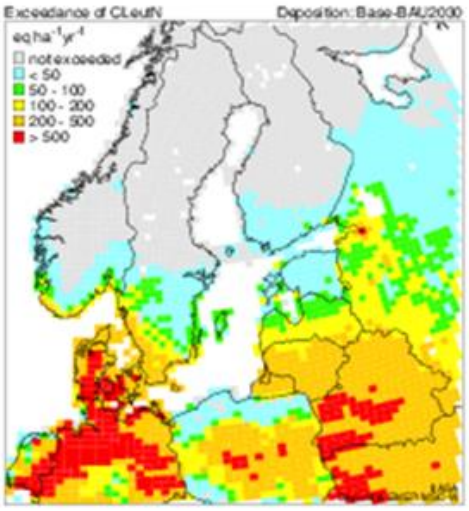
H. sulphur ESCAPE
H. sulphur HRAPIE

Low sulphur (2016 BLS emissions

L. sulphur ESCAPE
L. sulphur HRAPIE

Adapted from:
Barregard, L.; Molnàr, P.; Jonson, J.E.; Stockfelt, L. Impact on Population Health of Baltic Shipping Emissions. Int. J. Environ. Res. Public Health 2019, 16, 1954.





Exceedance (AAE; in eq/ha/a) and exceeded area (Exarea; in percent of the total area) for critical loads of acidification for the five deposition scenarios DE:Germany, DK:Denmark and NO: Norway.

Scenario	Base		NoBl		Bl2014		Base-BAU2030		NoBl-BAU2030	
	(km^2)	(%)	(eq/ha/a)	(%)	(eq/ha/a)	(%)	(eq/ha/a)	(%)	(eq/ha/a)	(%)	(eq/ha/a)
DE	**106870.5**	**44.1**	**246.5**	**43.9**	**244.1**	**44.2**	**247.4**	**24.4**	**100.2**	**24.3**	**99.1**
DK	**5692.3**	**11.9**	**14.3**	**6.7**	**9.1**	**13.7**	**18**	**1.4**	**3**	**1.2**	**2.6**
NO	**320449.3**	**11.3**	**20.2**	**10.9**	**19**	**11.4**	**20.6**	**8.5**	**11.4**	**8.3**	**11**

Monetarization of acidification, results

Country	2014, k$	C 2016, k$	C change from 2014 to 2016, k$
Denmark	3 795	383	-3 413
Estonia	2 999	325	-2 675
Finland	10 304	1 132	-9 171
Germany	4 831	572	-4 259
Latvia	2 980	359	-2 620
Lithuania	2 211	236	-1 975
Norway	2 675	379	-2 296
Poland	4 866	116	-4 750
Russia*	32 639	3 973	-28 666
Sweden	14 633	1 685	-12 947
Baltic Sea**	65 197	7 633	-57 564
Total	147 129	16 793	-130 336

1982 Stockholm Conference on Acidification of the Environment

Through a glass selectively—or some governments saw what they wanted to see

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Discussion

- PM2.5 levels reduced in the BSR as a result of stricter SECA regulations. This has resulted in marked health benefits. The main contributions to PM2.5 are now from NOx emissions.
- Sulphur, and thereby PM2.5 levels, reduced in in parts of Europe as a result of CAP2020. Improvements in the BSR small as ship emissions of S are already low here.
- We add a figure of 130 M$ for the political discussion of costs and benefits of SECA, in comparison to health benefits of 557 M$ and costs of 662 M$
- If such cost-benefit analyses are presented, also effects on ecosystems should be added
- After the 2015 regulation, the contribution from Baltic shipping to the exceedance of CL for acidification is very small and the land-based sources dominate

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