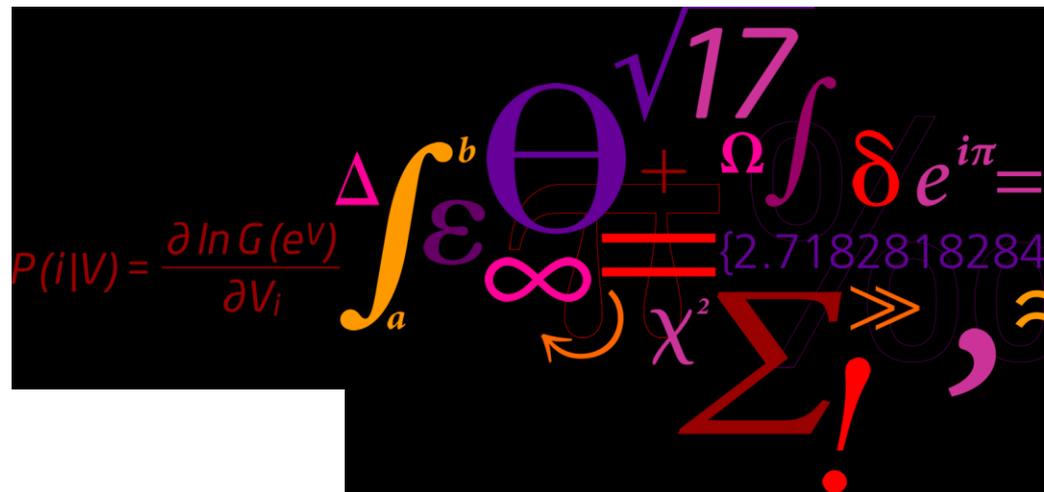


The indirect effects of the new low sulphur requirements in ECAs in RoRo shipping

Thalis Zis
Harilaos N. Psaraftis

Postdoctoral Researcher
Professor

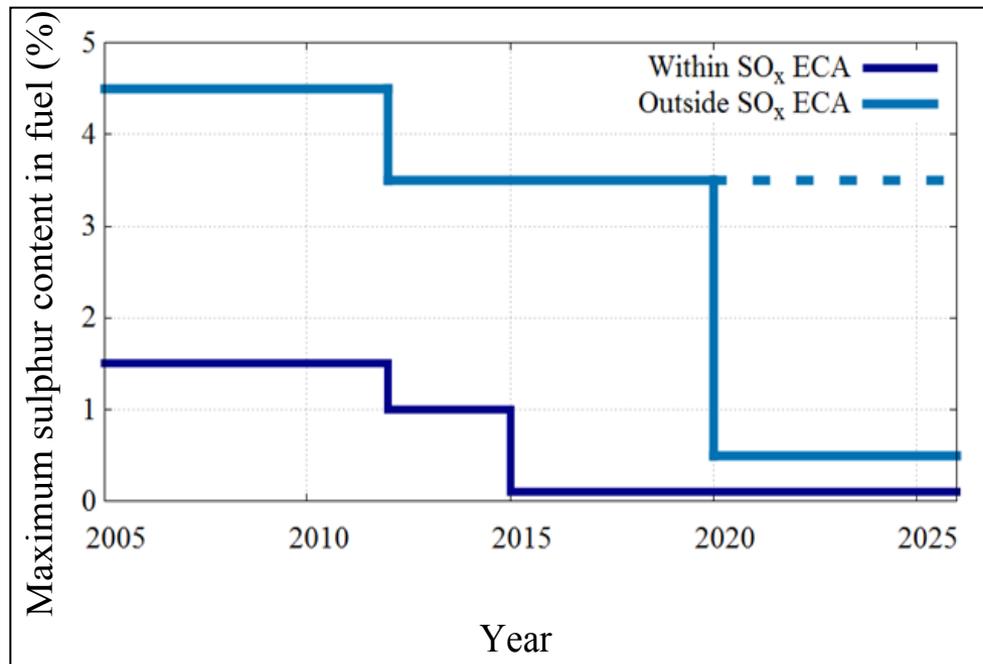


Presentation Outline

- Background
 - SECA regulation
 - Anticipated impacts
 - Fuel prices
 - Market picture
- Study Motivation
 - Effects to Ro-Ro operators
 - Costs for shippers
- The RoRoSECA project
 - Objectives
 - Methodology
- Initial findings
 - Route selection
 - Case studies
- Future work

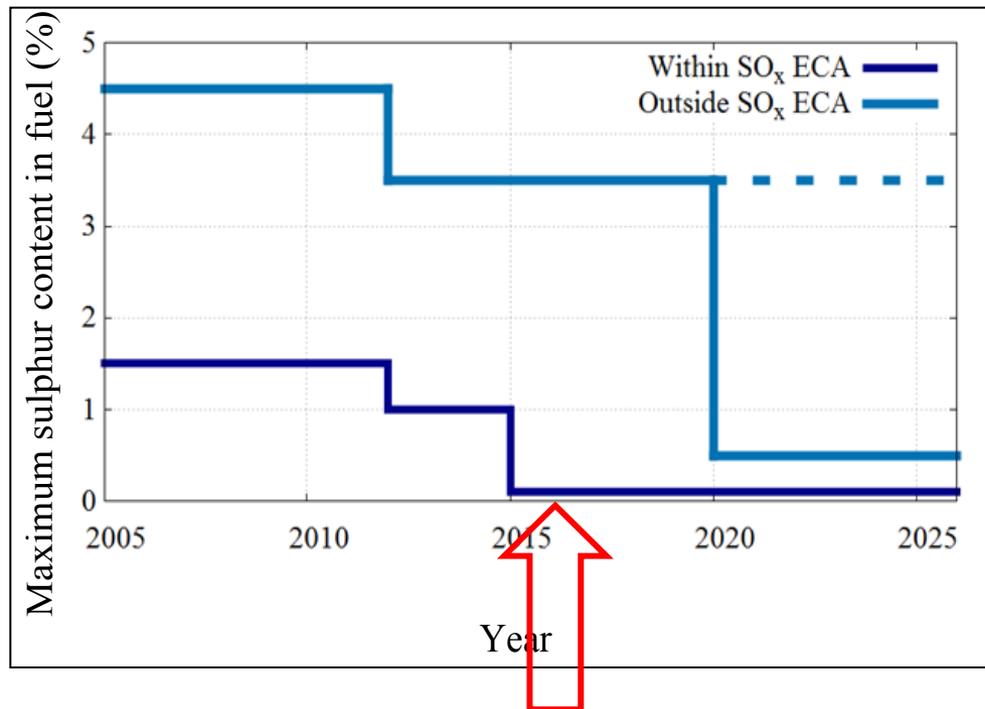
Background

- As of January 1st 2015:



	Year			
Areas	2005-2012	2012-2015	2015-2020	2020 (or 2025)-
Within SECA	1.5	1	0.1	0.1
Outside SECA	4.5	3.5	3.5	0.5

We are here..



EU regulation on sulphur

- Use of sulphur limit of a maximum 0.1% sulphur content
- Since 2005 for:
 - Ships at berth (longer than 2 hours)
 - Inland waterways
- Compliance could be achieved only by:
 - Use of scrubber systems
 - Use of alternative marine power (AMP), also known as shorepower and cold ironing
 - Use of low sulphur fuel (e.g. Marine Gas Oil)

The immediate implications of the 0.1% limit on SECA

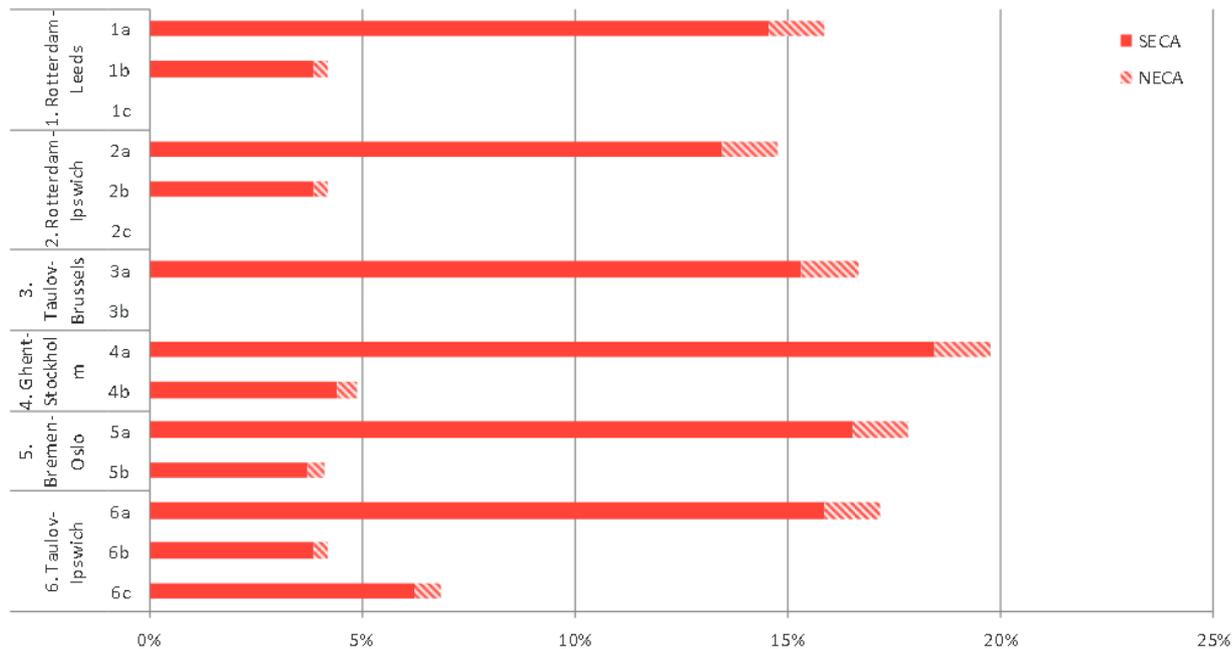
- It now affects all activity phases of a vessel
- Makes the case for scrubbers more appealing
- Perhaps cold ironing is less attractive now
- Whichever the abatement option, the operating costs will be higher than the case with the 1% limit

The wider implications of the new limit..

- On SECAs (is the environmental improvement significant?)
- Understanding the effects of the regulation on short sea shipping
- Dissecting the effect of low fuel prices on modal shares changes
- Proposing policies and operating practices to minimize and reverse the negative impacts

Anticipated impacts from studies

Figure 23: Percentage cost increase in sea-based costs due to SECA and NECA in 2015 for ro/ro routes



Source: The impact on short sea shipping and the risk of modal shift from the establishment of a NOx emission control area in the North Sea (North Sea Consultation Group, 2013)

Press releases **before** the new limit

SECA SHUTS DOWN TRANSFENNICA IBERIAN SERVICE

The Dutch-owned short-sea shipping line Transfennica (part of the Spliethoff Group) has announced that it is to cease its "Motorways of the Sea" ro-ro service between Bilbao, Portsmouth and Zeebrugge at the end of this month (December).

The decision is a direct result of the introduction of stricter new low-sulphur emission controls from 1 January 2015 in the Baltic Sea, the Kattegat, the North Sea and English Channel. A further SECA extends in a 200 nautical miles wide belt along the coasts of the USA and Canada.

SECA requirements lead to new European rail link

CARRIERS: Railway company ERS is opening a new route in Europe in light of rising customer demand following the implementation of new sulphur regulations. Many customers and countries are willing to change their mode of transport in order to save money.

DFDS closes Sassnitz-Klaipeda connection

Publication date: 2013-08-30

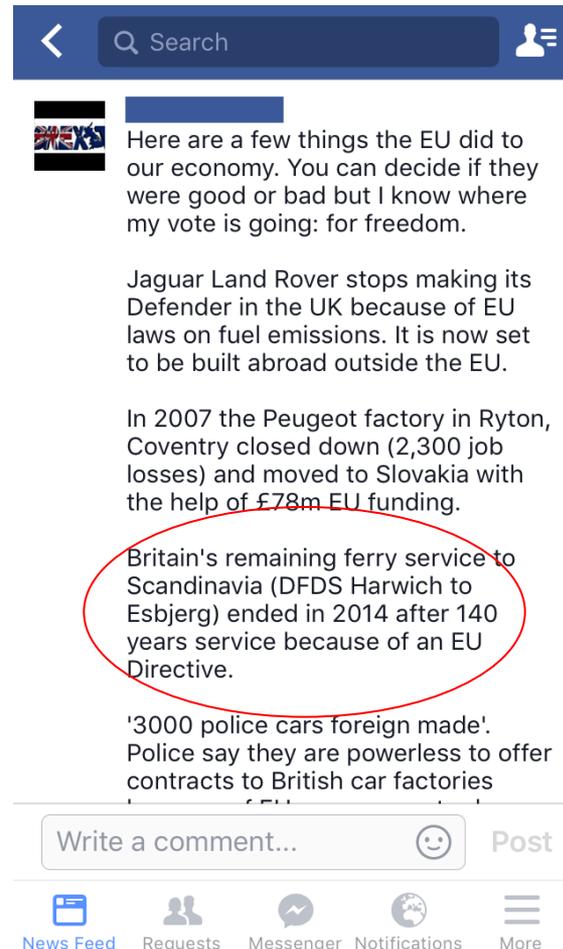
Tags: maritime, germany, denmark, lithuania



DFDS Seaways has decided to close the ferry service between Sassnitz, Germany and Klaipeda, Lithuania with effect from the end of September.

Previously a busy connection, the route has over the years become economically unviable. As Vice President of DFDS, Anders Refsgaard, stated: "We have fought hard to get new customers and improve revenue and profit, but unfortunately without success". He added, that with the outlook on continued decline in profits, and in light of the new sulphur regulations to be introduced from 1 January 2015, the company does not believe that it will be possible to turn the tide on the crossing.

Some surprising evidence ahead of Brexit referendum...






 Here are a few things the EU did to our economy. You can decide if they were good or bad but I know where my vote is going: for freedom.

Jaguar Land Rover stops making its Defender in the UK because of EU laws on fuel emissions. It is now set to be built abroad outside the EU.

In 2007 the Peugeot factory in Ryton, Coventry closed down (2,300 job losses) and moved to Slovakia with the help of £78m EU funding.

Britain's remaining ferry service to Scandinavia (DFDS Harwich to Esbjerg) ended in 2014 after 140 years service because of an EU Directive.

'3000 police cars foreign made'. Police say they are powerless to offer contracts to British car factories

Write a comment...  Post



 News Feed Requests Messenger Notifications More

But were they right in predicting?

Stena Line records 16% yearly growth on North Sea route



Stena Britannica sails between the UK port of Harwich and the Hook of Holland in the Netherlands

DFDS Wraps Up Record Year, Expects Higher Revenue in 2016



Image Courtesy: DFDS

Danish shipping and logistics company DFDS posted a profit of DKK 1.07bn (USD 151m), up by 89pct when compared to last year's DKK 571 million.

For the full-year 2015, the group reported revenue increase of 5% to DKK 13.5bn. Organic revenue growth, adjusted for route closures and acquisitions, was 7% mainly driven by 7% higher freight shipping volumes and 8% more passengers. In the fourth quarter, organic revenue growth was 10%.

P&O breaks Channel freight record in 2015

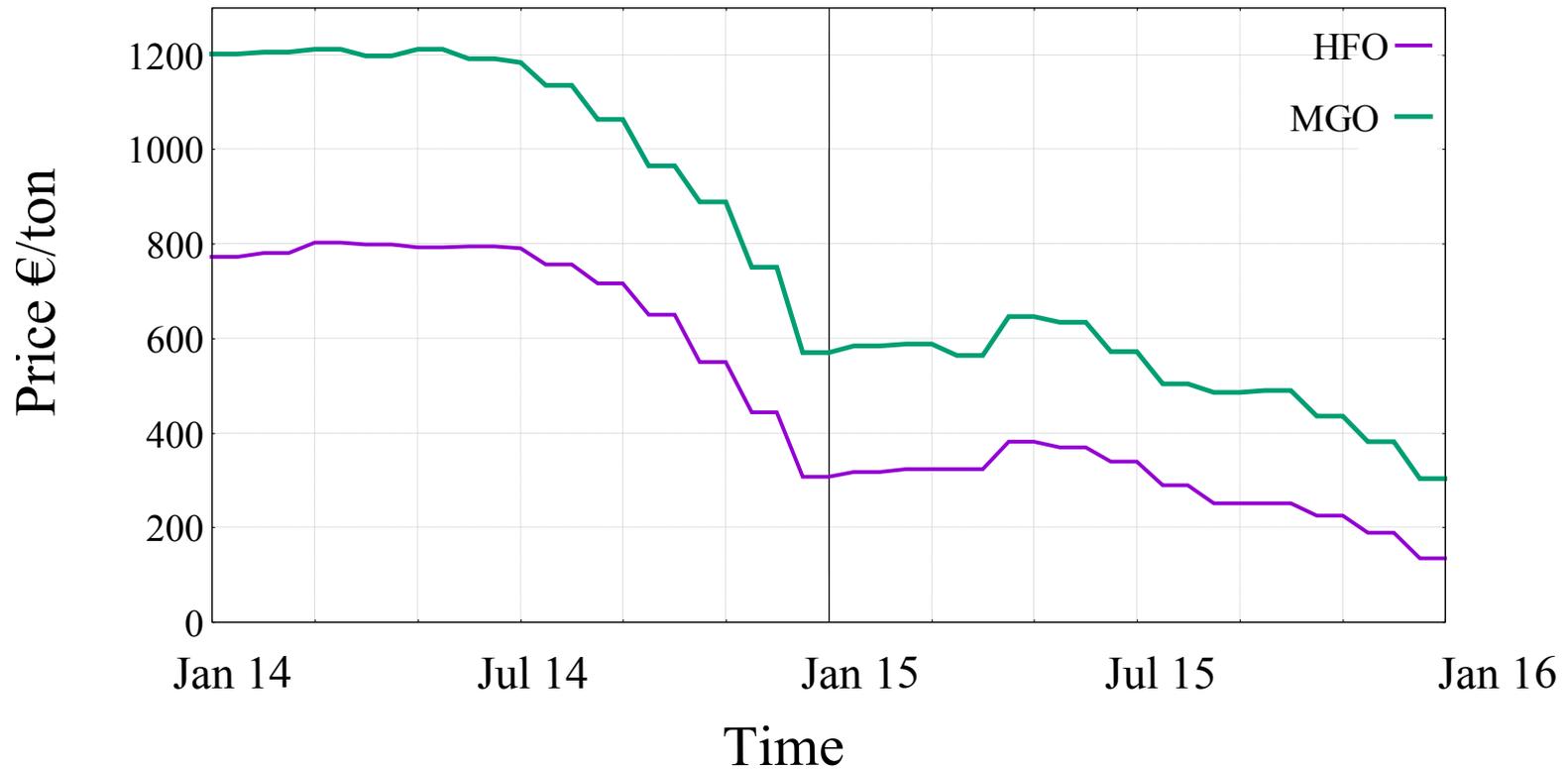
By Charlie Bartlett from London

P&O Ferries transported more freight between Dover and Calais in 2015 than any other year in its "modern history," amounting to 1,340,317 trucks.

The result is a 22% year-on-year increase over 2014, and is due in part to disruptions at the channel tunnel, which caused a 172% year-on-year increase in HGVs on its separate Teesport to Zeebrugge route throughout the month of July. The group pressed a sixth ship back into service on the English Channel that month in order to increase capacity.



Actual Fuel prices



Findings of relevant study

- The competitive position of RoRo shipping in comparison with road transport became worse, since the difference in fuel price has become smaller.
- The fuel price difference decreased from around \$1,240 (HFO-diesel) to around \$900 (MGO- diesel) per tonne of fuel
- the first available evidence shows that RoRo shipping has largely been able to cope with the fuel price increases. Some of the largest RoRo operators report outstanding financial figures over 2015.

Source: SECA Assessment: Impacts of 2015 SECA marine fuel sulphur limits .First drawings from European experiences. CE Delft

Presentation Outline

- Background
 - SECA regulation
 - Anticipated impacts
 - Fuel prices
 - Market picture
- **Study Motivation**
 - Effects to Ro-Ro operators
 - Costs for shippers
- The RoRoSECA project
 - Objectives
 - Methodology
- Initial findings
 - Route selection
 - Case studies
- Future work

Effects to Ro-Ro operators

- Ship operators can either use low-sulphur fuel, or retrofit vessels with scrubber systems
- MGO is more expensive, while scrubbers increase overall fuel consumption, and require significant capital costs
- Increased operating costs could lead to changes in
 - vessel deployment
 - frequency of service
 - sailing speed
 - existence of certain routes
- Some of the additional costs will be passed over to clients through the Bunker Adjustment Factor (BAF – fuel surcharges)

Cost to shippers

- Shippers would see increased fare rates due to the SECA regulation
- Eventhough MGO is now cheaper than what HFO was before the new limit, shippers would pay even less if HFO was still allowed
- Changes from ship operators on service may affect mode choice for shippers
- Reliability of certain services is at higher risk
- Is it possible to isolate the effects of the new limits from certain events that also affect mode choice? Including:
 - Low fuel prices
 - Competitive services shutting down
 - An overall change in transport demand

The RoRo SECA project

- <http://www.roroseca.transport.dtu.dk/>



Presentation Outline

- Background
 - SECA regulation
 - Anticipated impacts
 - Fuel prices
 - Market picture
- Study Motivation
 - Effects to Ro-Ro operators
 - Costs for shippers
- **The RoRoSECA project**
 - Objectives
 - Methodology
- Initial findings
 - Route selection
 - Case studies
- Future work

The RoRoSECA project

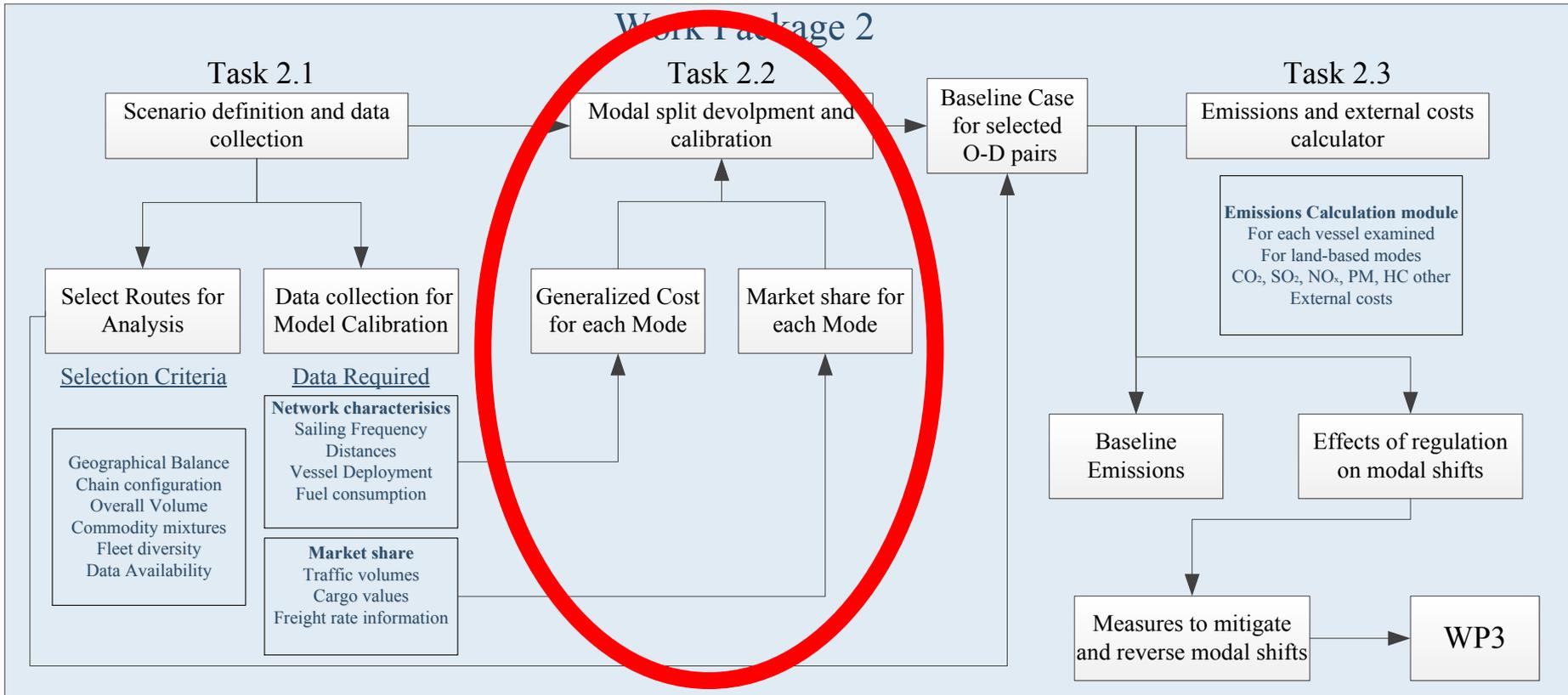
- 2 year project
- Funded by the Danish Maritime Fund (DMF)
- Case studies with DFDS
- New decision making tools
- An overview of the project...



RoRoSECA project Tasks:

- First Year
 - Task 2.1: Scenario Definition and data collection
 - **Task 2.2: Modal split model and calibration**
 - Task 2.3: Emissions Calculator for Ro-Ro ships
- Second Year
 - Task 3.1: Policy measures to reverse effects
 - Task 3.2: Operators measures (speed reduction, frequency, fleet etc)

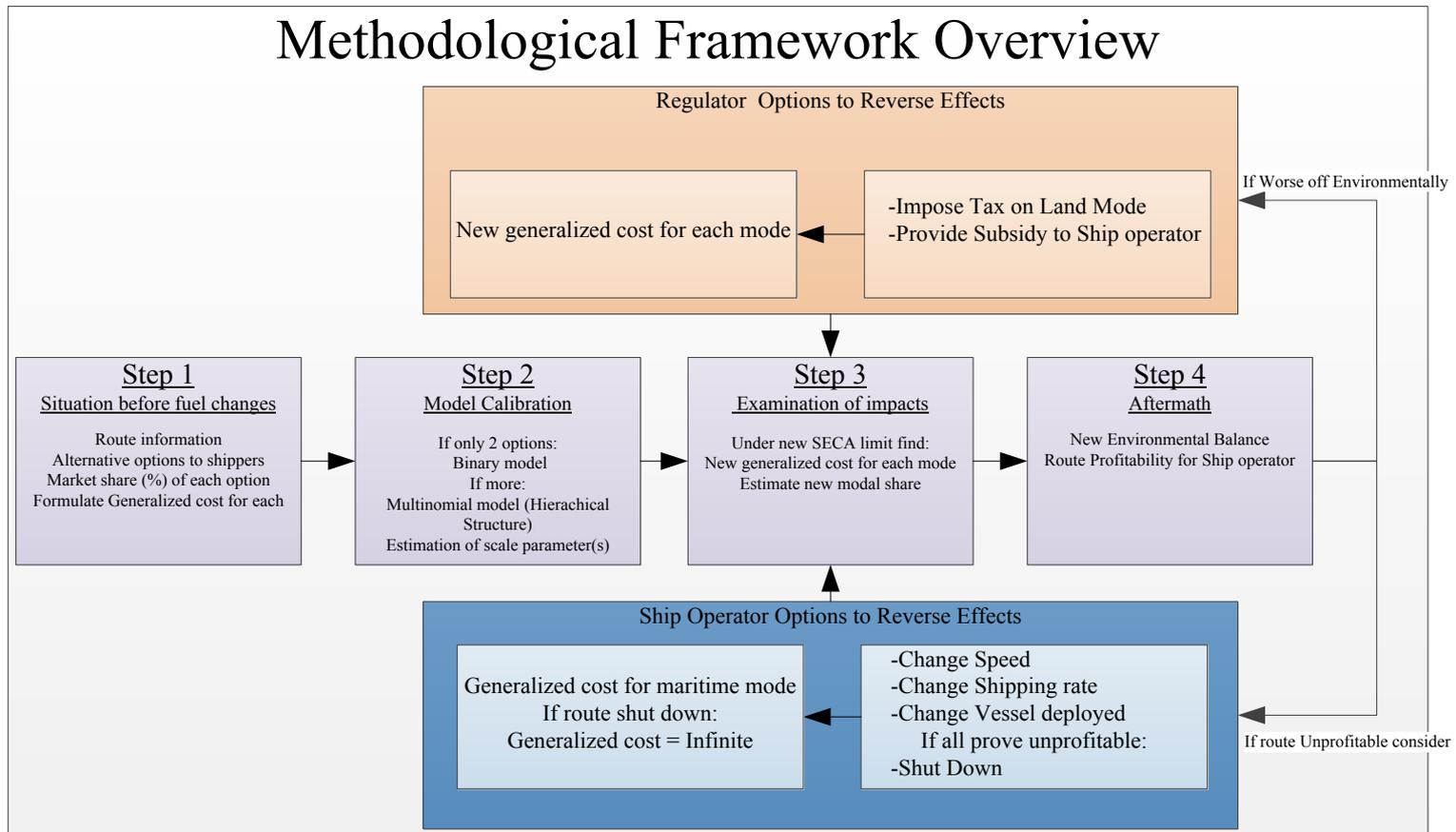
Objectives of WP2



Methodology

- First Year
 - Identify Routes for examination
 - Gather necessary data
 - Estimate Benchmark scenarios (emissions, shares, costs)
 - Calibrate model
 - Consider different scenarios based on fuel prices
- Second Year
 - Policy measures to reverse effects
 - Operators measures (speed reduction, frequency, fleet etc)

Linking the various modules together



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)



Route selection criteria

- Geographical balance  Proportion by Region
- Chain configuration  By Sailing Distance & Frequency
- Volume  By Vessel and Route Capacity
- Commodity mixture  Cargo type and value
- Vessel types  Ro-Ro, Ro-Pax, Cruise, abatement
- Data availability

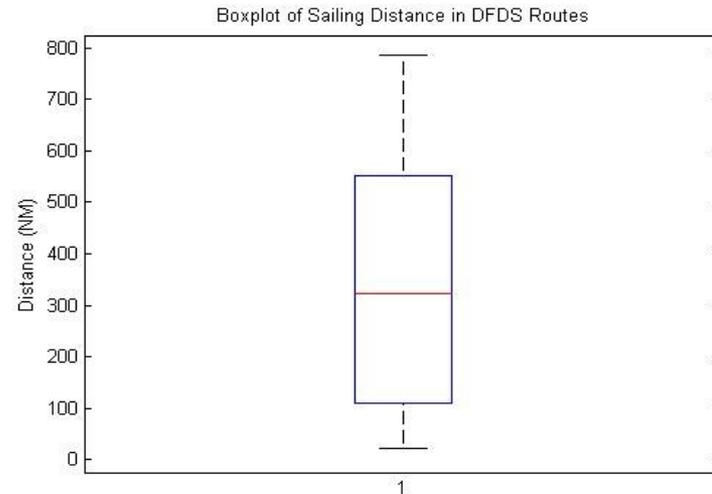
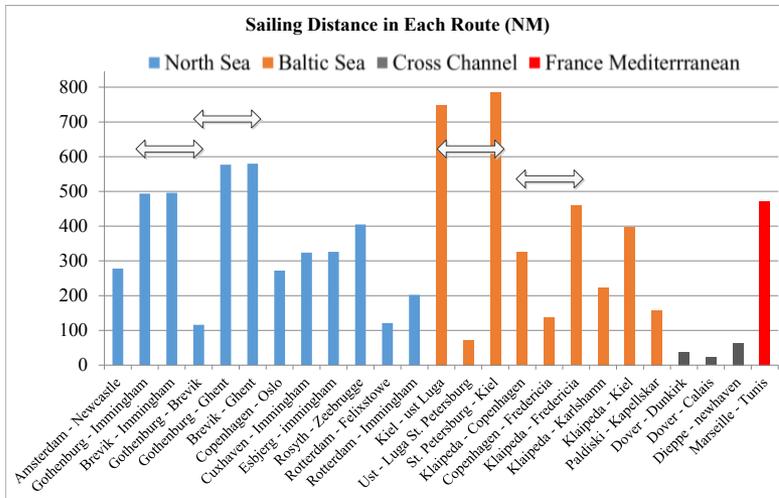
Geographical Balance

- 4 in North Sea
- 2 in Baltic Sea
- 1 Cross-Channel
- 1 recently shut down
- 1 Non-SECA

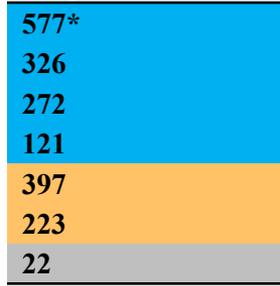


Chain Configuration

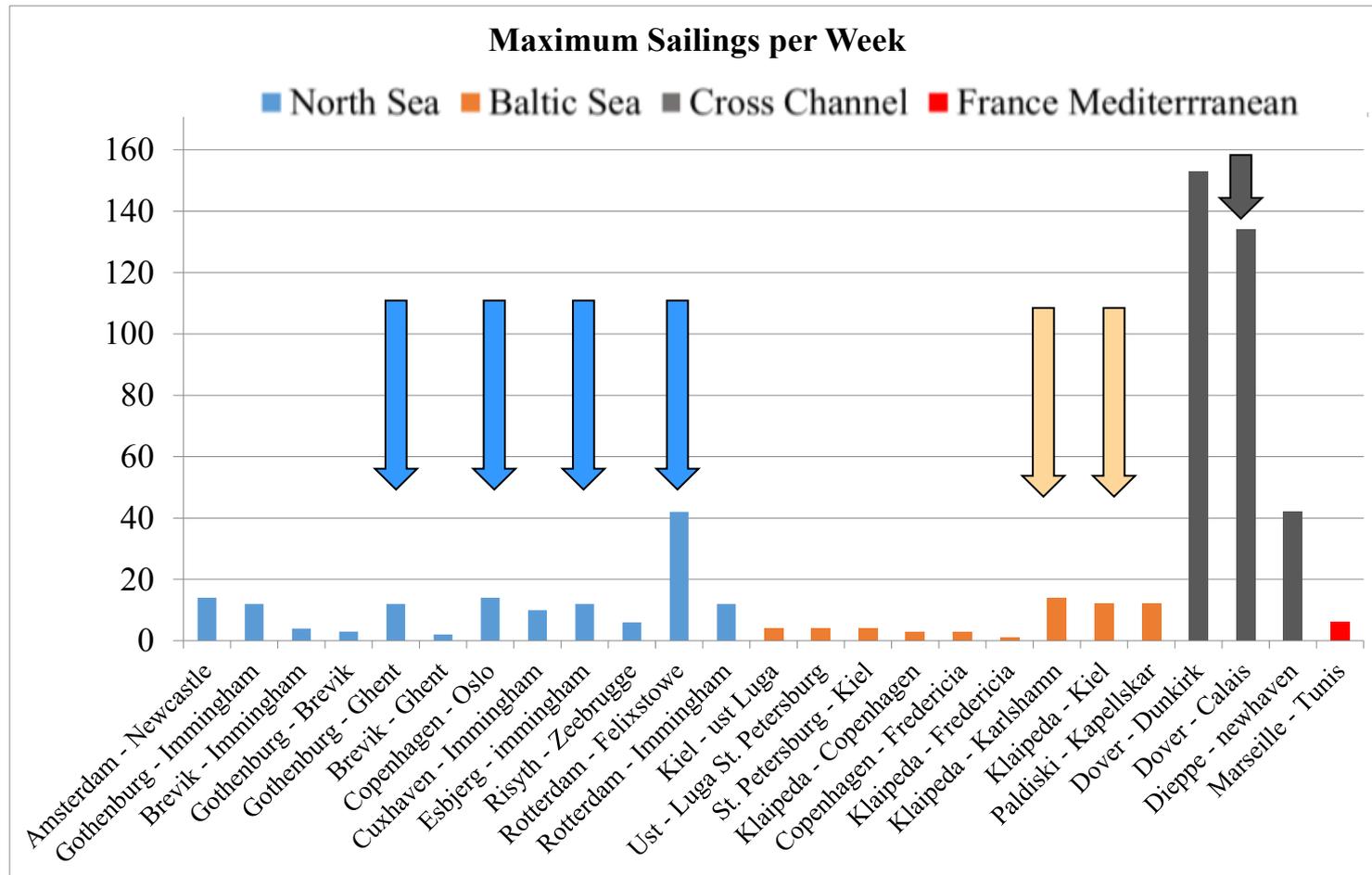
- Distance



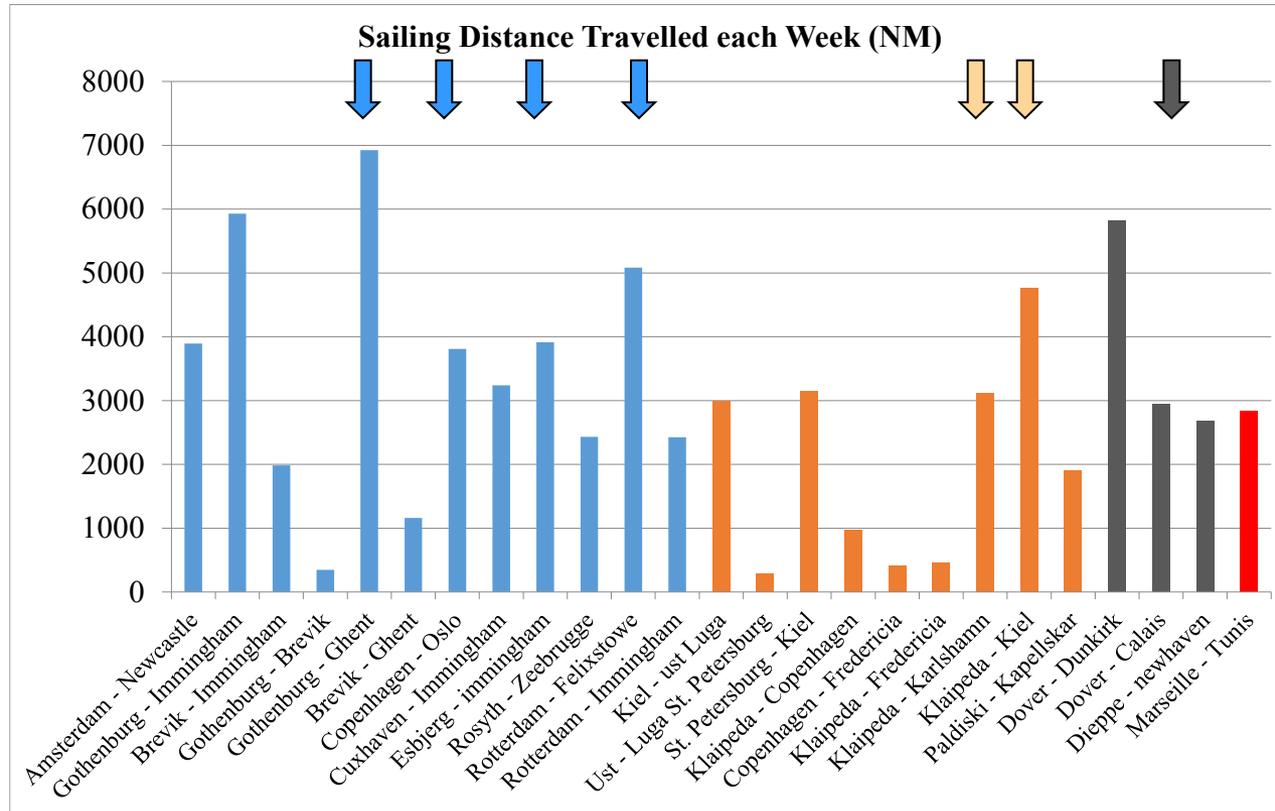
Distance of Proposed Routes



Frequency of Service



Sailing Distance Travelled per Week



Vessel Type and Technology

- Cruise Ships (1 MGO, 1 scrubbers)
- Ro-Ro (mixture of vessels with scrubbers or using MGO)
- Ro-Pax (4 MGO, 2 scrubbers)

Other Criteria

- Representation of Diverse mix of countries (9 in proposed)
- Include important hubs (Immingham, Gothenburg, Klaipeda)
- Terminals at large container ports (Felixstowe, Rotterdam)
- Select the cross channel Route with most competition (Dover Calais)

North Sea Routes

- Gothenburg – Ghent
- Esbjerg – Immingham
- Rotterdam – Felixstowe
- Copenhagen – Oslo



Baltic Sea Routes

- Klaipeda - Kiel
- Klaipeda - Karlshamn



Cross Channel Route

- Dover - Calais

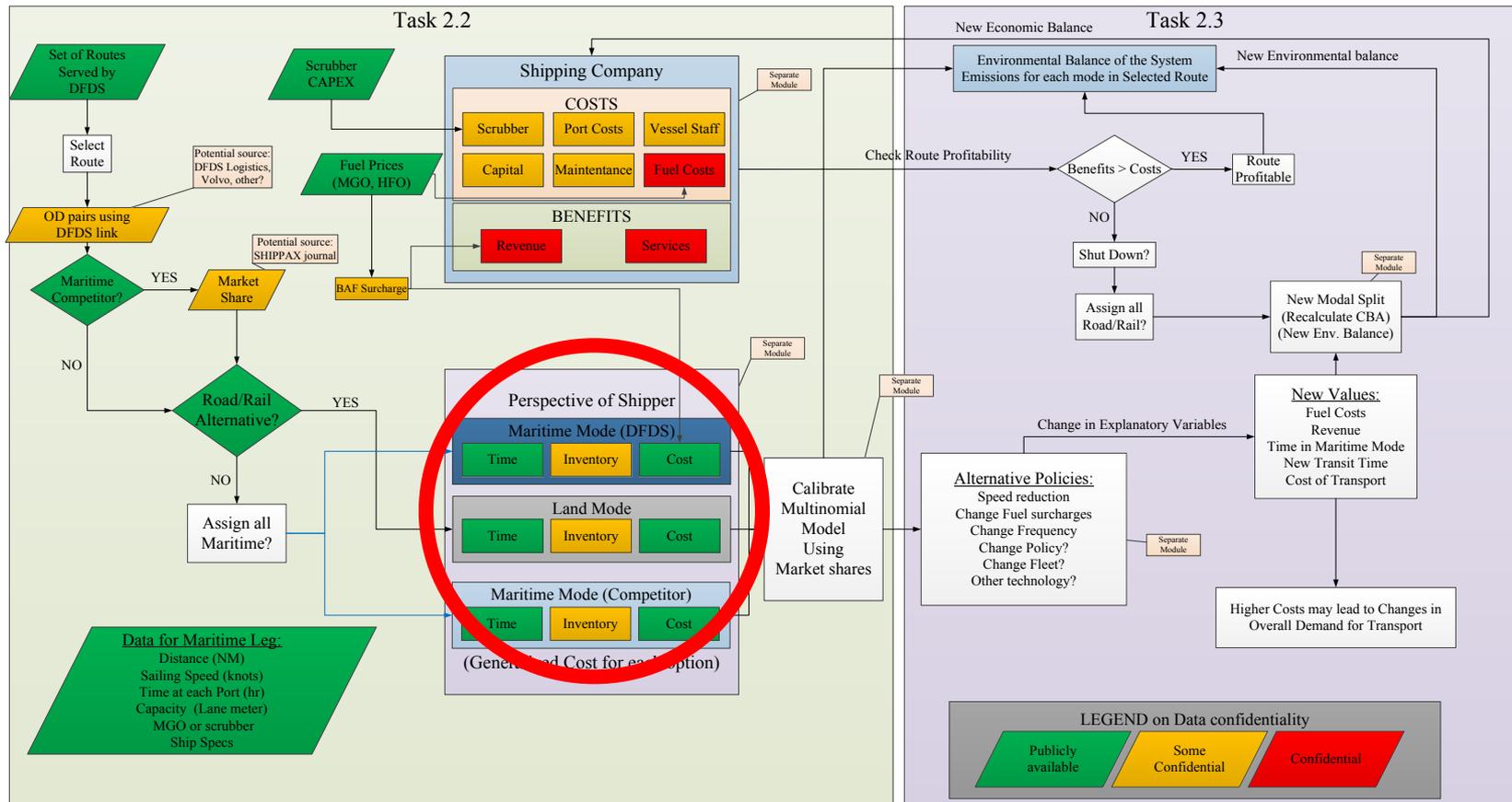


Summary

- 7 Routes (+1 recently shut down, +1 not affected by SECA)
- Analysing data of up to 38 vessels (due to changes in deployment)
- 240 out of a maximum 535 departures/week
- Significant proportion of total travel distance (43.4%)
- Significant proportion of total maximum capacity (43.48%)

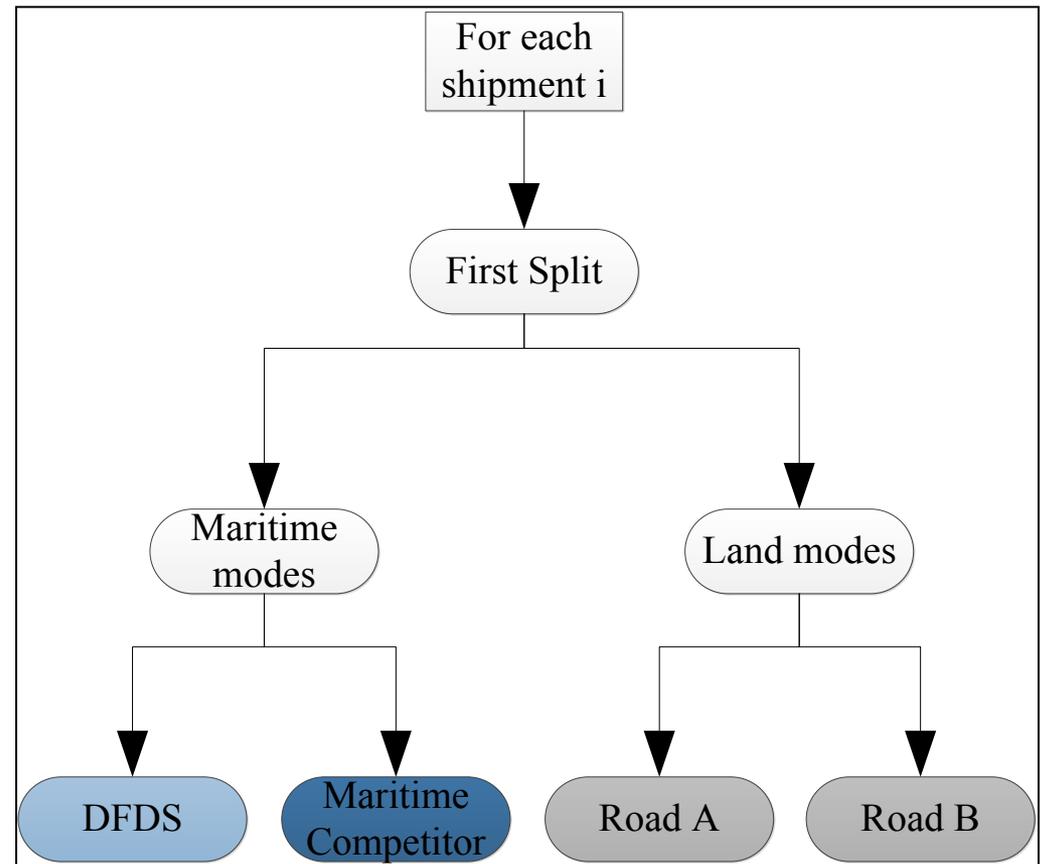
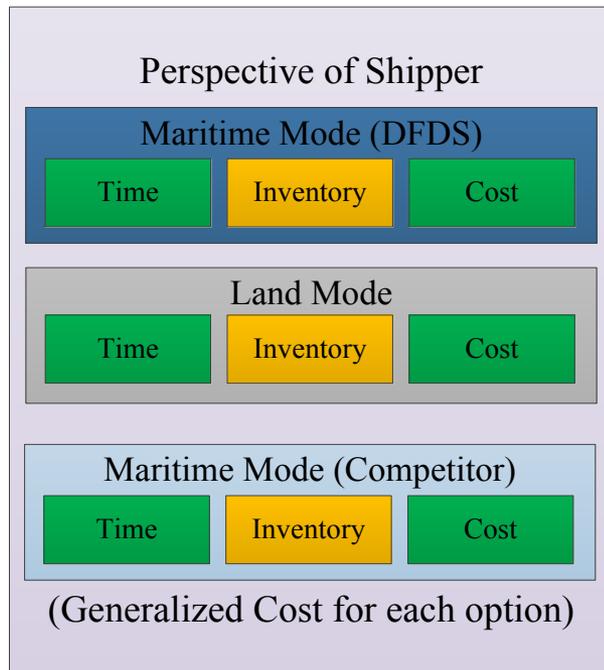


Methodological Framework

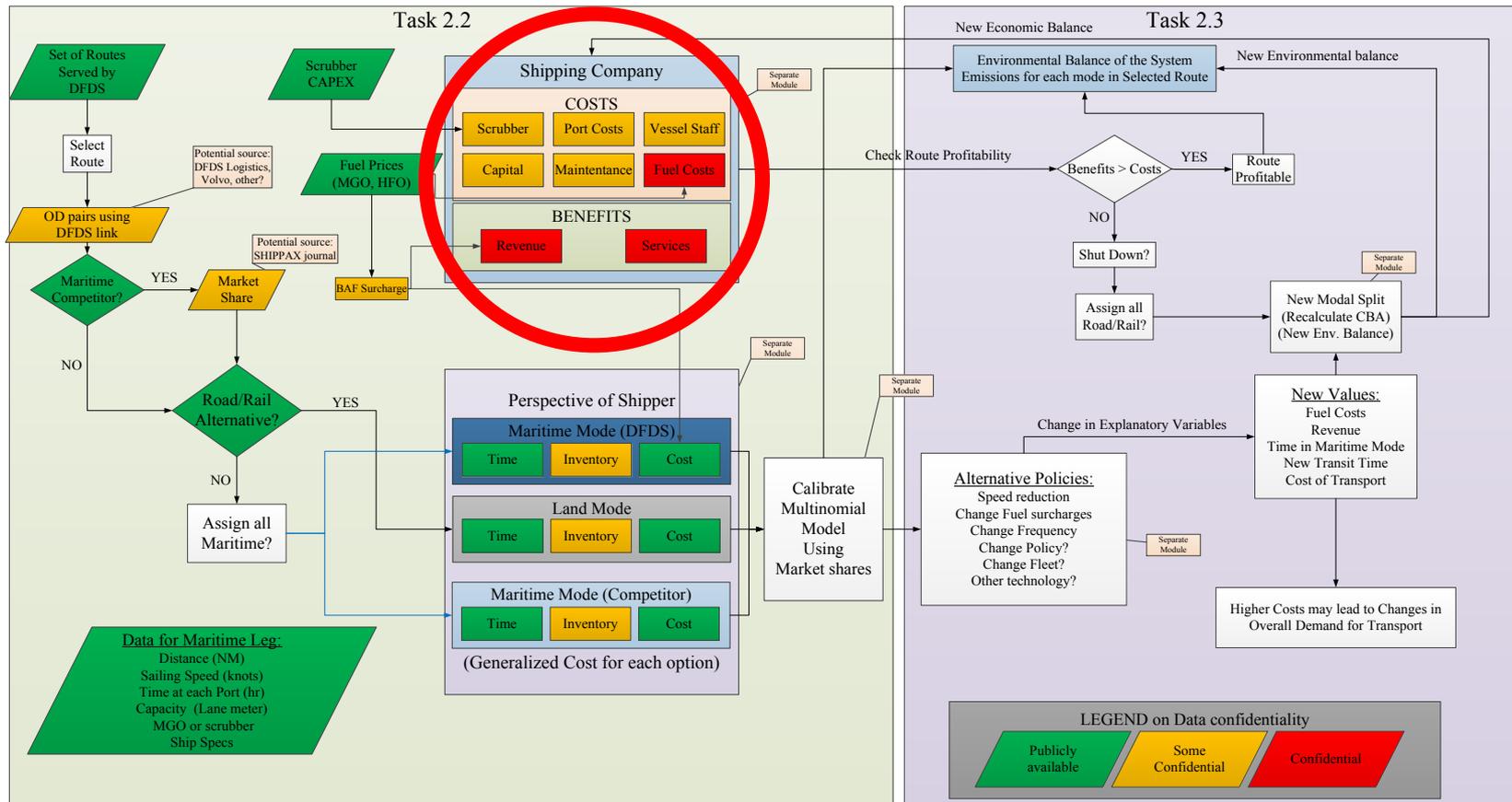


Perspective of the Shipper

- General Case – Hierarchical Structure

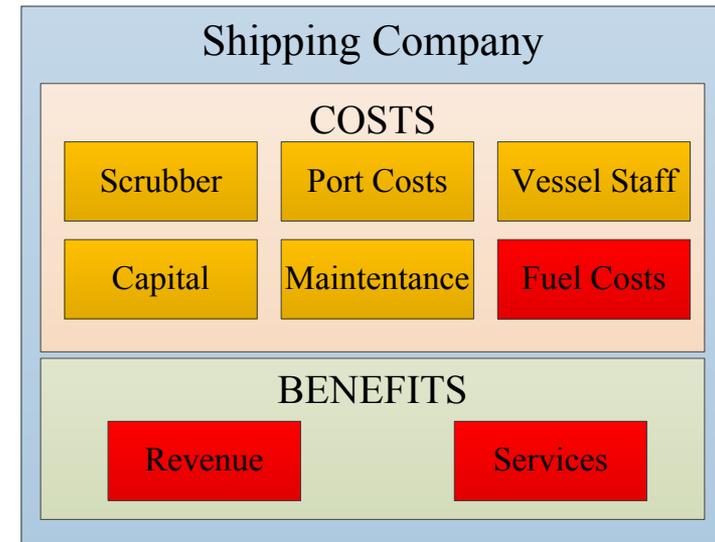


Process



Perspective of the Shipping Company

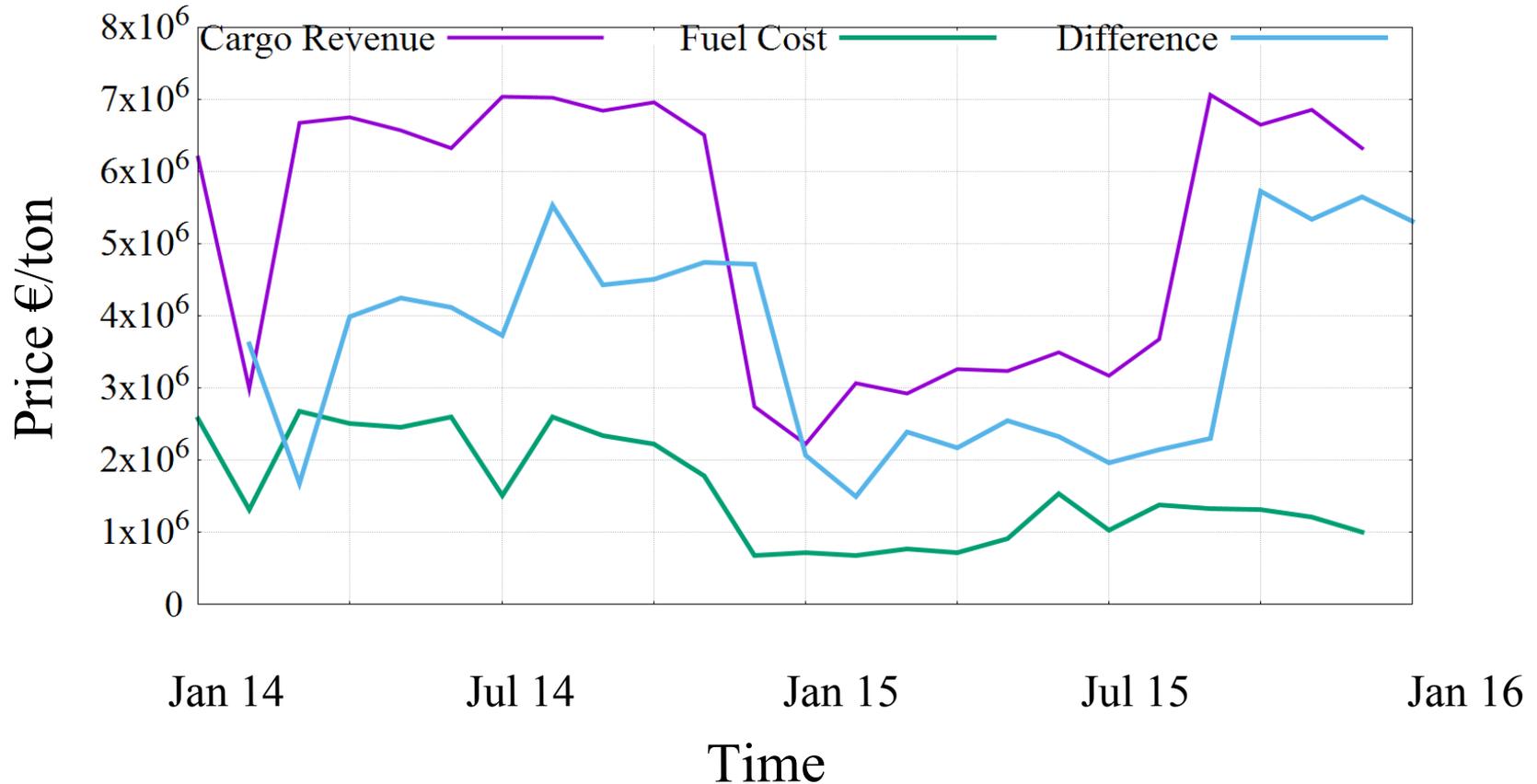
- Identify Revenue with a given Transport Demand
 - Passengers
 - Freight Rate for Cargo
 - Miscellaneous (Food, Drinks, Casino etc.)
- Identify Costs
 - Fuel
 - Port
 - Staff
 - Maintenance
 - Other
- Formulate Profitability Function
 - If Route non-profitable, consider shut down
 - Re-run modal split



Presentation Outline

- Background
 - SECA regulation
 - Anticipated impacts
 - Fuel prices
 - Market picture
- Study Motivation
 - Effects to Ro-Ro operators
 - Costs for shippers
- The RoRoSECA project
 - Objectives
 - Methodology
- **Initial findings**
 - Route selection
 - Case studies
- Future work

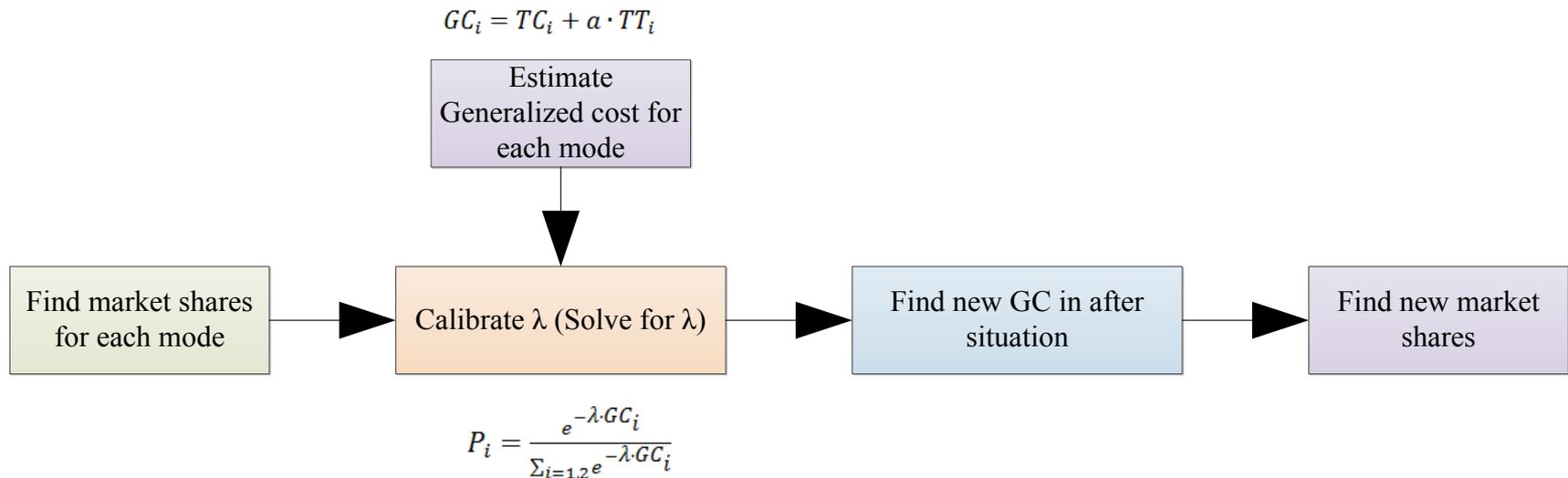
What happened 2014 vs 2015 (Dover - Calais) considering only cargo



Environmental Balance

- Identify Baseline Emissions prior to Reversal actions
- Emissions estimation for each mode at each Route
- Model to predict new balance after Ro-Ro operator or policy action taken

Process of estimating the impacts of SECA



A Binary logit model

- Probability of selecting mode i is

$$P_i = \frac{e^{-\lambda \cdot GC_i}}{\sum_{i=1}^2 e^{-\lambda \cdot GC_i}}$$

Where GC_i is the Generalized Cost of mode i :

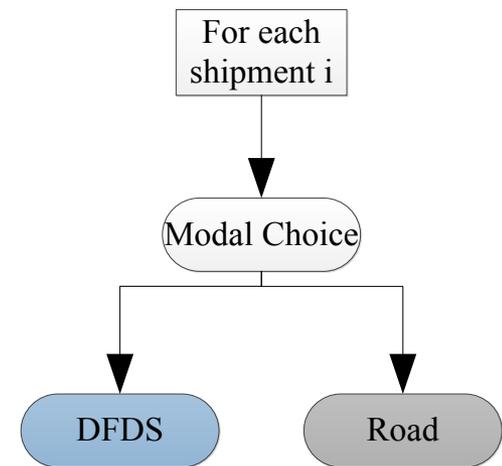
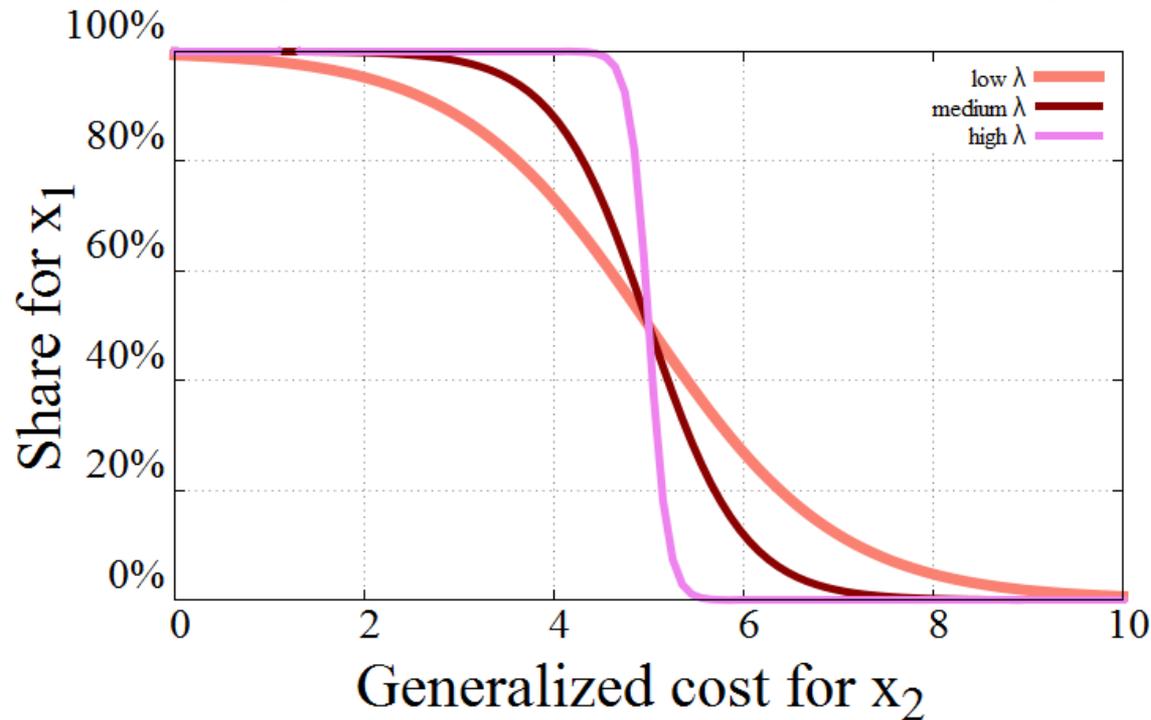
$$GC_i = TC_i + a \cdot TT_i$$

Where TC_i is the Travel Cost (€/lm), TT_i is the Travel Time (hours), a is the value of time (€/lm*hours)

- λ is a scale parameter that acts as a weight attached in the choice. The larger the value, the greater the implication of a change in cost in one of the modes

Example for different λ

Example with Generalized cost for $x_1 = 5$



Two simple case studies

- Case Study 1: Sweden (Gothenburg) to Belgium (Ghent)
 - Via Gothenburg –Ghent (maritime I)
 - Via Gothenburg - Frederikshavn (maritime II)
- Case Study 2: Kaunas – Hamburg
 - Via Klaipeda – Kiel (maritime I)
 - Via Baltisjk – Sassnitz (maritime II)
 - Fully Land Based (Road Only)
- Cargo depreciation at 3%, freight rate 0,022€/km*Im
- Fuel Case I: What actually happened (force use MGO with actual prices)
- Fuel Case II: What would happen if HFO still allowed (Actual prices)

Two simple case studies

Transport option									
	Share (%)	<i>Road only</i>		Share	<i>via Maritime I</i>		Share	<i>via Maritime II</i>	
		Distance (km)	Time (h)		Distance (km)	Time (h)		Distance (km)	Time (h)
Case Study 1	-	-	-	60	1067 (1067)	32	40	1209 (100)	23.4
Case Study 2	48	1481	21.2	24	1058 (735)	30.16	28	1047 (430)	26.8

Transport option						
	<i>Road only</i>		<i>via Maritime I</i>		<i>via Maritime II</i>	
	Fuel Case I	Fuel Case II	Fuel Case I	Fuel Case II	Fuel Case I	Fuel Case II
Case Study 1						
New Gen. Cost	-	-	56.75	45.9	67.9	62.5
New Share	-	-	62.28	67.73	37.72	32.27
Case Study 2						
New Gen. Cost	56.61	56.61	55.69	47.5	48.07	43.7
New Share	47.89	47.61	24.38	25.35	27.73	27.04

Conclusion

- Maritime shares would increase (proportion-wise)
- Maritime shares would have increased further if HFO was still allowed
- Maritime shares would drop at fuel levels of 2014 using MGO
- Profitability of ship operator is masking the negative effects of the regulation – a happy coincidence
- Once this happens, what measures could be used to revert any possible disadvantages?
- Find out more, in year 2 of



Thank you - Questions?

The work presented has been in the context of the project:

"Mitigating and reversing the side-effects of environmental legislation on Ro-Ro shipping in Northern Europe"

funded by the Danish Maritime Fund.

Contact: tzis@transport.dtu.dk