



Naturskyddsföreningen

Economic instruments for reducing air pollution from ships

Susanne Ortmanns – CCB Annual Conference 2007

Economic instruments for reducing air pollution from ships

- Swedish Society for Nature Conservation
- Swedish largest environmental NGO
- Working on issues as climate change, marine environment, hazardous substances, forests and agriculture

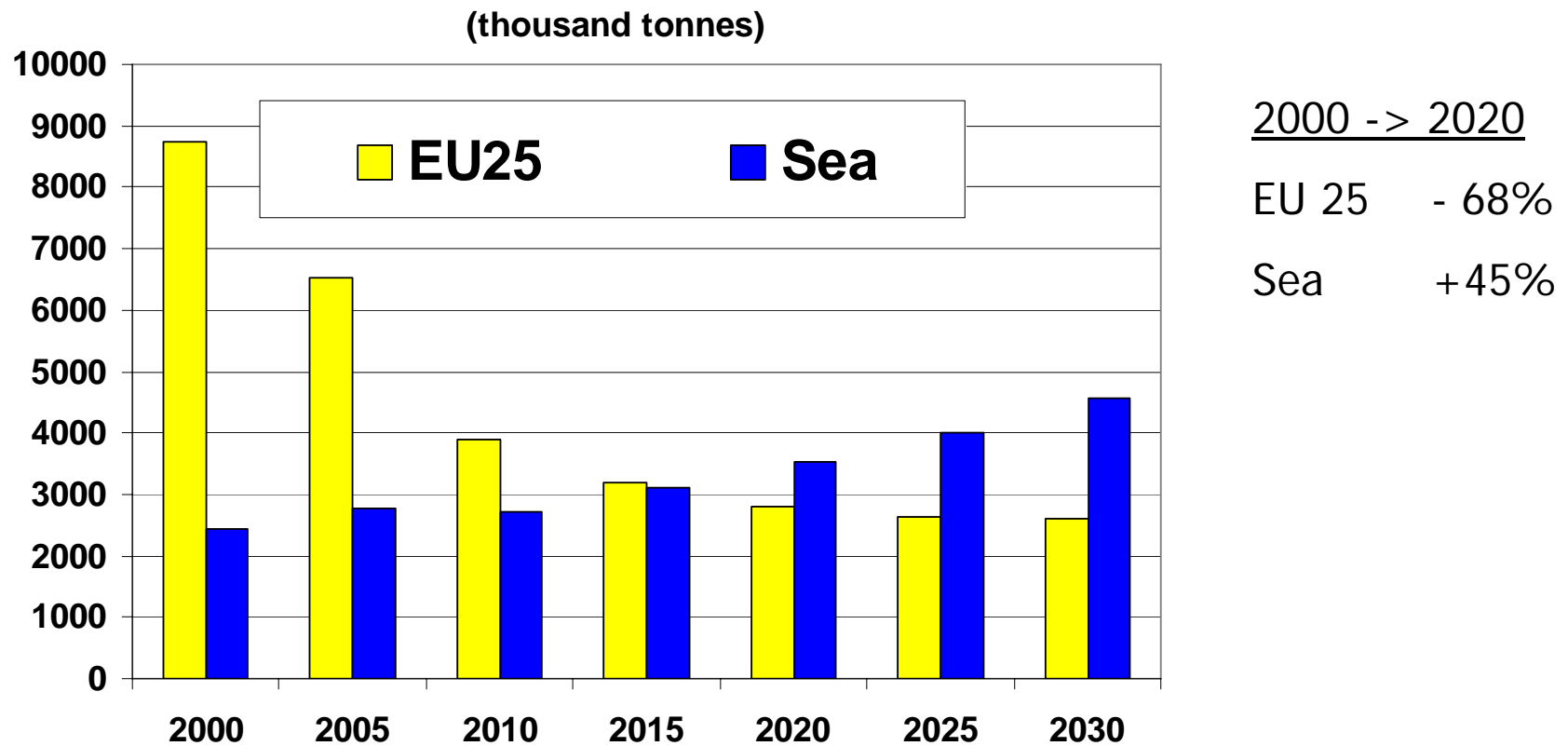
Economic instruments for reducing air pollution from ships

- The problem



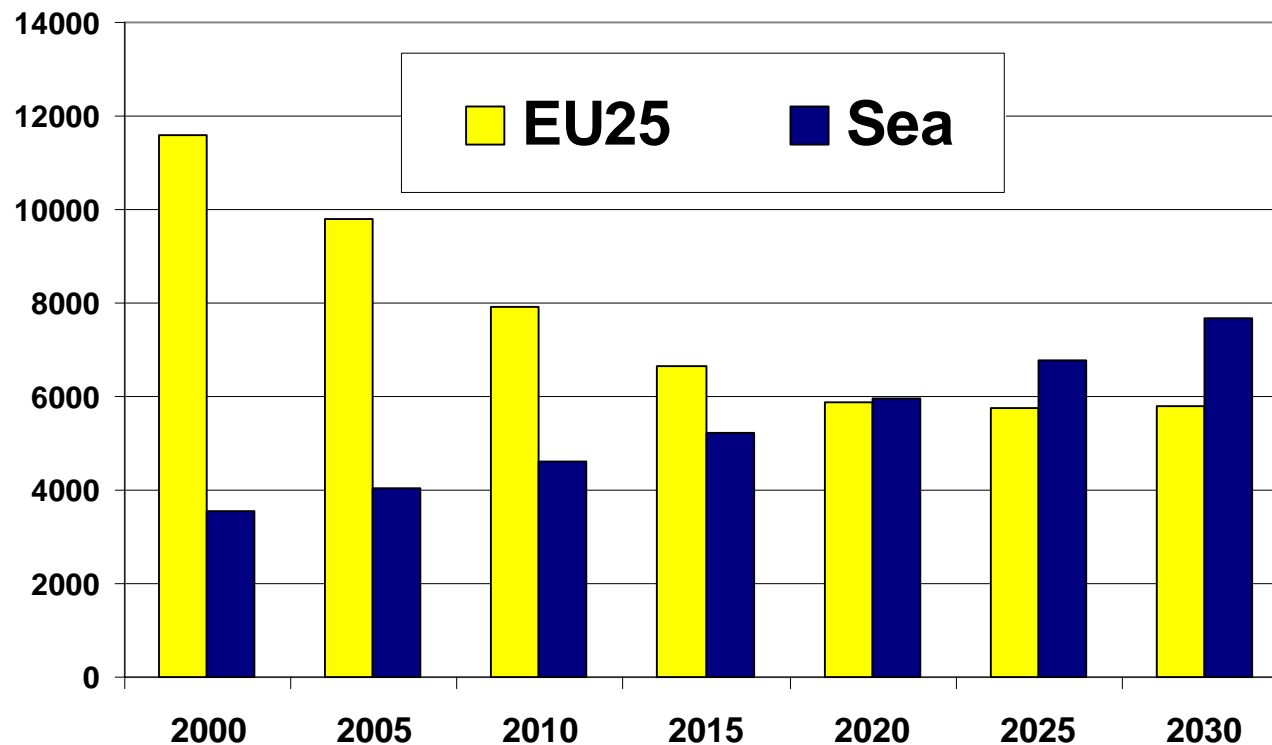
- Technical measures
- Policy instruments

SO₂-emissions 2000-2030: land-based vs. shipping



NO_x-emissions 2000-2030: land-based vs. shipping

(thousand tonnes)



2000 -> 2020

EU 25 - 50%

Sea +67%

Effects on health and environment (1)

Acidification

Acid depositions exceed critical loads over large areas of sensitive ecosystems. Recovery is slow.

- Forests ecosystems (biodiversity)
- Forest soils (nutrients, productivity)
- Freshwater ecosystems (biodiversity, recreation)
- Groundwaters (corrosion, metals)

Effects on health and environment (2)

Eutrophication

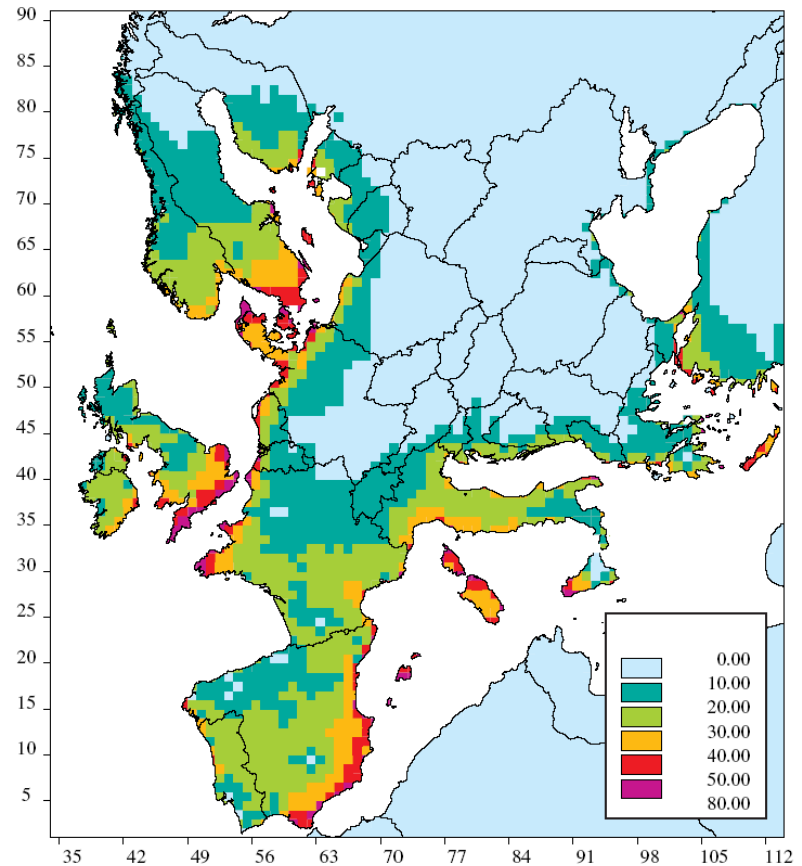
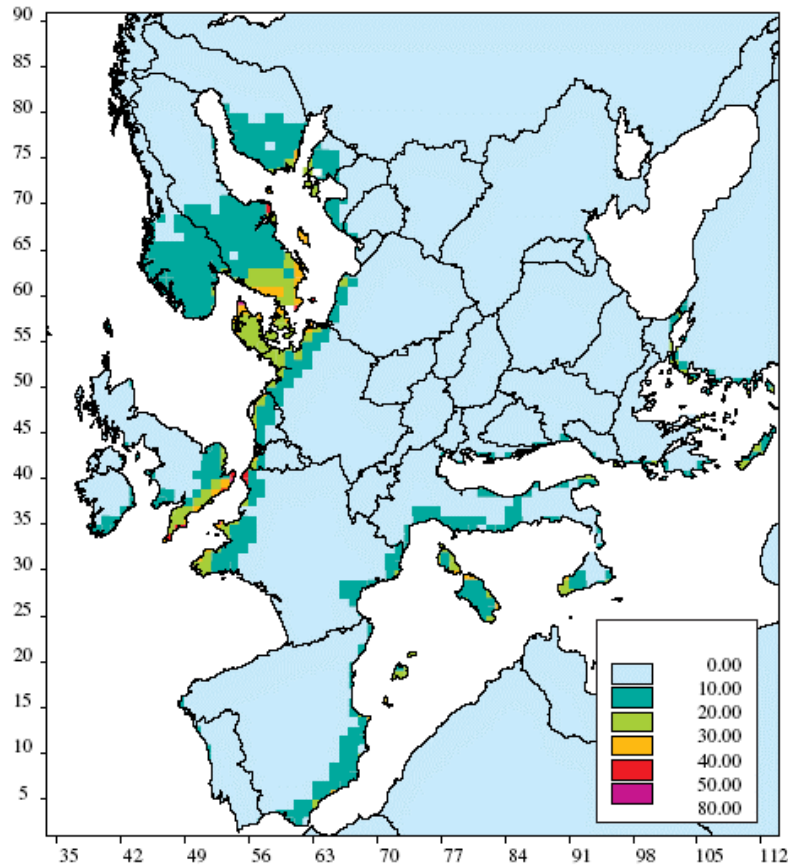
Nitrogen depositions exceed critical loads over large areas of sensitive ecosystems all over Europe.

- Natural and semi-natural ecosystems (biodiversity)
- Forest soils (nutrient imbalance, mycorrhiza)
- Coastal ecosystems (algae bloom, oxygen depletion)
- Groundwaters (nitrates)

Health impact

- Fine particles (PM) - 3.7 million life years lost in year 2000, or 348 000 premature deaths/year in EU25
- Impact on respiratory system - asthma, bronchitis and other respiratory diseases

Contribution made by ships to sulphur deposition 2000 and 2020 CLE (in percent)



Source: IIASA, http://www.iiasa.ac.at/rains/reports/IR06-107_Ships.pdf

Technical solutions to reduce emissions

Measure	% emissions reduction (-) / increase (+) per vessel			
	SO ₂	NO _x	PM	VOC
Basic internal engine modifications (IEM) for 2-stroke slow speed only	0%	-20%	0%	0%
Advanced internal engine modifications	0%	-30%	0%	0%
Direct water injection	0%	-50%	0%	0%
Humid air motors	0%	-70%	0%	0%
Exhaust gas recirculation ¹	-93%	-35%	>-63% ²	± ³
Selective catalytic reduction (2.7% residual oil)	0%	-90%	0%	0%
Sea water scrubbing	-75%	0%	25% ⁴	±
Fuel switching 2.7->1.5% S residual oil fuel	-44%	±	-18%	±
Fuel switching 2.7->0.5% S residual oil fuel	-81%	±	-20% ⁵	±
Low S marine diesel 0.5->0.1 % S	-80%	±	±	±

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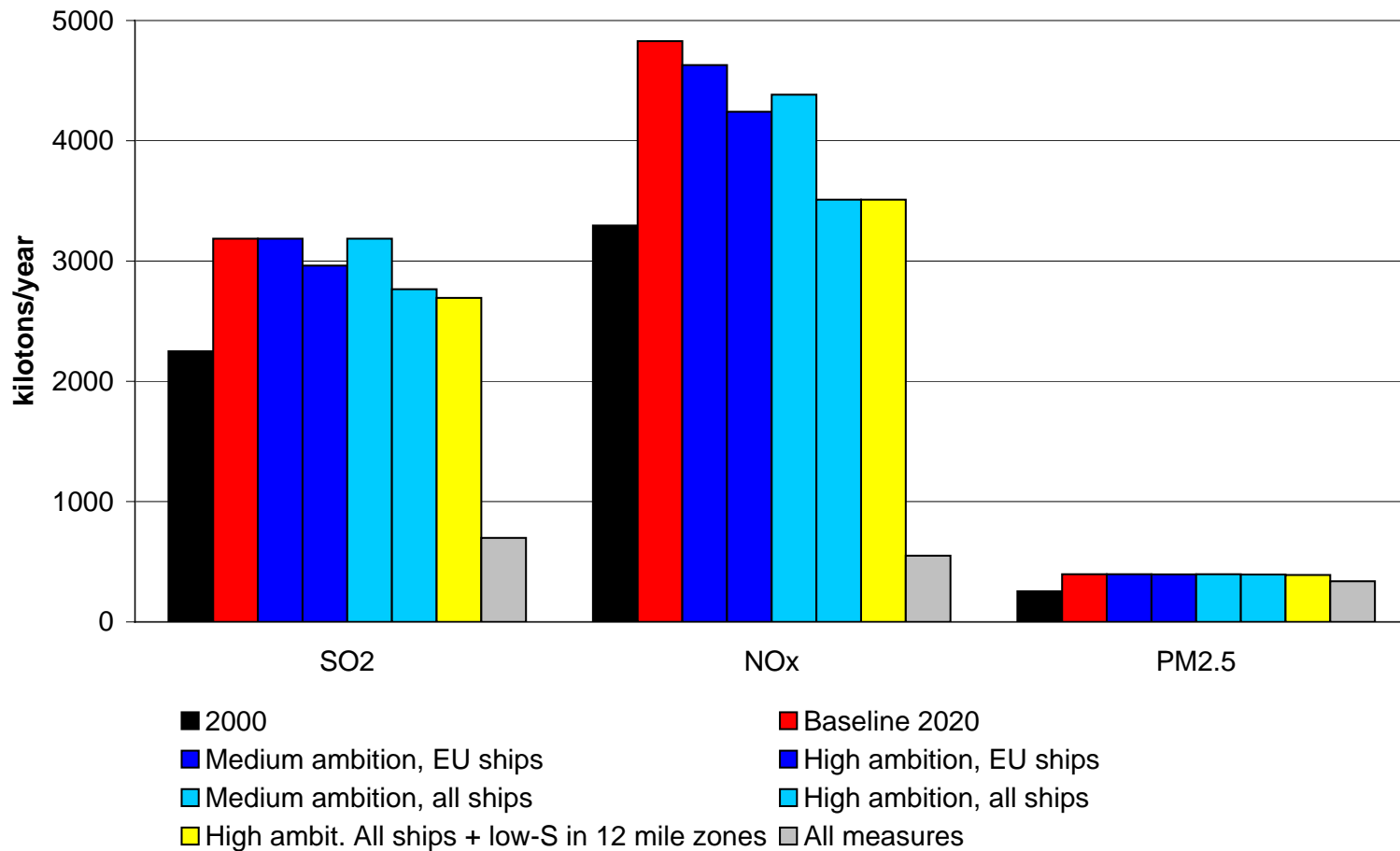
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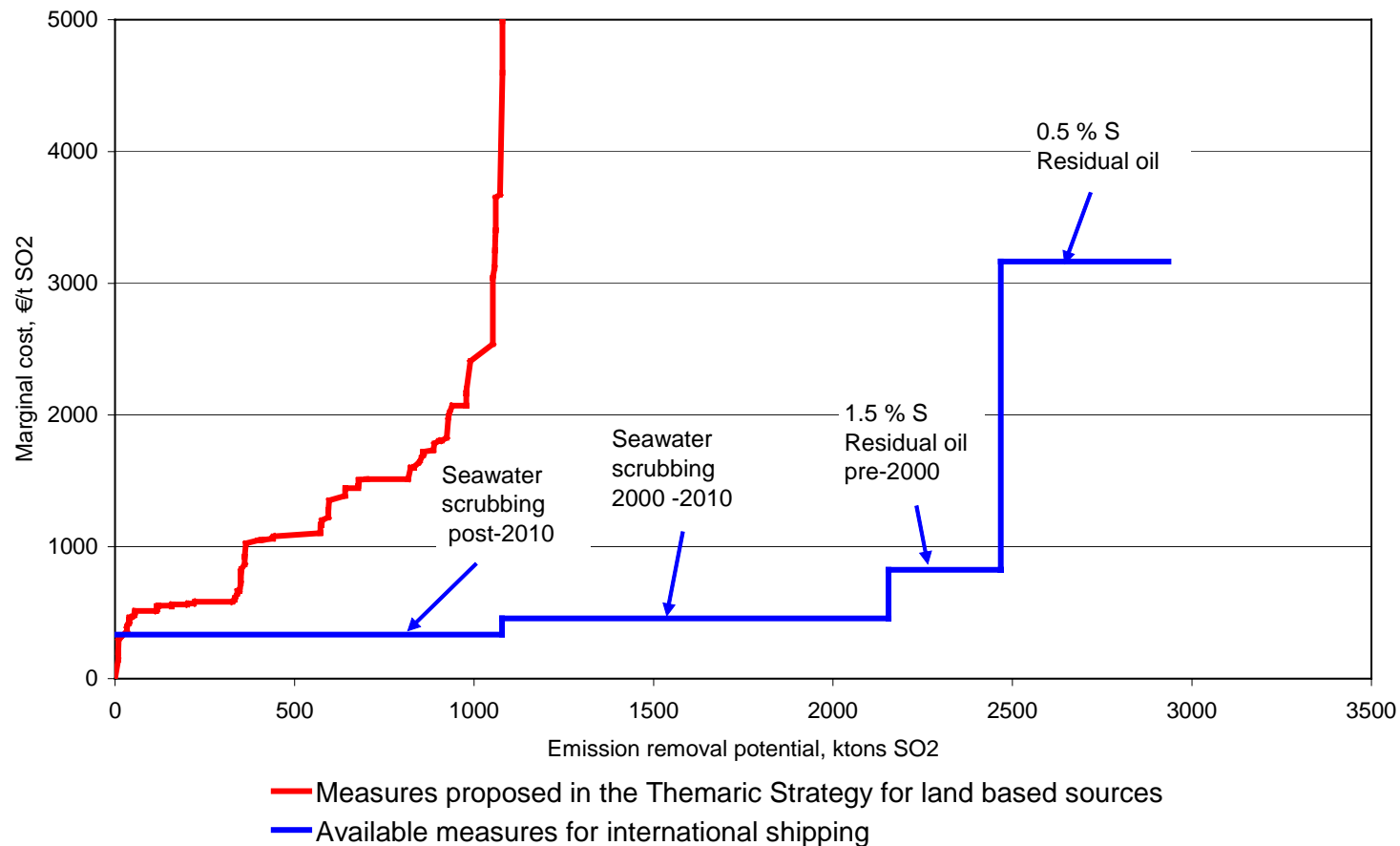


Emission scenarios for ships for 2020



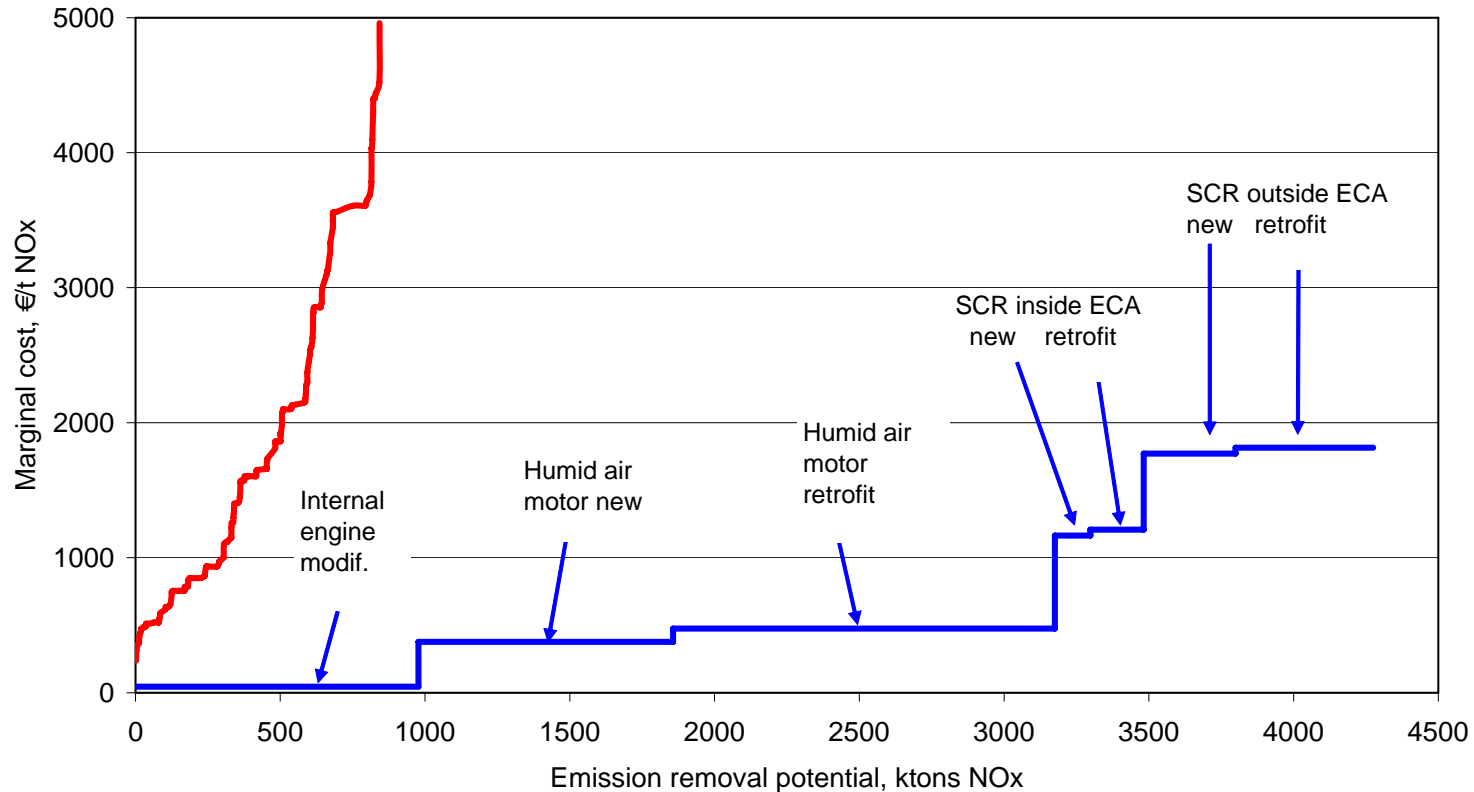
Source: IIASA, http://www.iiasa.ac.at/rains/reports/IR06-107_Ships.pdf

SO₂ – reduction costs



Source: IIASA, http://www.iiasa.ac.at/rains/reports/IR06-107_Ships.pdf

NO_x – reduction costs



- Measures proposed in the Thematic Strategy for land-based sources
- Available measures for international shipping

Source: IIASA, http://www.iiasa.ac.at/rains/reports/IR06-107_Ships.pdf

International Maritime Organisation

- Initiative 1988, resulted 1997 in MARPOL, Annex VI on prevention of air pollution (adopted 1997, into force 2005)
- entered into force 19 May 2005:
 - Global "cap" 4.5% S in bunker fuels
 - SECA's max 1.5% S (Baltic: May-06 & North Sea: Nov-07)
 - Weak NO_x-standards for new engines (post-2000)
- Discussions on strengthening of Annex VI initiated July 2005. Latest meeting subcommittee BLG 16-20 April 2007
 - Option 1: global fuel switch for shipping, resulting S in fuel content 1% or 0.5%. No support from oil industry.
 - Option 2: further reduction of S in fuel in SECA's
 - NO_x: two stage approach, reductions 20-80% in 2010 and 2015
- No proposal so far



EU directives

EU directive on air pollution from ships

Max. 1.5 % S in marine fuels for ships in Baltic Sea and North Sea and all ferries in EU-waters. For ships at berth max. 0.1 % S or shore side electricity (2010)

Review planned for 2008. Next steps

- Measures to reduce NO_x , if IMO does not strengthen Marpol Annex VI
- Reduction S in marine fuels – to 0.5 %?

National emissions ceilings directive

No emissions over ceiling in 2010. Few countries will succeed. Costs for reduction 2020:

- land-based sources 7.1 billion EUR/year
- at sea 5.5 billions EUR/year

Differentiated ports/fairway dues

- Dues could be differentiated according to a ship's emissions of various pollutants
- Voluntary or mandatory
- In Sweden differentiated port- and fairway dues since 1998:
 - Few years ago, 80 % of ships run on low sulphur fuel
 - Most ships with NOx reduction technique call at Swedish ports
- TT-line switched back to 1.5 % S in fuel → port city Trelleborg complains about higher SO₂ emissions in town!
 - Air quality in Rostock?
- Common system is needed, otherwise incentives from differentiated dues too weak
 - Could this be done within the Baltic Sea, or within all European seas?
 - Most countries do not have fairway dues

Distance-related emission charges

- Based on distance traveled in the Baltic Sea and specific emissions of SO₂ and NO_x
- The distance counted from the latest port in the area or from the border to the North Sea
- Collected by ports on behalf of a common authority
- The revenue recycled in a way that does not disturb the function of the charges
- Ships calling fewer than X times exempted

Taxation

Norway imposed tax on NO_x emissions by 1 Jan 2007

- Approx. 1.8 EUR/kg NO_x
- Applies to ships, aeroplanes, diesel locomotives etc.
- For shipping
 - all vessels in domestic traffic, regardless of the vessel's nationality
- Part of the income earmarked for investment grants for emission control measures as e.g. selective catalytic reduction.
- Strong measure for domestic traffic

- National taxes reach only coastal shipping
 - 80 percent of emissions emitted outside of 12-mile zones (EU waters)
- International taxes politically difficult



Trading scheme land-ship

Proposal by Swedish Shipowners association

- Financial incentive for emissions reductions of SO₂ and NO_x
- Shipping industry participates on voluntary basis
- Land based heavy emitters will be covered by caps
- Shipping industry can reduce emissions at comparable low cost
- Reduction credits created by shipping can be sold on the market
- A trading system on voluntary basis gives the opportunity to all ships in EU region to sell their emission reduction credits

- Would give no or small further emission reductions from land-based sources
- Contrary to PPP – polluters pay principle
- Contrary to principle aim of internalising external costs
- Would need change of EU legislation (IPPC directive)

Cap-and-trade scheme

- An cap is set for a given year and a given sea area
 - a total number of emission allowances, each of which provides its owner with the right to emit a unit of emissions.
- Allowances are given (or sold) to individual ships, which are allowed to trade them amongst each other
- The cap means a limit on total emissions (not only on emission rates)
- Initial allocation of allowances difficult, plus may need regular updating (as ships may move).
- This approach might require changes in MARPOL Annex VI and EU legislation (the S-in-fuels directive).
- Will shipping industry accept a cap on total emissions, and who has authority to set caps?

Conclusions

- Emissions from land-based sources are coming down, while those from ships show a continuous increase.
- Within 10-12 years, ships in the seas surrounding Europe will emit more SO₂ and NO_x than all land-based sources in EU-25 combined.
- Emissions from ships are responsible for 10 to 20% of sulphur deposition in coastal areas. In many coastal areas, ships will by 2020 be responsible for more than 50% of sulphur deposition.
- Available emission control measures can reduce emissions of SO₂ and NO_x from international shipping in European sea areas by 80 to 90%.
- To proceed faster we could use economic instruments as a complement to regulation.
- Something for the Baltic Sea Action Plan?



Sources

Slides 4+5: Projections of future emissions from the EU's Clean Air For Europe (CAFE) programme baseline scenario (Nov. 2004), which assumes implementation of IMO MARPOL Annex VI.

<http://europa.eu.int/comm/environment/air/cafe/general/keydocs.htm>

Slide 7: Figures on preliminary health damage estimates are from a report to the CAFE programme: "CAFE CBA: Baseline Analysis 2000 to 2020" (Jan. 2005), by AEA Technology.

Slide 8-14: From interim report "Analysis of Policy Measures to Reduce Ship Emissions in the Context of the Revision of the National Emissions Ceilings Directive", by International Institute for Applied Systems Analysis (IIASA), October 2006, http://www.iiasa.ac.at/rains/reports/IR06-107_Ships.pdf

Slide 18: From report "Reducing Emissions from Ships in the Baltic Sea Area, The feasibility of introducing a distance-related en-route charge", Per Kågeson (Nature Associates), T&E 05/2, <http://www.transportenvironment.org>

Information on the developments regarding EU policies on air pollution from ships, IMO MARPOL Annex VI, and related activities (e.g. the Swedish system of environmentally differentiated fairway and port dues), can be found in various articles in Acid News, a magazine published by the Swedish NGO Secretariat on Acid Rain, www.acidrain.org.

See also the report: "Air pollution from ships" (Nov. 2004), published jointly by five environmental NGOs. www.acidrain.org/shipbriefing_nov04.pdf

