

# Benefits of the North European ECA (SECA and NECA)

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# North European (NE) ECA



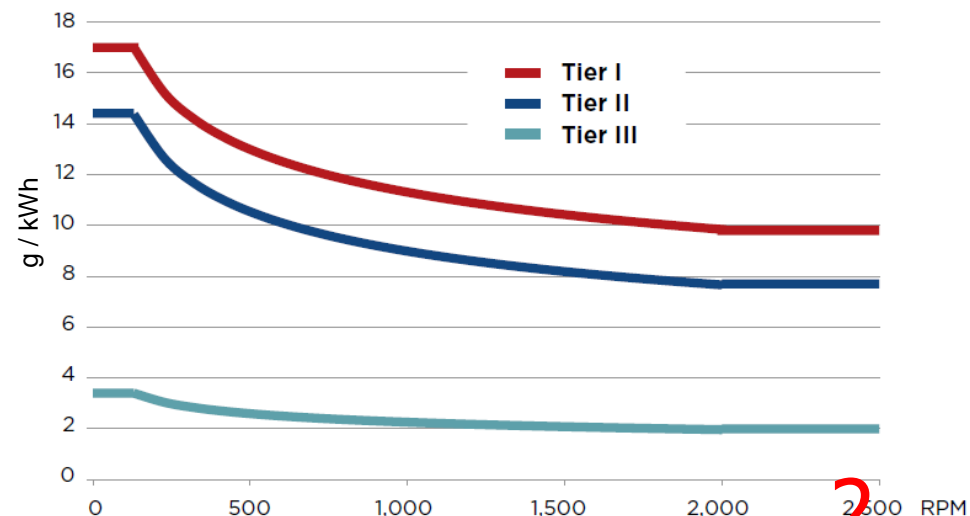
Source: International Maritime Organization

## SECA: Limit SO<sub>x</sub>

2010: Max. 1 % S

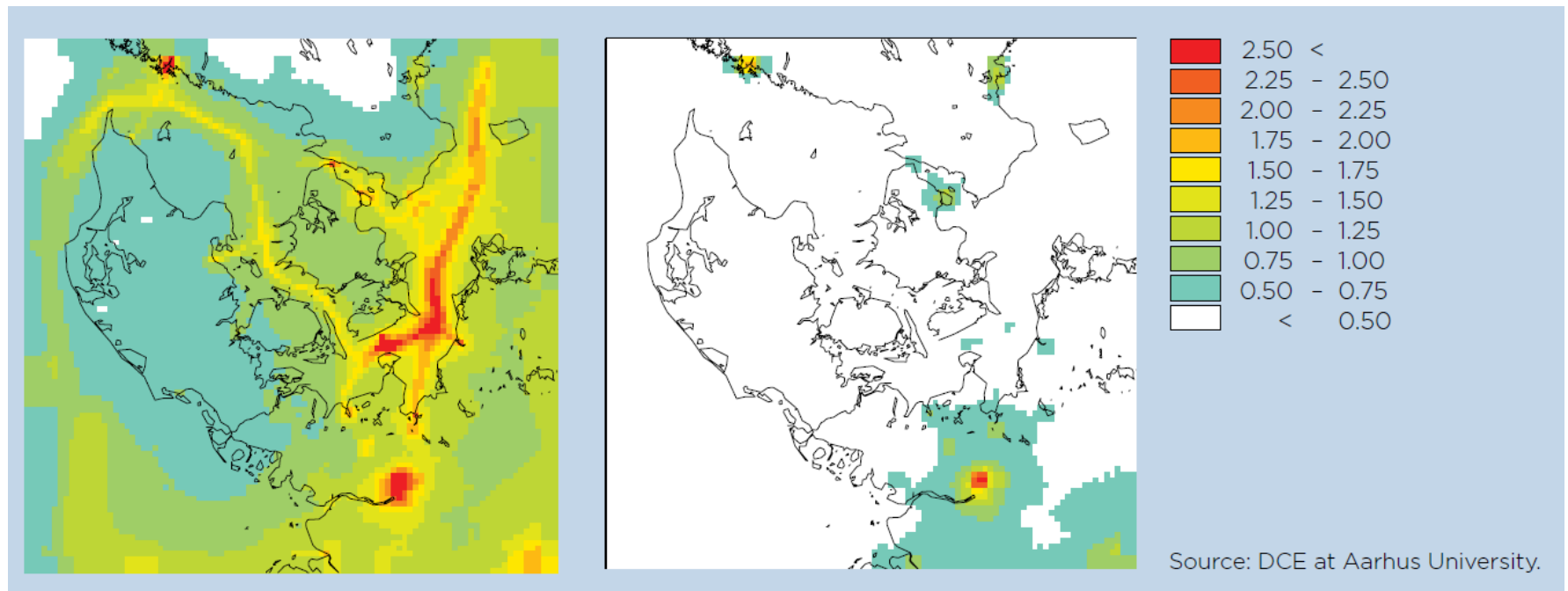
2015: Max. 0.1 % S

## NECA: Limit NO<sub>x</sub> (2021)



# Model calculation

Danish SO<sub>2</sub> concentrations ( $\mu\text{g}/\text{m}^3$ ) b/a the SECA

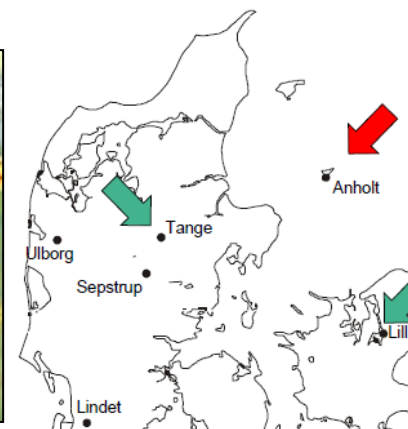
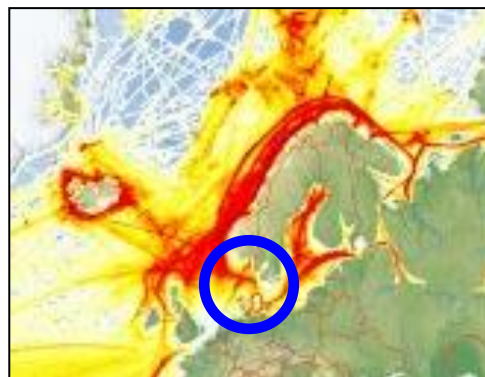


**Before**

**After**

# Measurements b/a 2015 limit

- The measured drop in sulphur air pollution indicates more than 95 % compliance.



SECA: Effects of 2015 limit	Anholt	Risø	Tange
Mean 2011-14, 1 % S ( $\mu\text{g S/m}^3$ )	0.33	0.34	0.22
Mean 2015-16, 0.1 % S ( $\mu\text{g S/m}^3$ )	0.13	0.17	0.10
Reduction ( $\mu\text{g S/m}^3$ )	0.20	0.17	0.12
Reduction (%)	60 %	50 %	55 %

- Control indicate > 98 % compliance (late fuel switch).

## Cost-benefit of SECA (2.7 → 0.1 %)

- **Health costs** of SO<sub>2</sub> in the NE SECA: 18.5 USD per kg
- **Removal costs** (replacing 2.7 % S fuel with 0.1 % S fuel):  
(600\$ - 400 \$) / 52 kg SO<sub>2</sub> = 3,8 USD per kg
- Society saves (earns) 18.5 million USD from less health damage every time society invests 3.8 million USD in 0.1 % S fuel instead of 2.7 % S fuel → **Rate of return: 387 %**
- This is a very positive business case ... and on top of this less damage to crops, constructions, nature etc.

## Cost-benefit of SECA (0.5 → 0.1 %)

- **Health costs** of SO<sub>2</sub> in the NE SECA: 18.5 USD per kg
- **Removal costs** (replacing 0.5 % S fuel with 0.1 % S fuel):  
(500\$ - 400 \$) / 8 kg SO<sub>2</sub> = 12,5 USD per kg
- Society saves (earns) 18.5 million USD from less health damage every time society invests 12.5 million USD in 0.1 % S fuel instead of 0.5 % S fuel → **Rate of return: 50 %**
- This is still a very positive business case ... and on top of this less damage to crops, constructions, nature etc.

# Cost-benefit of the NECA

- **Health costs** of  $\text{NO}_x$  in the NE NECA: 21.5 USD per kg
- **Removal costs** of  $\text{NO}_x$  in the NECA: 1.5 USD per kg
- Society saves (earns) 21.5 million USD from less health damage every time society invests 1.5 million USD in  $\text{NO}_x$  removal → **Rate of return: 1.333 %**
- This is a very positive business case ... and on top of this less damage to crops, constructions, nature etc.

# Conclusion

- Reduced air pollution from shipping in ECAs provides people longer and healthier lives and benefits society from an economical point of view.
- In the North European SECA has not been observed serious compliance challenges (> 95 % compliance).
- Denmark has measured large reductions in sulphur pollution due to the SECA and look forward to NO<sub>x</sub> reductions when the NECA is fully implemented.



# Movie in Spanish and publication

European Parliament movie on S-enforcement:

<https://owncloud.markenfilm-crossing.de/s/sJf3x8aTMLRoBMj>



Link to free publication:

[https://www.ecocouncil.dk/media/com\\_reditem/files/customfield/item/803/8a96d6d5c449c75f47889200be6373e6e6a8a4b7.pdf](https://www.ecocouncil.dk/media/com_reditem/files/customfield/item/803/8a96d6d5c449c75f47889200be6373e6e6a8a4b7.pdf)



# Measurements b/a 2015 limit

Januar-maj	Anholt $\mu\text{g S/m}^3$	Risø $\mu\text{g S/m}^3$	Tange $\mu\text{g S/m}^3$
2011	0,35	0,34	0,27
2012	0,26	0,28	0,17
2013	0,29	0,31	0,17
2014	0,43	0,42	0,25
2015	0,14	0,18	0,10
2016	0,11	0,16	0,09
Middel 2011-2014	0,33	0,34	0,22
Middel 2015-2016	0,13	0,17	0,10
Faldet med ( $\mu\text{g S/m}^3$ )	0,21	0,17	0,12
Ændring %	62	50	56