

# Short sea-shipping: a serious contender in the European transport contest?

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Professor



$$P(i|V) = \frac{\partial \ln G(e^V)}{\partial V_i} \int_a^b \epsilon \Theta^{\sqrt{17}} + \Omega \int \delta e^{i\pi} = \{2.7182818284\} \chi^2 \Sigma!$$

# Questions by the organizers

- Is SSS a serious contender in the European transport contest?
- Could an intermodal approach make SSS a serious contender in the European transport contest?
- Is a future where SSS overshadows road and rail possible?
- In what ways is the EU incentivising the move from road to sea?
- How has the 'Motorways of the Sea' initiative influenced intermodal transport in Europe?

# Questions by the organizers

- Is SSS a serious contender in the European transport contest?
- **Not fully, at this point in time**
- Could an intermodal approach make short sea-shipping a serious contender in the European transport contest?
- **Yes, but we still have a long way to go**
- Is a future where short-sea shipping overshadows road and rail possible?
- **Yes, but we still have a long way to go**
- In what ways is the EU incentivising the move from road to sea?
- **In several ways, but we still have a long way to go**
- How has the 'Motorways of the Sea' initiative influenced intermodal transport in Europe?
- **In several ways, but we still have a long way to go**

## Parenthesis: SSS in the US

- Jones Act (circa 1920):
- Intra-US trade: only by ships that
  - Fly the US flag
  - Are manned by US crew
  - Are built in the US!

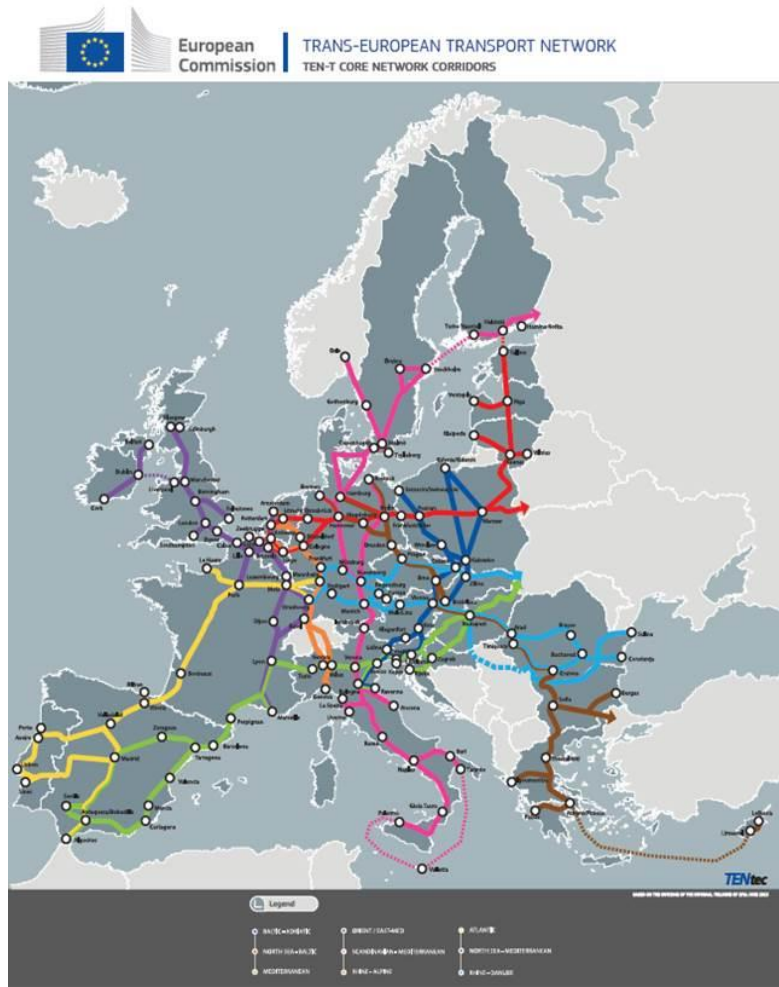


- + Enormous lobbying power of trucking industry, ... →
- Situation as regards SSS: **stone-age and hopeless**
- Q: Are we doing any better in Europe?

# Outline

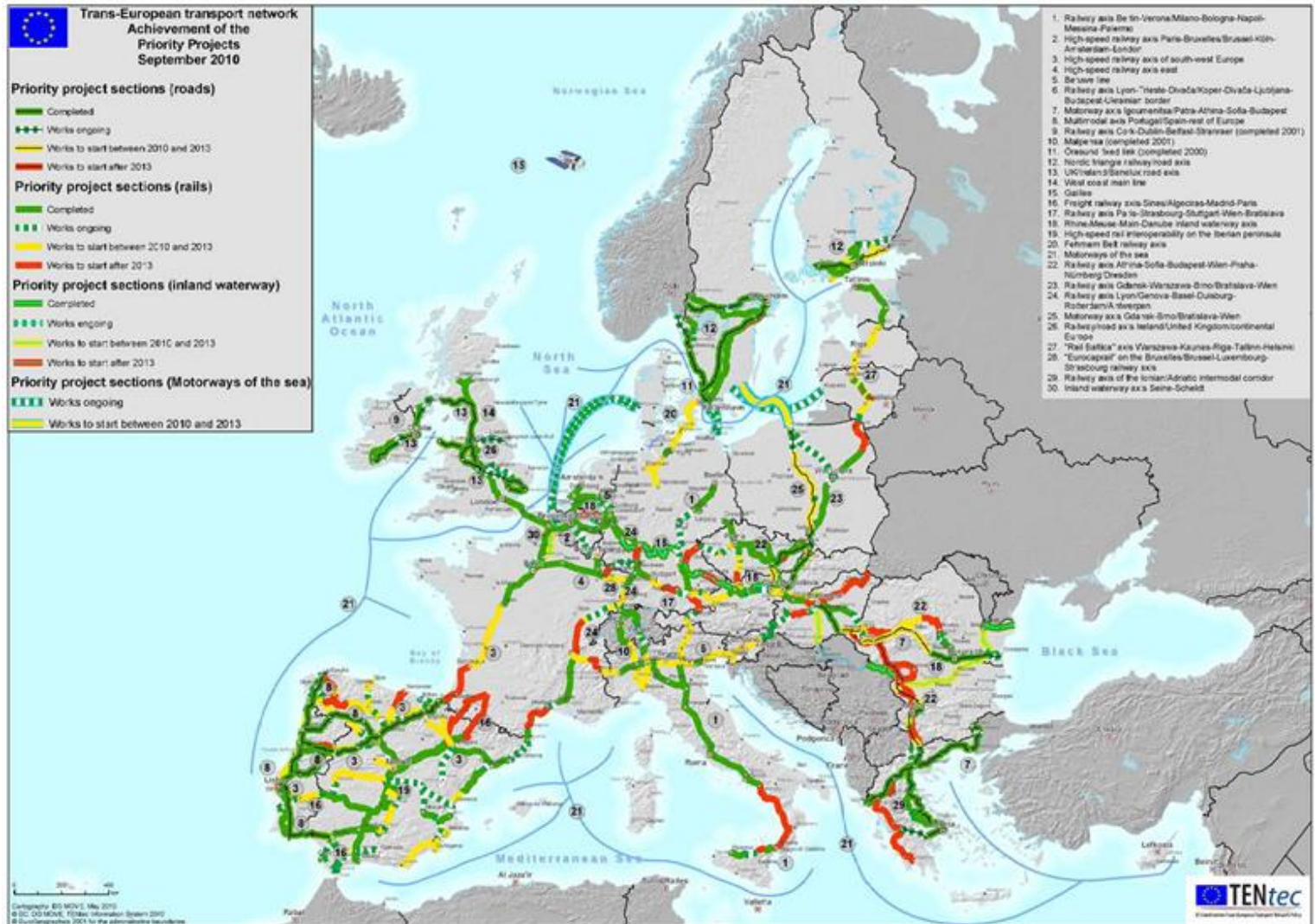
- Macro view (SSS)
- Micro view (RoRos)

# The macro view: TEN-T core network



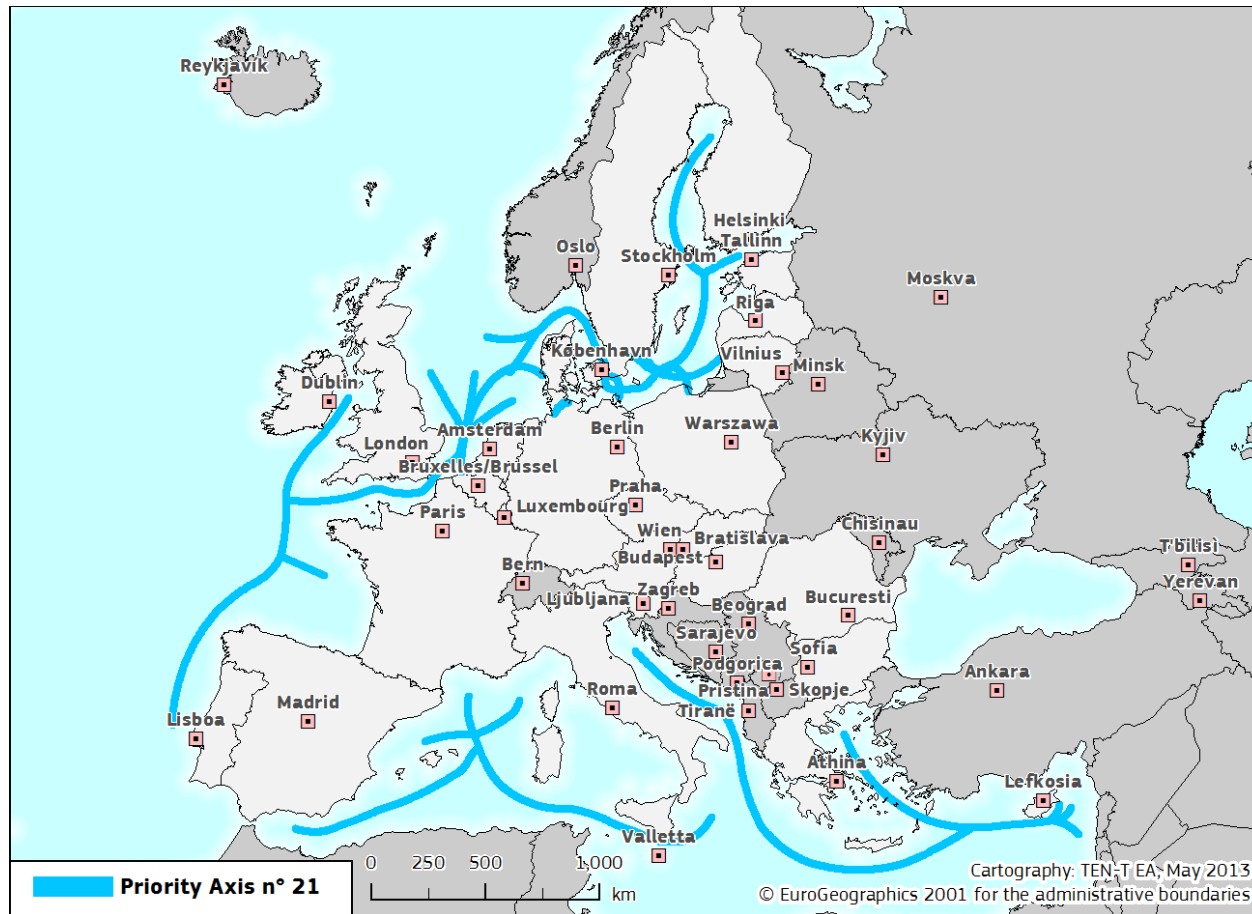
- Regulation EU 1315/2013 (TEN-T guidelines)
- Regulation EU 1316/2013 (Connect Europe Facility)

# TEN-T: 30 priority projects





# Motorways of the Sea (MoS): project No. 21





# MoS funding: impressive

## From latest workplan of MoS coordinator

- Under MoS, from the 52 projects selected 45 projects have been implemented, aiming at a budget of €450 million in EU grants and a total investment of almost €2.0 billion.
- Another 20 maritime, ports and innovation projects have been inspired by MoS.

## List of projects

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	MoS (Motorways of the Sea)													
2														
3	Project portfolio:													
4														
5														
	Project Code	Title	Cross-border	Action type	Planned duration (years)	Initial End Date	Estimated End Date	Estimated End Date deviation (months)	Initial total costs (€ M)	Actual total costs (€ M) <sup>1</sup>	Estimated total costs (€ M) <sup>2</sup>	Initial TEN-T funding (€ M)	Actual TEN-T funding (€ M) <sup>3</sup>	Estimated TEN-T funding (€ M) <sup>4</sup>
6	2008-EU-21010-4	Motorway of the Sea - High Quality Rail and Intermodal Nordic Corridor Konigsline	Yes	Mixed (Studies & Works)	6,0	31-12-2013	31-12-2013	0	50,3	13,5	13,5	10,2	2,8	2,8
7	2008-EU-21015-4	Motorways of the Sea projects in the Baltic Sea Area Klaipėda-Karishamn link	Yes	Mixed (Studies & Works)	5,4	31-12-2013	31-12-2014	12	26,0	22,2	22,5	5,2	4,5	4,5
8	2009-EU-21020-4	Motorways of the Sea Esbjerg - Zeebrugge	Yes	Works	5,0	31-12-2012	31-12-2012	0	26,5	16,9	16,9	5,3	3,3	3,3
9	2009-EU-21010-4	Baltic Link Gdynia-Karlskrona	Yes	Works	4,8	31-10-2013	31-10-2013	0	85,5	85,5	85,4	17,1	17,1	17,1
10	2010-EU-21101-5	MoS 24 - ICT based Co-modality Promotion Center for integrating PP24 into Mediterranean MoS	Yes	Studies	2,9	31-12-2013	31-12-2013	0	4,9	4,9	4,7	2,5	2,5	2,3
11	2010-EU-21102-5	Monitoring and Operation Services for Motorways of the Sea (MOS4MOS)	Yes	Studies	1,2	31-05-2012	31-05-2012	0	5,6	5,1	5,1	2,8	2,5	2,5
12	2010-EU-21105-5	MIELE	Yes	Studies	3,3	31-12-2013	31-12-2013	0	16,0	16,0	14,3	8,0	8,0	7,2
13	2010-EU-21106-5	ITS Adriatic multi-port gateway	Yes	Studies	3,2	30-06-2013	31-12-2013	6	2,9	2,9	2,9	1,4	1,4	1,4
14	2010-EU-21107-4	Motorway of the Sea Rostock - Gedser	Yes	Mixed (Studies & Works)	4,0	31-12-2013	31-12-2013	0	122,4	111,8	93,3	24,5	22,4	18,7
15	2010-EU-21108-4	The Baltic Sea Hub and Spokes Project	Yes	Mixed (Studies & Works)	4,0	31-12-2013	31-12-2013	0	311,4	172,6	148,9	24,8	15,8	12,8
16	2010-EU-21109-5	MonaLisa	Yes	Studies	3,3	31-12-2013	31-12-2013	0	22,5	22,5	22,5	11,2	11,2	11,2
17	2010-EU-21112-5	LNG infrastructure of filling stations and deployment in ships	Yes	Studies	3,2	31-03-2013	31-12-2013	9	26,8	26,8	26,8	9,6	9,6	9,6
18	2011-EU-21001-4	Adriatic Motorways of the Sea (ADRIAMOS)	Yes	Mixed (Studies & Works)	4,0	31-12-2014	31-12-2014	0	56,7	56,7	64,5	12,2	12,2	12,2
19	2011-EU-21004-5	TrainMoS	Yes	Studies	1,8	15-10-2013	31-12-2013	2	2,5	2,5	2,5	1,3	1,3	1,3
20	2011-EU-21005-5	LNG in Baltic Sea Ports	Yes	Studies	3,0	31-12-2014	31-12-2014	0	4,8	3,4	2,5	2,4	1,7	1,2
21	2011-EU-21007-5	COSTA	Yes	Studies	2,2	30-04-2014	30-04-2014	0	3,0	3,0	3,0	1,5	1,5	1,5
22														

# MoS funding work plan

## 3 Key Priorities

- Environment
- Integration of Maritime Transport in the Logistics Chain
- Maritime Safety, Traffic Management, Human Element/Training

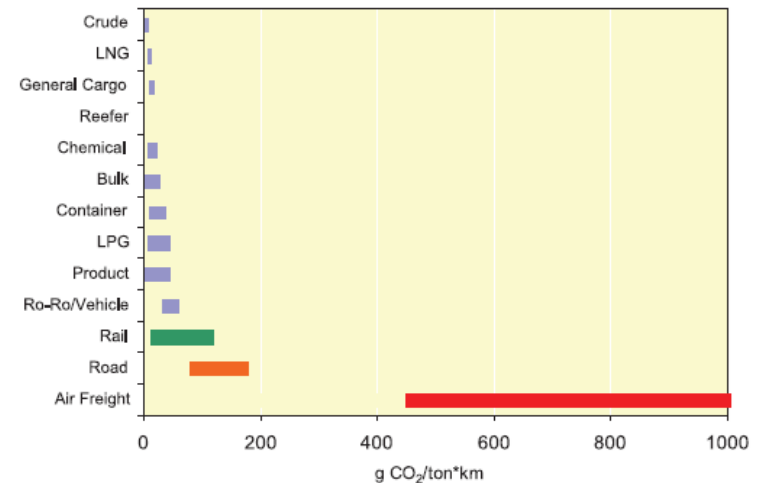
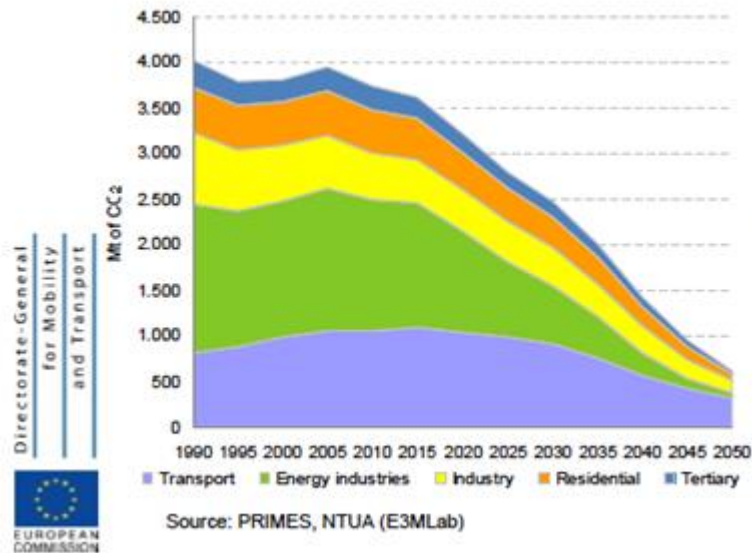
## Sample projects

- Motorway of the Sea - High Quality Rail and Intermodal Nordic Corridor Konigslinie
- Motorways of the Sea projects in the Baltic Sea Area Klaipėda-Karlshamn link
- Motorways of the Sea Esbjerg - Zeebrugge
- MoS 24 - ICT based Co-modality Promotion Center for integrating PP24 into Mediterranean MoS
- LNG in Baltic Sea Ports
- Etc etc

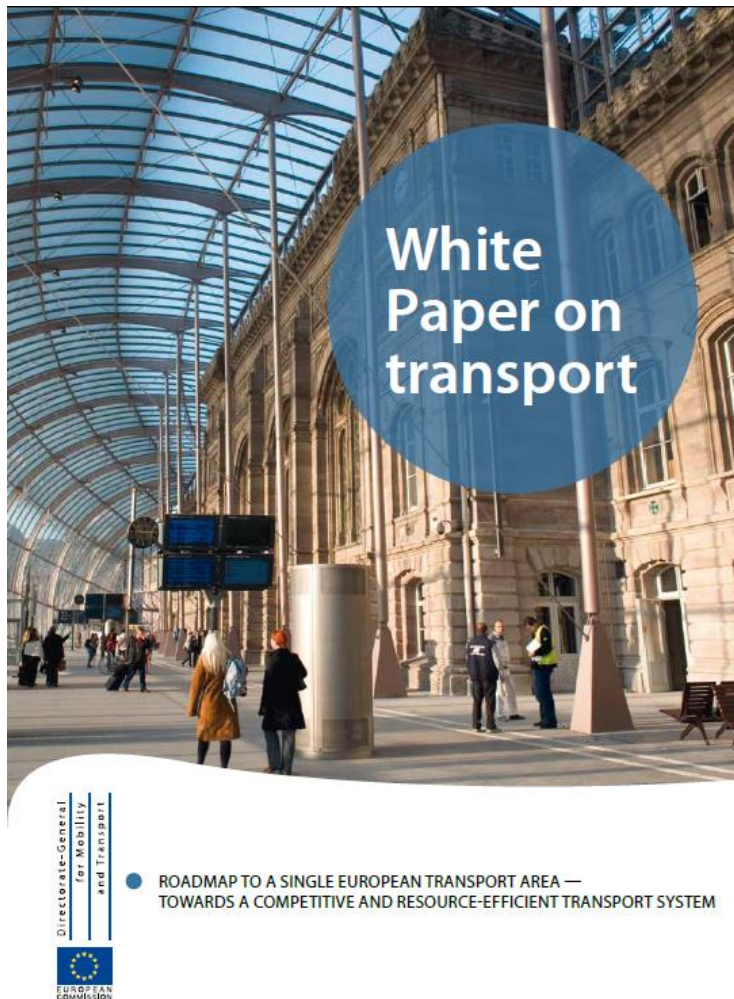
# The environmental scene

## Challenges

## Opportunities



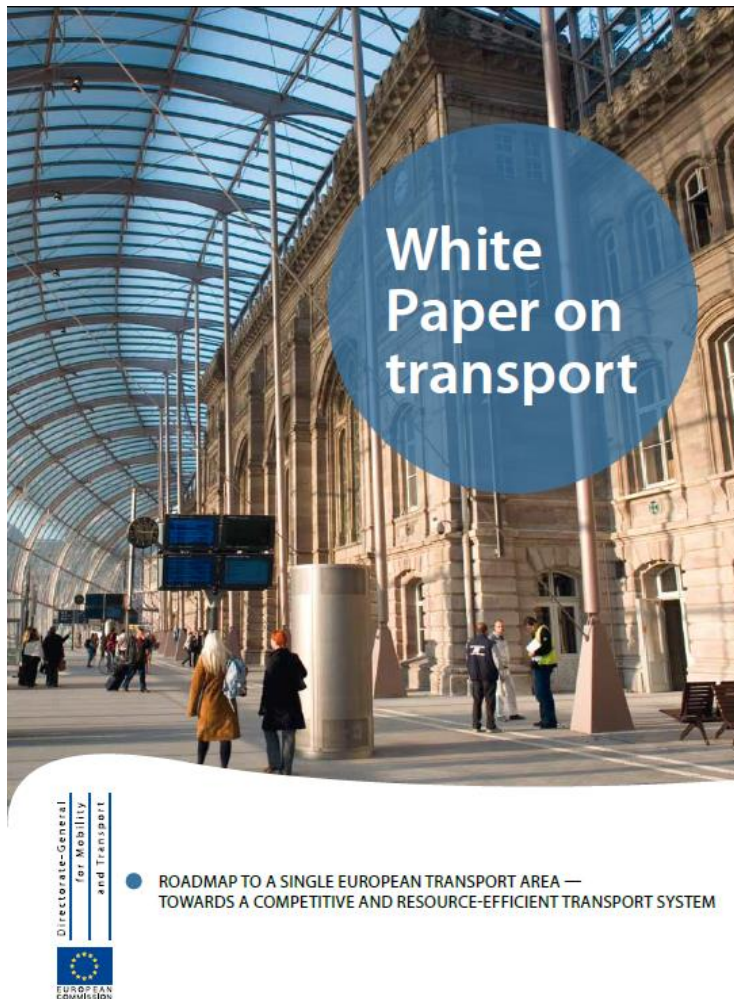
# 2011 Transport White Paper



(among other things)

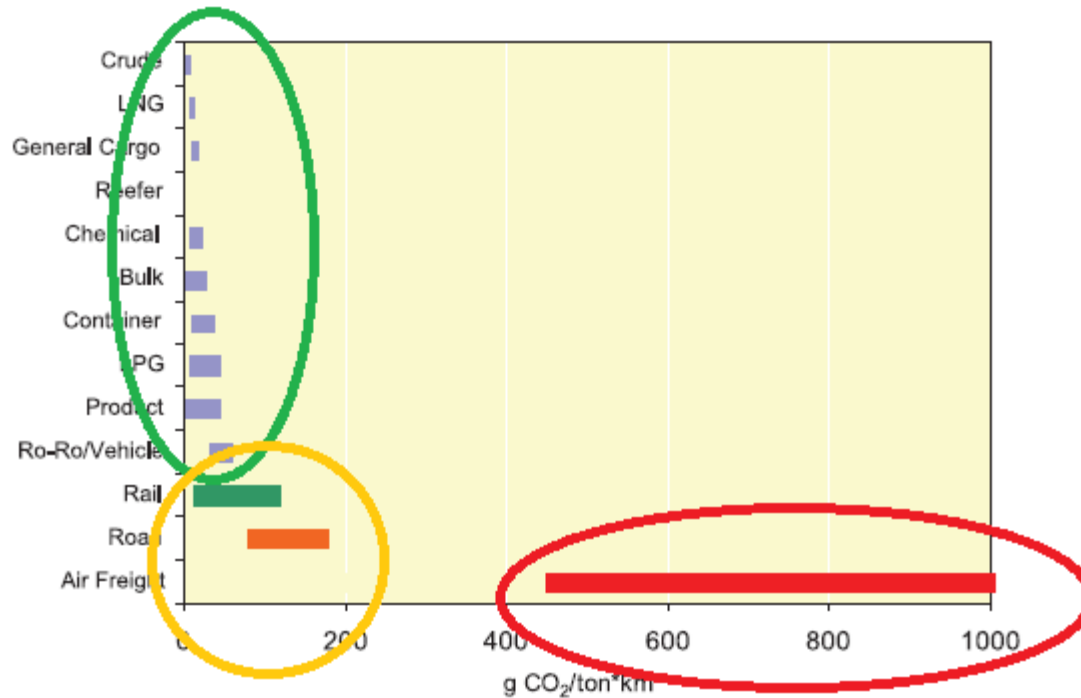
- Sets a goal of reducing GHG emissions from transport (all modes) by 60% by 2050 vis-à-vis 1990 levels
- SSS can be instrumental toward meeting this goal,
  - if energy efficiency of shipping is improved, and
  - if enough traffic is shifted from land to sea.

# 2011 Transport White Paper



- (among other things)
- Sets a goal of reducing GHG emissions from transport (all modes) by 60% by 2050 vis-à-vis 1990 levels
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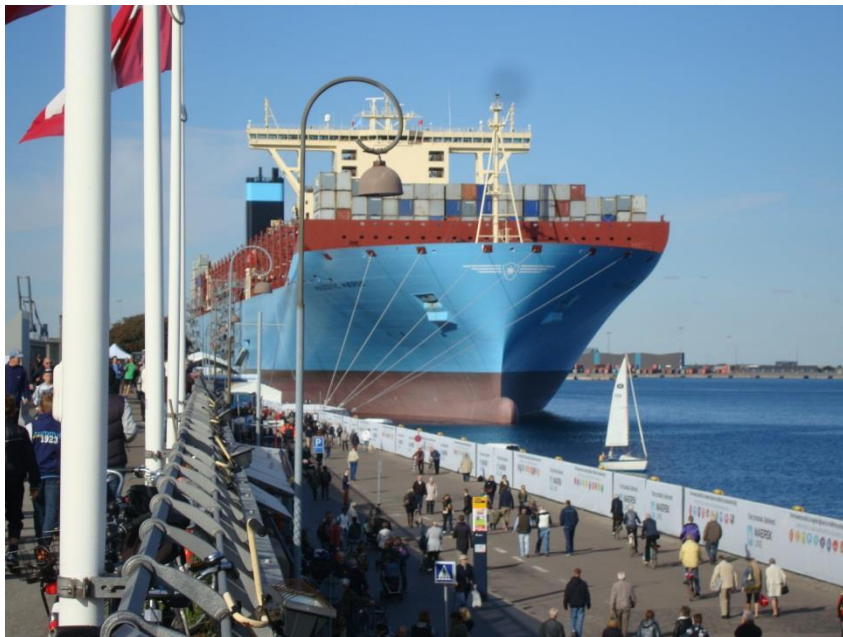
# 134 Second IMO GHG Study 2009



**Figure 9.3** Typical range of ship CO<sub>2</sub> efficiencies compared to rail, road and air freight



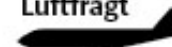
# A deep-sea paradigm



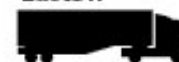
## Grøn transport

Så mange gram CO<sub>2</sub> bruges der til at transportere et ton gods en km.

Luftfragt



Lastbil



Tog



Maersk Triple-E



560g

47g

18g

3g



## Challenge (technological)

- Can something equivalent be developed for SSS?
- Innovative designs
- Fuel efficient engines
- LNG
- Scrubbers
- Batteries
- etc





## The 2nd pillar

### Improve energy efficiency

- Better designs
- Better engines
- Better propellers
- Cleaner fuels
- Other technologies

### Shift traffic from land to sea

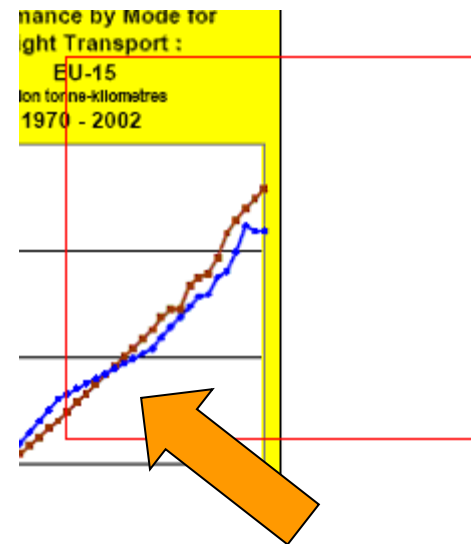
- Big role for SSS
- Role of ports: critical

## Challenge (logistical)

- Improve efficiency of SSS supply chain
  - Strategic: network design
  - Operational: fleet management
- Make ports work more efficiently



# The not so good news: Focus after 1985



1985

## Not-so-good news cont'd

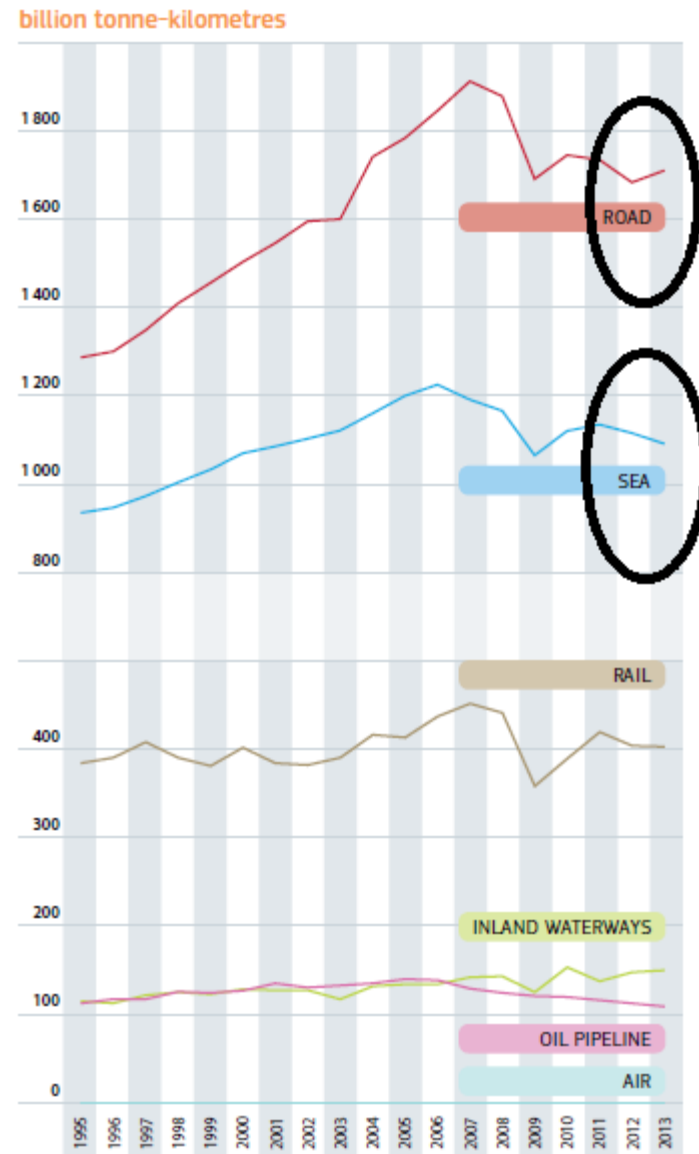
- in 1985 road surpassed SSS as the top transporter in intra-EC trades in ton-km,
- a position that it will continue to hold if no serious action is taken
- Recent trends disturbing



# Disturbing trends

Source: EU Transport in figures: statistical pocketbook 2015

## 2.2.1 EU-28 Performance by Mode for Freight Transport – 1995–2013





# Declining shares

Source: EU Transport in figures: statistical pocketbook 2015

## 2.2.2 PERFORMANCE OF FREIGHT TRANSPORT EXPRESSED IN TONNE-KILOMETRES

### EU-28 Performance by Mode

#### FREIGHT TRANSPORT

	billion tonne-kilometres						
	ROAD	RAIL	INLAND WATERWAYS	PIPELINES	SEA(*)	AIR	TOTAL
1995	1 289	388	122	115	930	2	2 846
2000	1 509	405	134	127	1 067	2	3 245
2001	1 553	388	133	134	1 083	2	3 292
2002	1 603	386	133	130	1 100	2	3 353
2003	1 608	394	124	132	1 119	2	3 378
2004	1 751	419	137	133	1 159	2	3 601
2005	1 795	416	139	138	1 198	2	3 687
2006	1 858	438	139	137	1 224	2	3 798
2007	1 925	452	145	128	1 190	2	3 843
2008	1 891	443	146	125	1 164	2	3 771
2009	1 700	364	131	122	1 062	2	3 380
2010	1 755	394	156	121	1 118	2	3 546
2011	1 744	422	142	118	1 133	2	3 562
2012	1 693	407	150	115	1 113	2	3 480
2013	1 719	407	153	112	1 089	2	3 481
1995–2013	33.4%	4.7%	25.1%	-2.7%	17.0%	27.0%	22.3%
per year	1.6%	0.3%	1.3%	-0.2%	0.9%	1.3%	1.1%
2000–2013	13.9%	0.2%	14.1%	-12.0%	2.0%	3.7%	7.3%
per year	1.0%	0.0%	1.0%	-1.0%	0.2%	0.3%	0.5%
2012–2013	1.6%	0.0%	1.8%	-2.7%	-2.2%	-1.0%	0.1%

**Road: 45.3% to 49.4%**

**Sea: 32.7% to 31.3%**

#### MODAL SPLIT

	billion tonne-kilometres						(%)
	ROAD	RAIL	INLAND WATERWAYS	PIPELINES	SEA(*)	AIR	
1995	45.3	13.6	4.3	4.0	32.7	0.1	
2000	48.5	12.5	4.1	3.9	32.9	0.1	
2001	47.2	11.8	4.0	4.1	32.9	0.1	
2002	47.8	11.5	4.0	3.9	32.8	0.1	
2003	47.6	11.7	3.7	3.9	33.1	0.1	
2004	48.6	11.6	3.8	3.7	32.2	0.1	
2005	48.7	11.3	3.8	3.7	32.5	0.1	
2006	48.9	11.5	3.6	3.6	32.2	0.1	
2007	50.1	11.8	3.8	3.3	31.0	0.1	
2008	50.1	11.7	3.9	3.3	30.9	0.1	
2009	50.3	10.8	3.9	3.6	31.4	0.1	
2010	49.5	11.1	4.4	3.4	31.5	0.1	
2011	49.0	11.9	4.0	3.3	31.8	0.1	
2012	48.6	11.7	4.3	3.3	32.0	0.1	
2013	49.4	11.7	4.4	3.2	31.3	0.1	

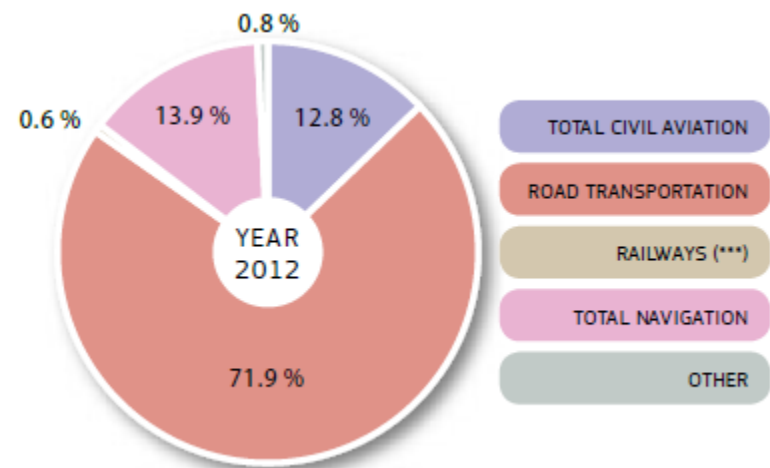


# Road pollutes more

Source: EU Transport in figures: statistical pocketbook 2015



## GHG Emissions from Transport – EU-28 BY MODE (SHARE %)



## SSS and EU enlargement

- Since May 2004, when Latvia, Lithuania and Estonia became EU members, **maritime transport in the Baltic Sea was reported to decrease 10 %; while road transport increased almost 50 %** (source: ESPO).
- This was due to a sharp decrease in bureaucracy and administrative procedures for road transport, while the same is not the case with SSS.
- Same may be true due to Bulgaria and Romania's accession in 2007, and Croatia's in 2013.
- This means that an **reverse modal shift** (from sea to road) has taken place as the result of the enlargement.

# Let us be green

## EU ENVIRONMENTAL DIRECTIVES & REGULATIONS THAT AFFECT SSS

- The Health and Safety in the Workplace Directive,
- The Waste Reception Facilities Directive,
- The Wild Birds Directive,
- The Habitats Directive,
- The Bathing Water Directive,
- The Dangerous Substances Directive,
- The Urban Waste Water Treatment Directive,
- The Shellfish Directive,
- The Water Framework Directive,
- The Environmental Impact Assessment Directive,
- The Strategic Environmental Assessment Directive,
- The Environmental Liability Directive,
- The Sulphur Directive,
- The Shore Power Directive,
- The Maritime Spatial Planning Directive, and
- The MRV Regulation.

(16 and counting!)



## Cumulative challenges

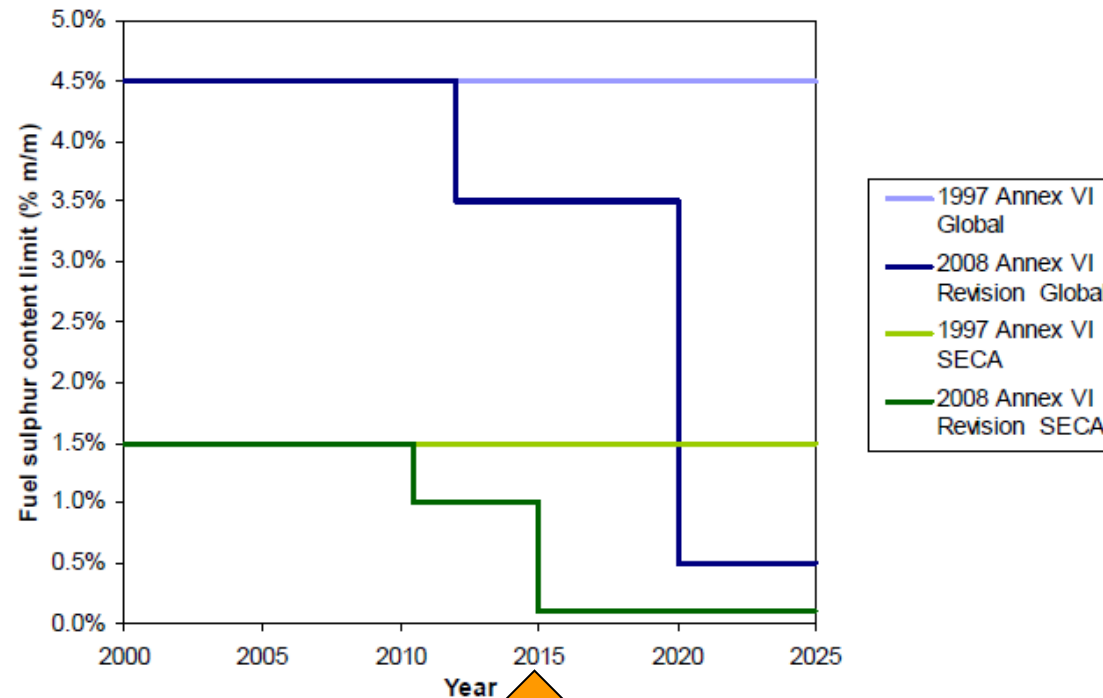
- Demanding regulatory environment (add safety+security to environmental protection)
- Urgent need to reverse trend (road vs sea)
- Need of significant private capital

# The micro level: RoRo shipping



# FOCUS: IMO MARPOL Annex VI

Oct. 2008 IMO emission standards are further revised by amendments to Annex VI





# IMO MARPOL Annex VI





# Background on impact: many studies/papers

- Kalli et al (2009)
  - Ljungström et al (2009)
  - Stavrakakis et al (2009)
  - Hader at al (2010)
  - ECSA: Notteboom et al (2010)
  - EC: Bosch et al (2009), Kehoe et al (2010), Delhayé et al (2010)
  - ECSA & ICS: Grebot et al (2010)
  - EMSA (2010)
  - etc
- 
- Special issue of Tr. Res. Part D on ECAs (2014)

# Special issue

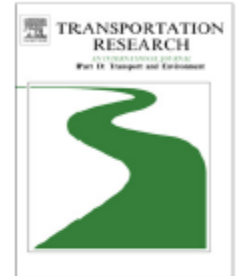
Transportation Research Part D xxx (2014) xxx–xxx



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## Transportation Research Part D

journal homepage: [www.elsevier.com/locate/trd](http://www.elsevier.com/locate/trd)



### Editorial

## Emission control areas and their impact on maritime transport

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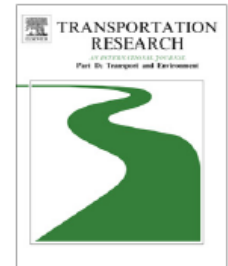
<sup>b</sup>Logistics and Transport Research Group, Department of Business Administration, School of Business, Economics and Law at University of Gothenburg, P.O. Box 610, SE 405 30 Göteborg, Sweden



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## Transportation Research Part D

journal homepage: [www.elsevier.com/locate/trd](http://www.elsevier.com/locate/trd)



# The possible designation of the Mediterranean Sea as a SECA: A case study



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# Results

- Shift to road >5%
- Less Sox
- (paradoxically) Less CO<sub>2</sub>!
- RoPax going 23 knots
- Low load factor



1



2

## A new DTU project:



- **Mitigating and reversing the side-effects of environmental legislation on Ro-Ro shipping in Northern Europe**
- Main objective: identify and assess possible technical, operational, regulatory and financial measures for the mitigation and reversal of the negative repercussions of environmental legislation to the market shares of Ro-Ro shipping in Northern Europe.
- Sponsor: Danish Maritime Fund
- Duration: 2 years (15/6/2015-14/6/2017)

## Remarks

- The fact that fuel prices have dropped precipitously since the summer of 2014 has somehow alleviated the repercussions of the new regulations.
- However, this was also the case for the road mode and the risk of route closure still exists, particularly if fuel prices rise again in the future.
- Some operators have already shut down some of their routes.
- → Need to be on the alert.

# DISCLAIMER

- **No results yet! (being at month 8)**
- **BUT: I will try to explain what we are doing**



## Case studies based on



# Current DFDS network

- 18 Routes (22 links)
- 38 vessels
- Up to 535 departures/week, 13 countries, 30 ports
- 4 main areas
  - North Sea (9 Routes, 20 vessels)
  - Baltic Sea (5 Routes, 7 vessels)
  - Cross-Channel (3 Routes, 6-7 vessels)
  - Mediterranean (1 Route, 1-2 vessels)



# Main route selection criteria

- 6-8 Routes
- Geographical Balance
- Distance (good spread between short and long routes)
- Volume & frequency of service
- Vessels (various types & abatement technologies)

# Active routes to study (7)

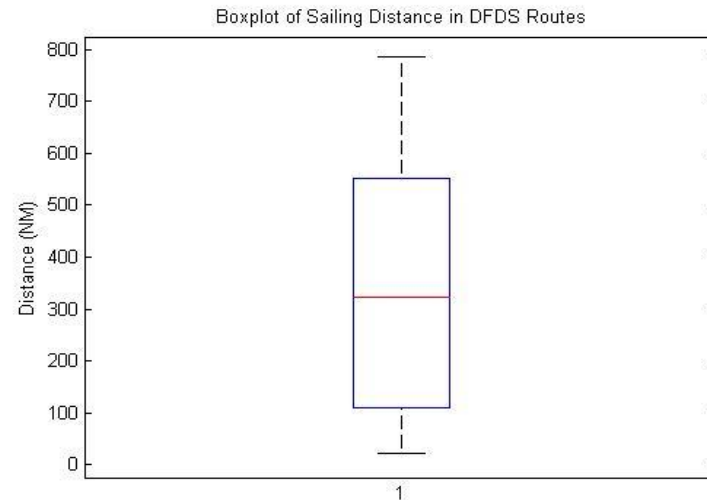
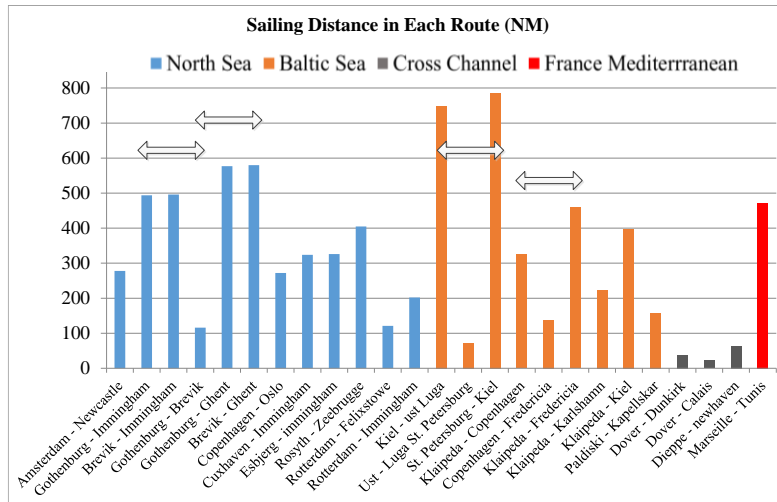
Route	Vessel		Vessel Capacity	
	Type	Tech	Lane meters	Passengers
<b>NORTH SEA</b>				
Gothenburg – Ghent – Brevik	RoRo	Scrubber	3831	12
	RoRo	Scrubber	3831	12
	RoRo	Scrubber	3831	12
Copenhagen – Oslo	Cruise	Scrubber	(450 cars)	1790
	Cruise	MGO	(320 cars)	1989
Esbjerg – Immingham	RoRo	Scrubber	3000	12
	RoRo	MGO	3000	12
Rotterdam – Felixstowe	RoRo	Scrubber	2772	12
	RoRo	Scrubber	2772	12
	RoRo	MGO	1680	12
<b>BALTIC SEA</b>				
Klaipeda – Kiel	RoPax	Scrubber	2115	328
	RoPax	Scrubber	2240	328
Klaipeda – Karlshamn	RoPax	MGO	2490	600
	RoPax	MGO	2496	600
<b>CROSS CHANNEL</b>				
Dover – Calais	RoPax	MGO	1784	1100
	RoPax	MGO	1949	405

## Also!

- Esbjerg- Harwich (recently shut down)
- Marseille-Tunis (outside SECA)

# Short vs long routes

- Distance

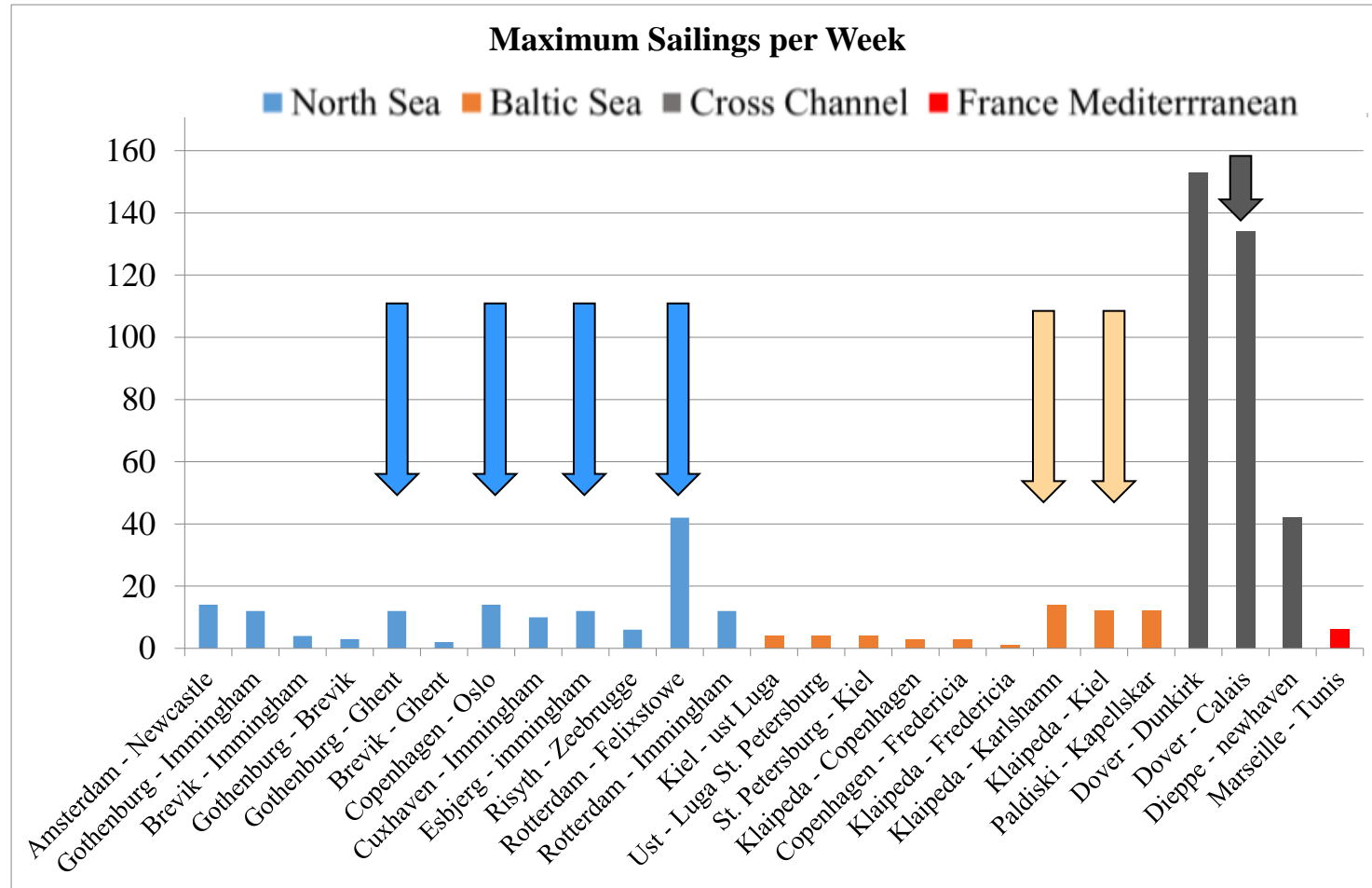


## Distance of Proposed Routes

577\*  
326  
272  
121  
397  
223  
22



# Frequency of Service



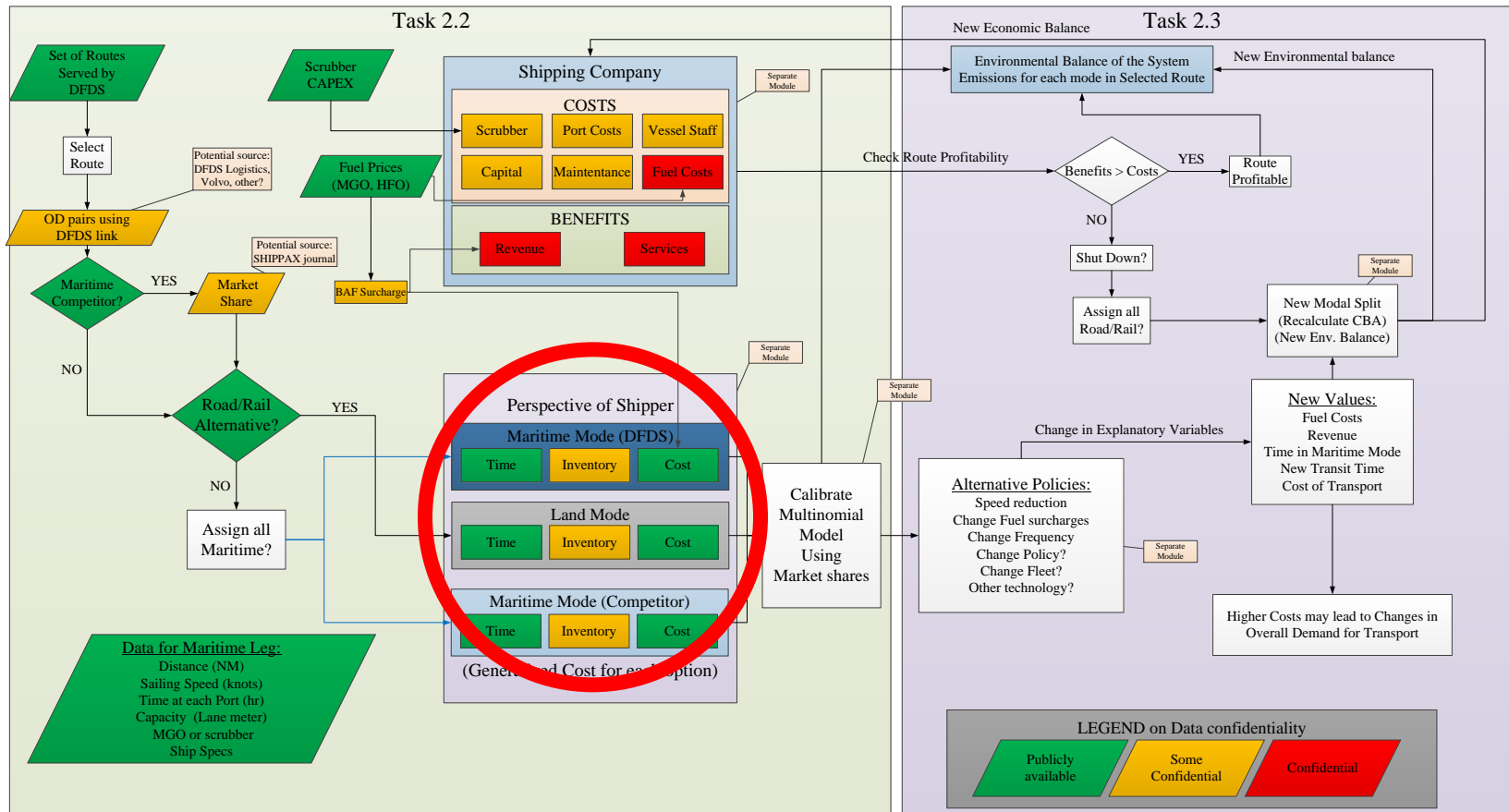
## Volume

- The selected routes account for approximately 43% of the total DFDS lane meters capacity

## Vessel Type and Technology

- 2 Cruise Ships (1 MGO, 1 scrubbers)
- 8 Ro-Ro (3 MGO, 5 scrubbers)
- 6 Ro-Pax (4 MGO, 2 scrubbers)

# Modal split model development and calibration



# Perspective of the Shipper

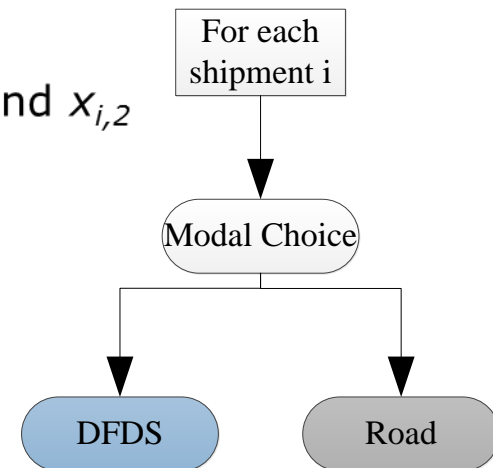
- Transport Option for scenario  $i$
- For each Option  $j$ :

- Monetary Cost
- Travel Time
- Inventory Cost
- Waiting times

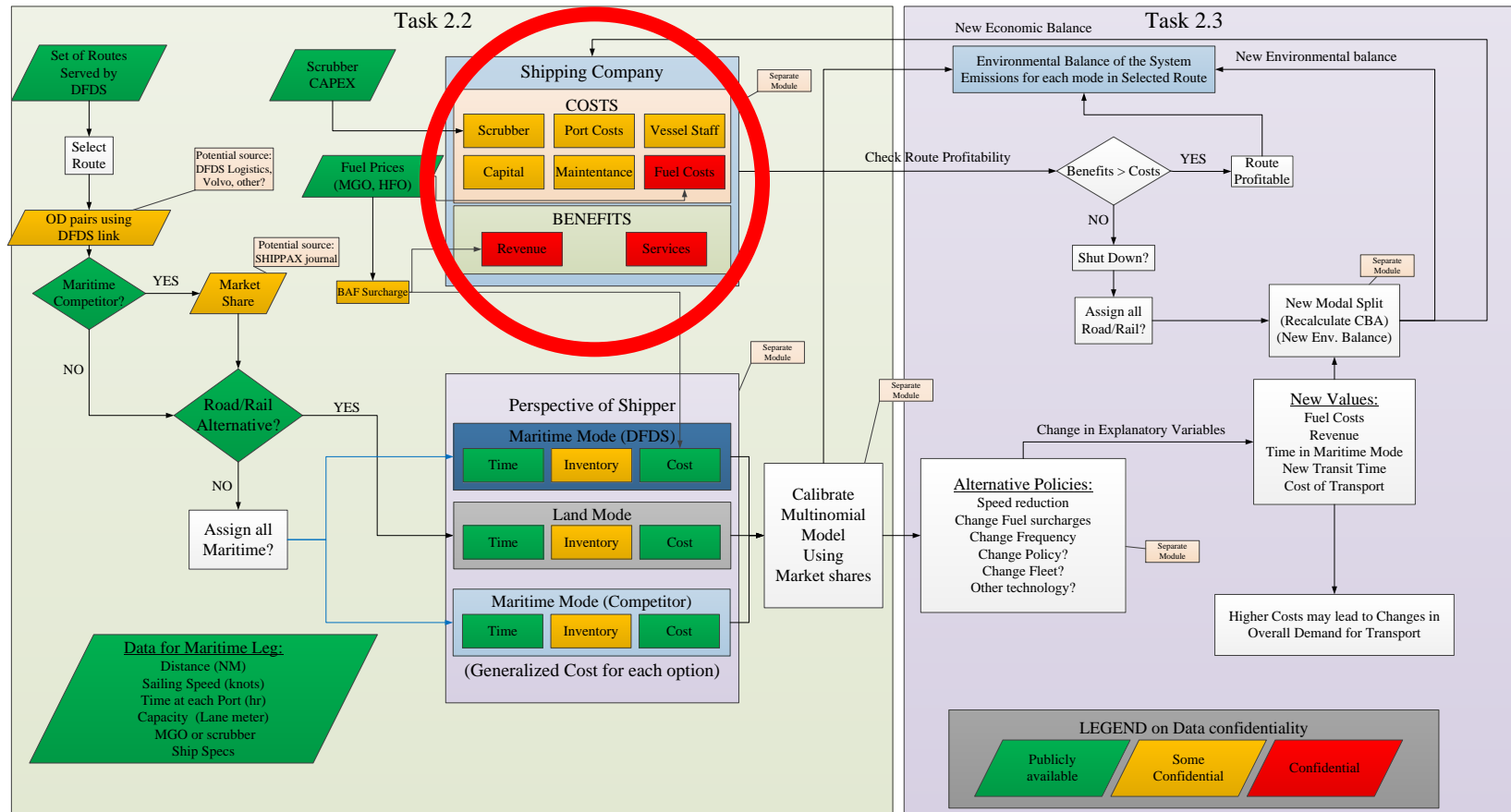


- Identify market share (%)  
For example, the simplest binary case (sea vs land):  $x_{i,1}$  and  $x_{i,2}$

- Calibrate Model  $x_{i,1} = \frac{e^{-\lambda \cdot C_{i,1}^g}}{e^{-\lambda \cdot C_{i,1}^g} + e^{-\lambda \cdot C_{i,2}^g}} \longrightarrow$  estimate  $\lambda$
- Assume an increase in  $C_{i,2}^g \longrightarrow$  then  $x_{i,1} \uparrow$  and  $x_{i,2} \downarrow$

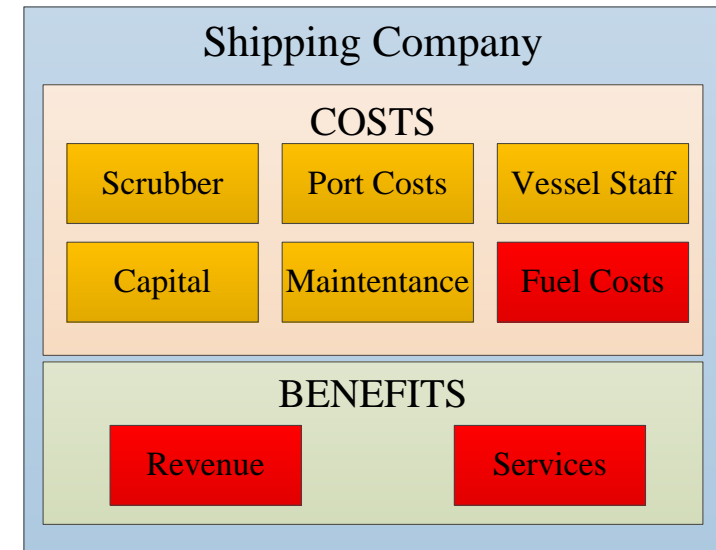


# Perspective of the Shipping Company



# Perspective of the Shipping Company

- Identify Revenue with a given Transport Demand
  - Passengers
  - Freight Rate for Cargo
  - Miscellaneous (Food, Drinks, Casino etc.)
- Identify Costs
  - Fuel
  - Port
  - Staff
  - Maintenance
  - Other
- Formulate Profitability Function
  - If Route non-profitable, consider shut down
  - Re-run modal split





# WP3 Measures to mitigate or reverse modal shifts

- *Task 3.1 Measures from the Ro/Ro operator*
  - Speed reduction
  - Service frequency and schedule reconfiguration
  - Fleet and network reconfiguration
  - Alternative fuels such as LNG
  - Other technical measures such as scrubbers
  - Appropriate pricing policies
- *Task 3.2 Measures from policy makers*
  - Full or partial internalization of external costs, all modes
  - Easing of port dues/fairway dues/ice dues for relevant shipping
  - Public funding or subsidies
  - Any potential policy measure recommended by the ESSF and its subgroups

# Ahead

TO JUNE 2016

- Finalize & calibrate model
- Gather additional data
- Make runs for selected routes
- Workshop (stay tuned)

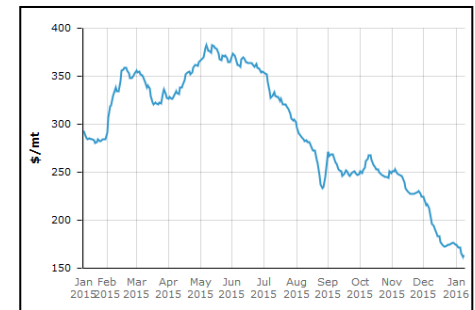
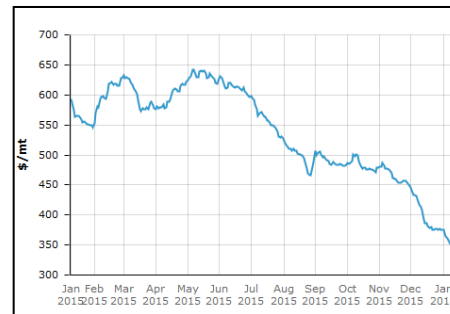
2ND YEAR

- Examine mitigation measures & policies

# Challenges

- **How to isolate effect of sulphur legislation from that of other developments that happened in parallel**

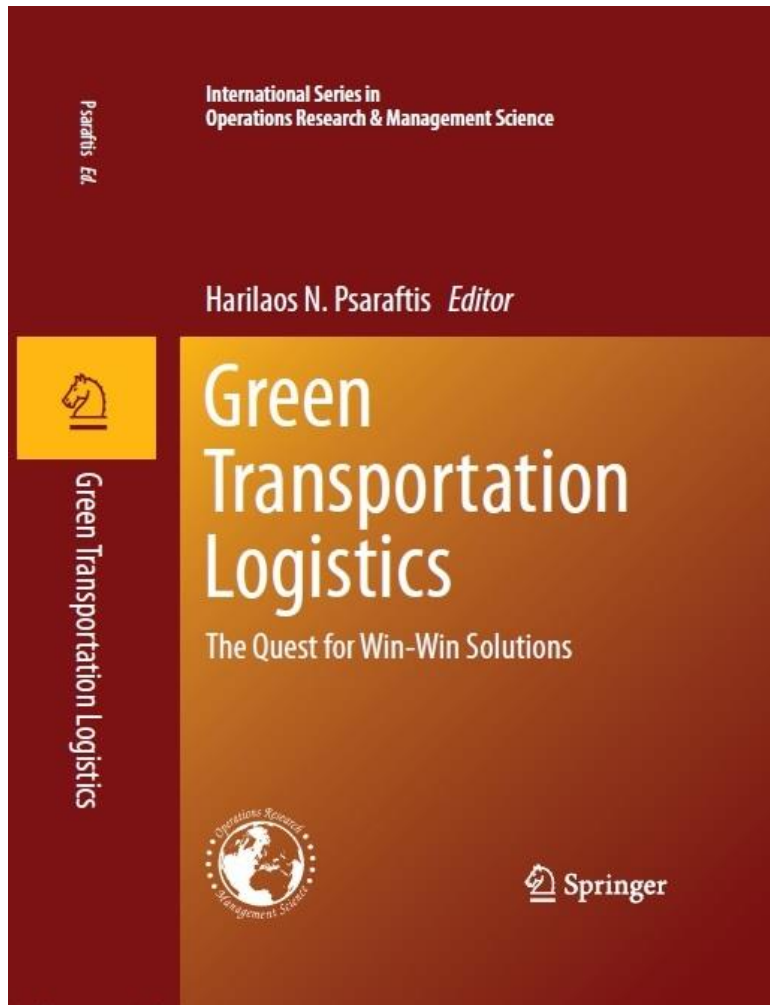
- Precipitous drop of fuel prices



- Russian economic crisis

- **Lower fuel prices may induce higher speeds and hence more CO<sub>2</sub>!**

# New Book



- 15 chapters, 548 pages
- Covers all modes of transport
- Plus green corridors, TEN-Ts, etc

# Questions by the organizers

- Is SSS a serious contender in the European transport contest?
- **Not fully, at this point in time**
- Could an intermodal approach make short sea-shipping a serious contender in the European transport contest?
- **Yes, but we still have a long way to go**
- Is a future where short-sea shipping overshadows road and rail possible?
- **Yes, but we still have a long way to go**
- In what ways is the EU incentivising the move from road to sea?
- **In several ways, but we still have a long way to go**
- How has the 'Motorways of the Sea' initiative influenced intermodal transport in Europe?
- **In several ways, but we still have a long way to go**

# Thank you

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