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# The impact of changing ships' fuels

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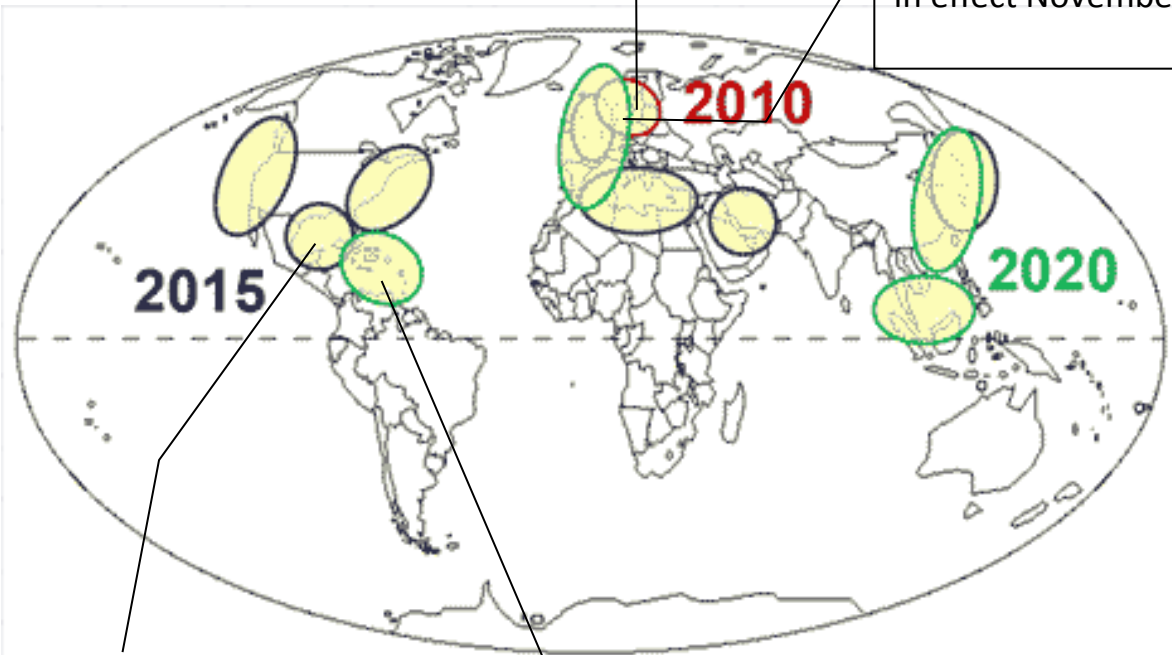
MDS Transmodal

# 1. Marpol Annex VI: Prevention of Air Pollution from Ships

Emission Control Areas first entered into force in 2005, emissions limits tightened in 2010- only 4 in force currently

Baltic Sea (SOx) came into force in May 2005, in effect from May 2006

North Sea and English channel (SOx) came into force November 2006, in effect November 2007

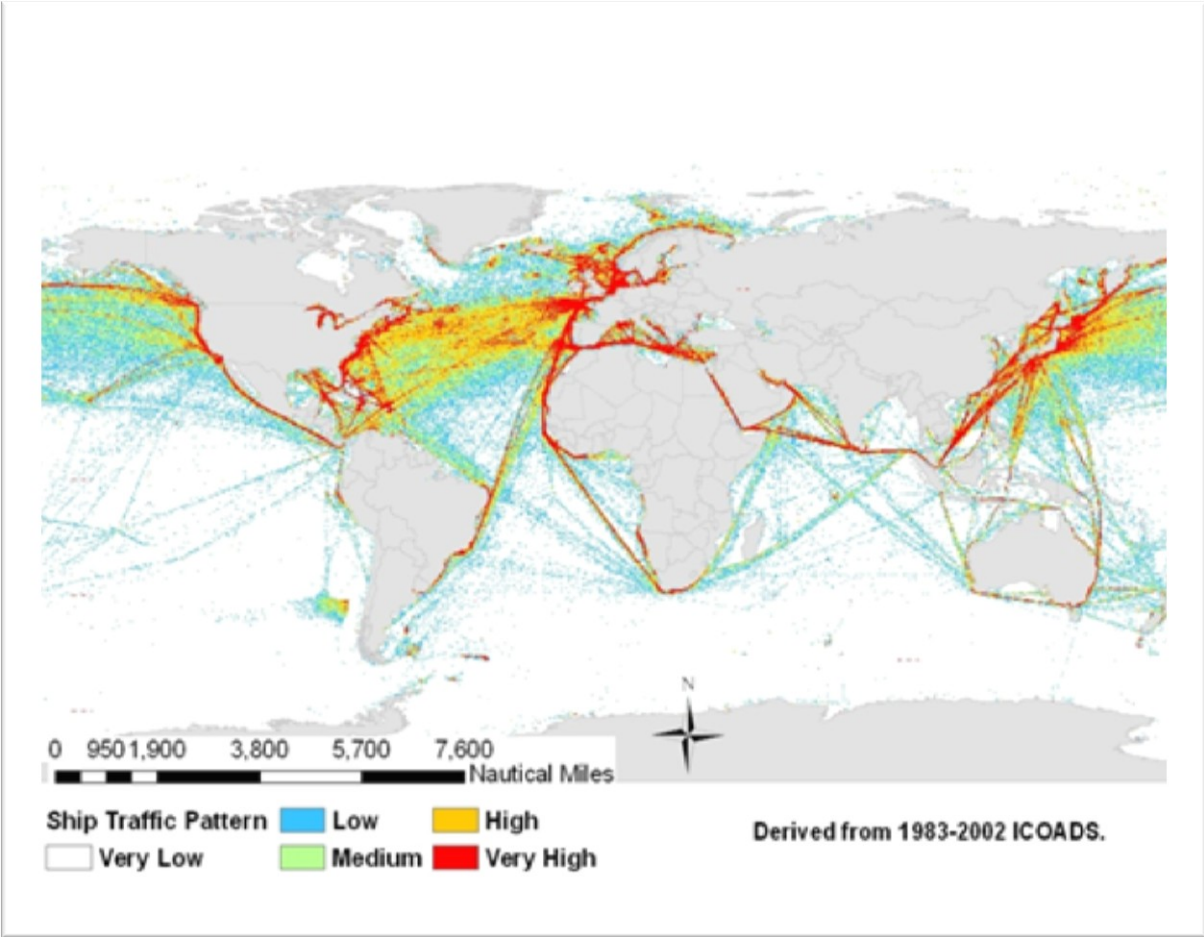


North American (SOx, NOx and PM) coasts designated in 2010, into force Aug 2011 in effect from August 2012

US Caribbean Sea (SOx, NOx and PM) into force Jan 2013, in effect Jan 2014

## 2. Why is Annex VI necessary in these areas?

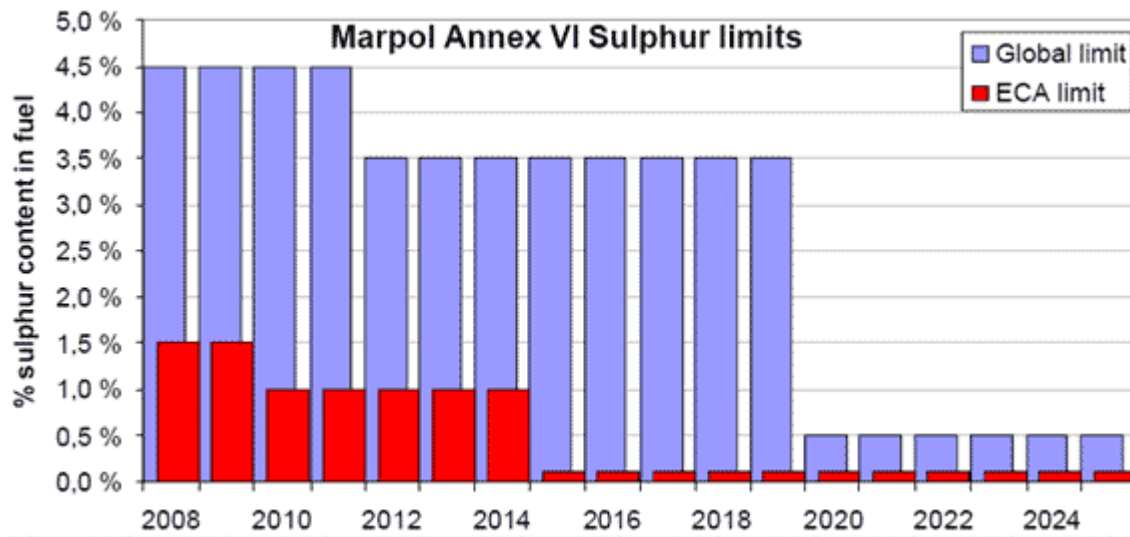
World shipping patterns



### 3. The SECA measures

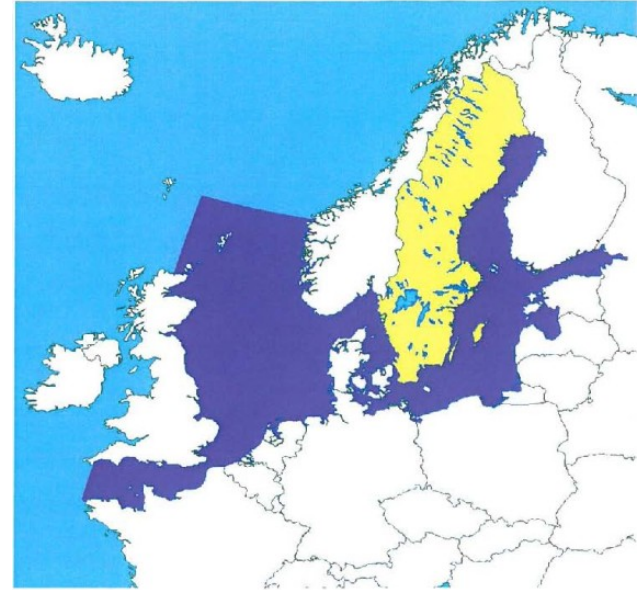
Two sets of sulphur emission and fuel quality standards:

1. Global requirements
  2. More stringent requirements in defined Emission Control Areas
- ECAs are currently limited to 1.0% m/m, will decrease to 0.1% in January 2015
  - Global level now at 3.5% , will decrease to 0.5% in 2020 or 2025



## 4. The North Sea/English Channel/Baltic SECAs

- Limit on sulphur content of marine fuels of 0.1% from January 2015
- Effectively bans heavy fuel oil unless emission abatement methods employed
- Owners must provide evidence of fuel purchase etc., monitored by Port State Control
- West Coast GB and Irish Sea not included...yet
- Rest of European Waters under discussion in the EC



SOURCE: VTI

# 5. Strong environmental & health argument

- Net reduction in SO<sub>2</sub> No<sub>x</sub> and particulate matter (PM) by 2020 forecast at:

	'000s tonnes		
	So <sub>2</sub>	No <sub>x</sub>	PM2.5
Baltic	157	55	25
North Sea	374	130	55

*Source: SEC (2011) 918 final (Commission)*

- Net monetised benefit of 0.1% sulphur rule (Baltic, North Sea and Channel) in 2020

	€billion	
	high scenario	low scenario
Environmental/health benefits	23	10
Operator costs	4.6	0.9
Cost benefit ratio	5.0	25.6

- Difficult to argue with such high ratios

## 6. Previous studies

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- European Community Shipowners Association, Jan 2010
- Transport Mobility Leuven, August 2010
- Swedish Maritime Administration Study, 2009

# 7. Study conclusions

- **ECSA** looked at 15 routes including 8 in UK
- Concluded that switching to MGO (0.1% sulphur) from HFO (1.5% sulphur) would raise ferry operating costs by 20%-30% and by 12% on long distance roro routes (Benelux-Humber/Scotland) - around £25 per unaccompanied trailer)
- A warning that ECA could impact on policy to promote short sea shipping:

*“Depending on the actual modal back shift the overall outcome for the environmental performance might well be negative”.*

- **TML** concluded impact would vary considerably by sub-mode

	Change in share
– Lolo	-7%
– Roro freight only	-4%
– Small ro-pax	-1%
– Large ro-pax	-2%

(based on conversion to MGO instead of fitting scrubbers)



## 8. MDST appraisal

### ECSA study

- Did not consider Dover Straits, main focus Swedish routes
- Based on lower fuel prices prevailing then (290hfo/521mgo)
- Limited to ro-ro ferry routes and did not consider intra- European short sea and feeder container services or bulk markets

### TML Study

- Maritime costs based on daily ship operating costs including capital costs, much **higher** than market rates (35-45%), which determine shipping line behaviour
- Rail costs used were much **lower** than market rates
- Lo-lo big losers as costs assumed to rise by 29%
- Contradicted ECSC study on small loss of market share by small ropax
- A reduction in road haulage (as model assumed fixed total transport budget, so maritime consumed more of the budget)- unrealistic

## 9. Swedish maritime administration study

- also assumed MGO @ + €200 versus HFO (present exch. rates)
- concluded effects would include
  - concentration of overland rail haulage through principal port (Gothenburg) replacing local port traffic
  - transfer from SSS to through rail southbound to Continental mainland (via Oresund Bridge)
  - an increase in road haulage traffic in southern Sweden
  - Switching of cargo from SSS along the European coast and even the Mediterranean to rail

“the consequences for society of a [consequential] transfer of freight transport from shipping to road are not desirable from an environmental perspective”

# 10. UK Case Study



# 11. UK – Continent Unit load market (2010)

(‘000s units)

	Western Channel	Dover Straits	North Sea	Total	% share
<b>Accompanied trucks</b>	282	3,243	212	3,737	42%
<b>Unaccompanied trailers</b>	95	74	1,189	1,358	15%
<b>MAFI trailers</b>	-	-	713	713	8%
<b>Containers</b>	-	-	2,990	2,990	34%
<b>Total</b>	377	3,317	5,104	8,798	
<b>% share</b>	4%	38%	58%		100%

- Dover dominates accompanied market
- North sea ports dominate Unacc. and container (lo-lo) market
- North Sea has largest overall market share

## 12. GBFM: to test impact of SECA on unitised cargo

- GBFM calibrated transport cost model of maritime, road and rail costs
- Explains route assignment, modal choice and route selection
- Case study analysis limited to intra European cargo to test:
  1. Switch to scrubbers - each ship to cost €4 million to 'convert' + 2% extra energy costs + €100,000 increase in fixed operating costs.
  2. Alternative to use MGO instead of fuel oil
    - long run option to build new ships for LNG
- Otherwise all conditions remaining constant

# 13. GB – Continent services

- Assumed (modelled) market shares in 2015

Route	Share
Channel tunnel through rail	2.0%
Dover	25.3%
Eurotunnel	14.0%
Ramsgate	1.5%
Western Channel	3.6%
Southern N Sea – Benelux	13.9%
Northern N Sea – Benelux	11.1%
Scandinavia services	7.3%
Longer ro-ro services	1.5%
Iberian peninsula	0.9%
Ireland	17.3%
Longer distance lo-lo services	1.7%

# 14. Model Output: using scrubbers

- Increased costs of 5-6% moved on longer routes
- Costs via Dover Straits only rise by 4%
- Proportion goods via Northern British ports falls by 5% benefiting shorter crossings to the Thames
- Increased volumes by rail in the UK
- But road kms increase even more

Route	Impact
Channel tunnel through rail	+ve
Dover	+ve
Eurotunnel	+ve
Ramsgate	+ve
Western Channel	-ve
Southern N Sea – Benelux	-ve
Northern N Sea – Benelux	-ve
Scandinavia services	-ve
Longer ro-ro services	-ve
Iberian peninsula	-ve
Ireland	-
Longer distance lo-lo services	-ve

# 15. Model Output: using MGO

- Increased costs of 9–16% moved on longer routes
  - costs via Dover Straits only rise by 6%
  
- Proportion goods via Northern British ports falls by 24%
  - benefiting shorter crossings to the Thames
  
- Increased volumes by rail in the UK
  - But road kms increase even more

Route	Impact
Channel tunnel through rail	+ve
Dover	+ve
Eurotunnel	+ve
Ramsgate	+ve
Western Channel	-ve
Southern N Sea – Benelux	+ve
Northern N Sea – Benelux	-ve
Scandinavia services	-ve
Longer ro-ro services	-ve
Iberian peninsula	-ve
Ireland	-
Longer distance lo-lo services	-ve



# 16. Potential of LNG (negligible sulphur)

- LNG currently offers MUCH LOWER costs than HFO (about 40% saving) and MGO (about 60% saving)
- Switch to LNG therefore favours SSS
- Implication for modal split positive
  - UK study implies ‘northern’ GB ports GAIN 18% volume
- Challenge:
  - bunkering facilities not available in UK
  - therefore no ships operating to/from UK
  - low charter rates discourage new investments
  - only a few new orders emerging

Route	Impact
Channel tunnel through rail	-ve
Dover	-ve
Eurotunnel	-ve
Ramsgate	-ve
Western Channel	+ve
Southern N Sea – Benelux	-ve
Northern N Sea – Benelux	+ve
Scandinavia services	+ve
Longer ro-ro services	+ve
Iberian peninsula	+ve
Ireland	-
Longer distance lo-lo services	+ve

## 17. LNG – some further considerations

- LNG offers significant cost savings once the initial investment has been made
- Owners need to be confident that LNG fuel supplies will be readily available – therefore regular ferry routes could justify the investment
- Switching to LNG could offer ferry operators huge savings. Recent worked example:
  - 2 ships over 15 years **HFO plus scrubbers** at say £5m = £50 million
  - switch to **LNG** = savings of £11 million
  - annual operating profits (EBITDA) =£35 million
  - @ 10% rate of return over 30 years = capital investment in excess of +£250 million for new ships
- LNG can be used in fast or conventional ferries so fuel cost advantage of conventional ferries in low sulphur zones is annulled
- Existing older ferries may not have the remaining capital worth to make investment in scrubbers a viable option
- A larger ship operating at say 36 knots will double the productivity of the vessel (greater frequency possible)

# 18. Summary of Impacts

- **On Shipping:**

Shipping effectively required to face the high cost of either:

- fitting scrubbers (say €4 million/ship) or
- using MGO at +€200/tonne (€730/t mgo compared with €530/t hfo)
- Switching to LNG in the longer term
- Ferry operators could re-think strategies using LNG

- **On Ports:**

Relative competitiveness of different routes affected, will lead to:

- some traffic diversion and modal shift to road and rail on some routes
- changing traffic volumes / market shares (both positive and negative)
- need for LNG bunkering infrastructure

# 19. Finally

- SECA to be introduced in just 2.5 years; the time it takes to design and build a ship.
- Impact assessment by public authorities weak
  - no clear overall view on cost and mode shift implications
  - Therefore some doubts about previous studies' conclusions
  - Mixed messages informing policy makers' decisions
- Our modeling suggests impacts significant
  - freight market highly elastic
- Most efficient resolution in the long term is to switch to LNG
  - but capital costs involved very high
- Infrastructure for LNG could be part-funded by the TEN-T?
- Marco Polo (or equivalent) could help lines adapt to new reality?