

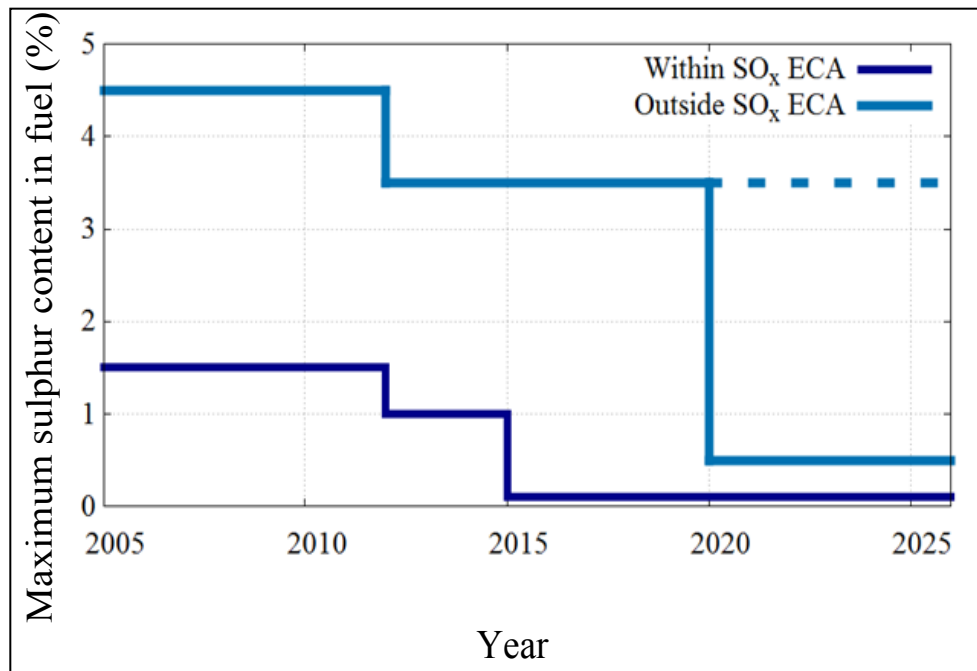


# Presentation Outline

- Background
  - Objectives
  - Anticipated Impacts
  - Market picture and Fuel Prices
  - Effects to Ro-Ro operators
  - Costs for shippers
- Modelling Modal shifts
  - Objectives
  - Route Selection Criteria
  - Methodology
- Initial findings
  - The most important component
  - Case studies
- Next Steps

# Background

- As of January 1st 2015:



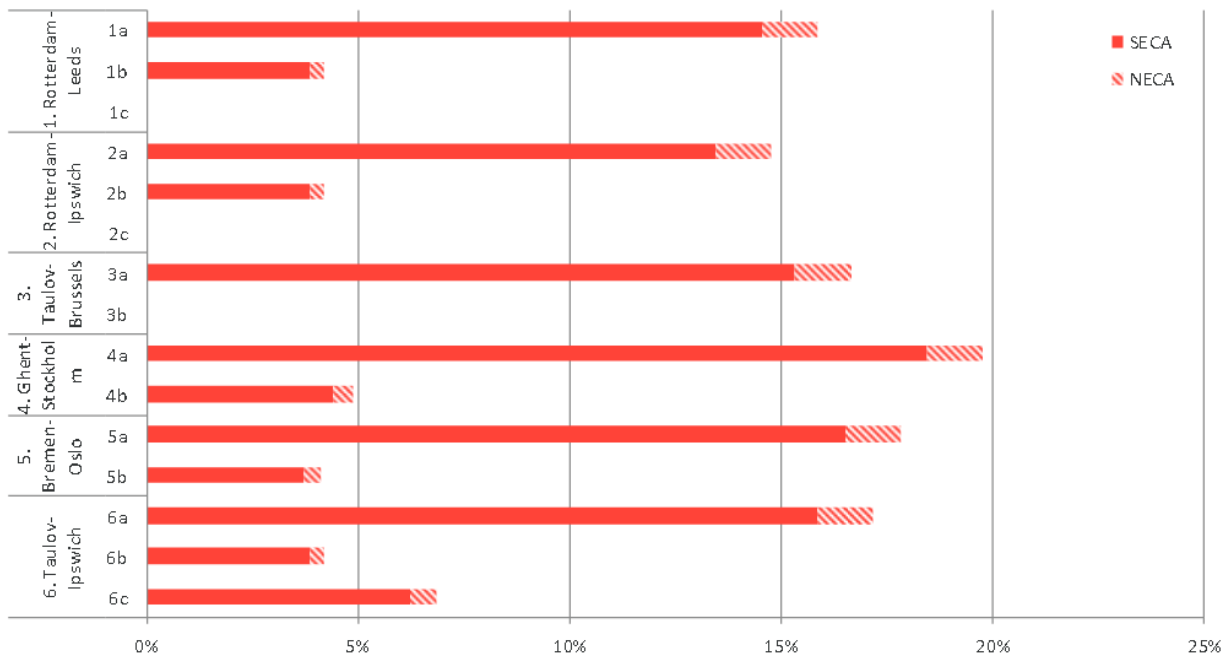
	Year			
Areas	2005-2012	2012-2015	2015-2020	2020 (or 2025)-
Within SECA	1.5	1	0.1	0.1
Outside SECA	4.5	3.5	3.5	0.5

## 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)

# 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.

# 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

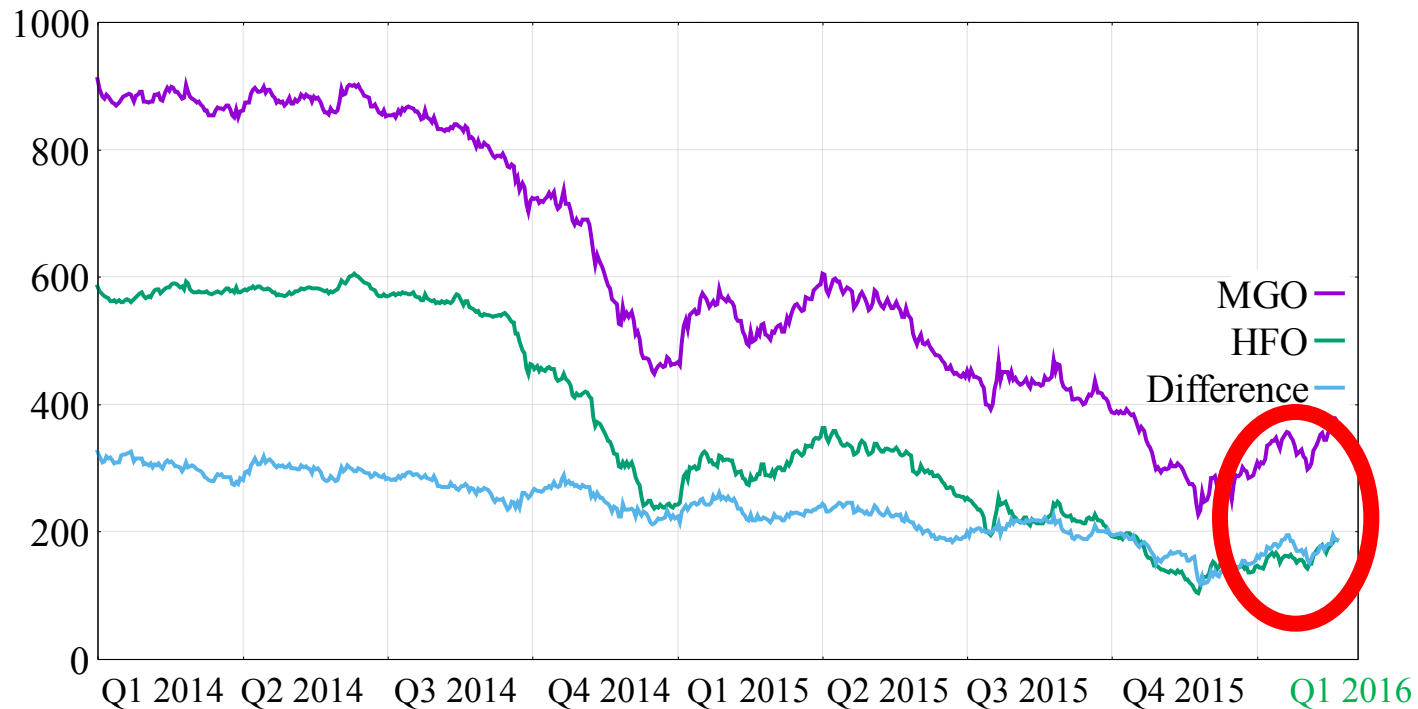
By Charlie Bartlett from London

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



The absolute price differential would gradually decrease  
 Fuel prices have started going up in 2016



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## **Objectives:**

### **Understand the wider implications of the new limit..**

- On SECAs (is the environmental improvement significant?)
- How is Short Sea Shipping affected
- External effects on modal shifts?
- Identify the negative impacts of the regulation
- Propose measures to mitigate and reverse these

# 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)

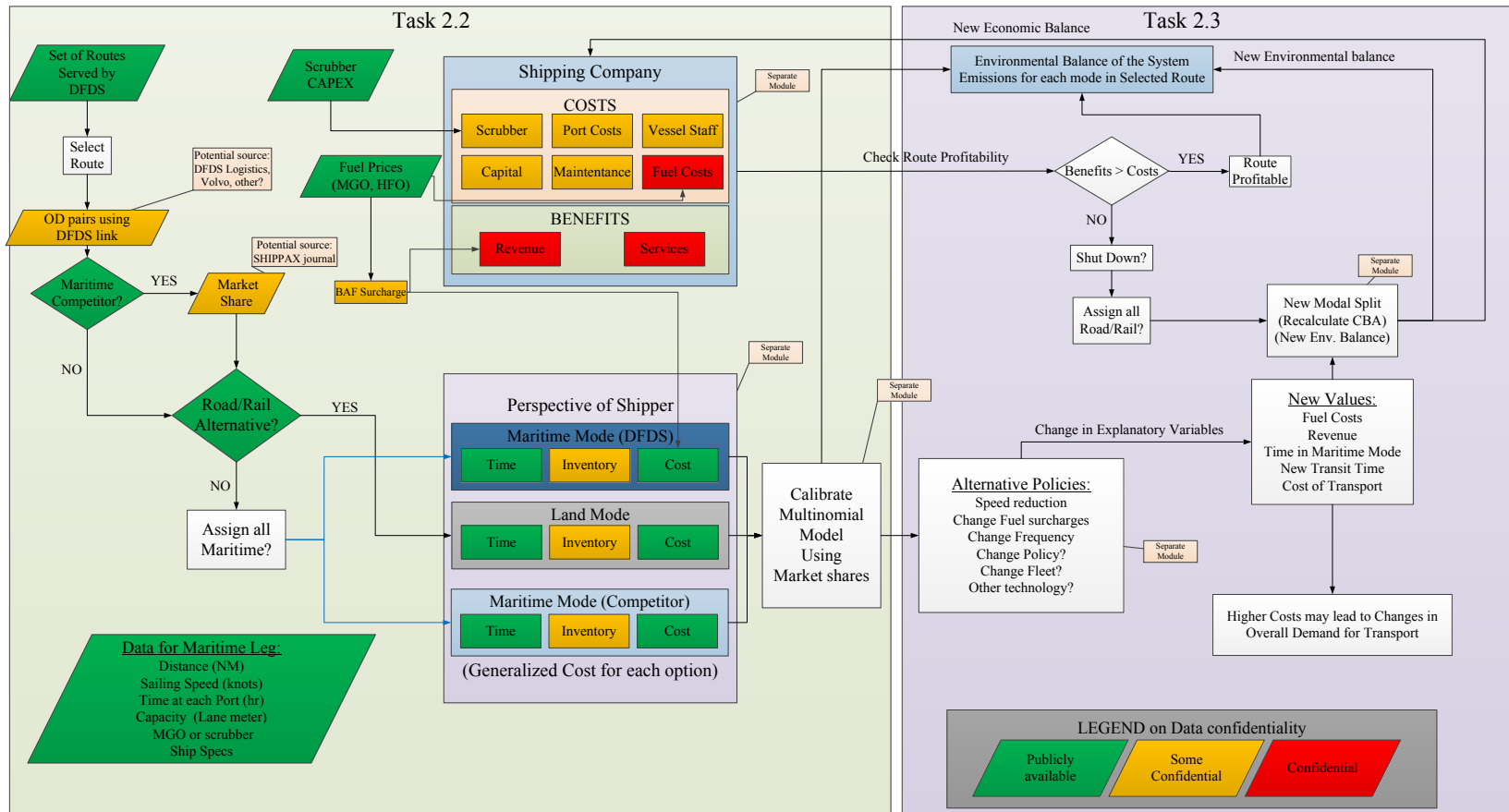


# Summary of selected routes

- 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%)

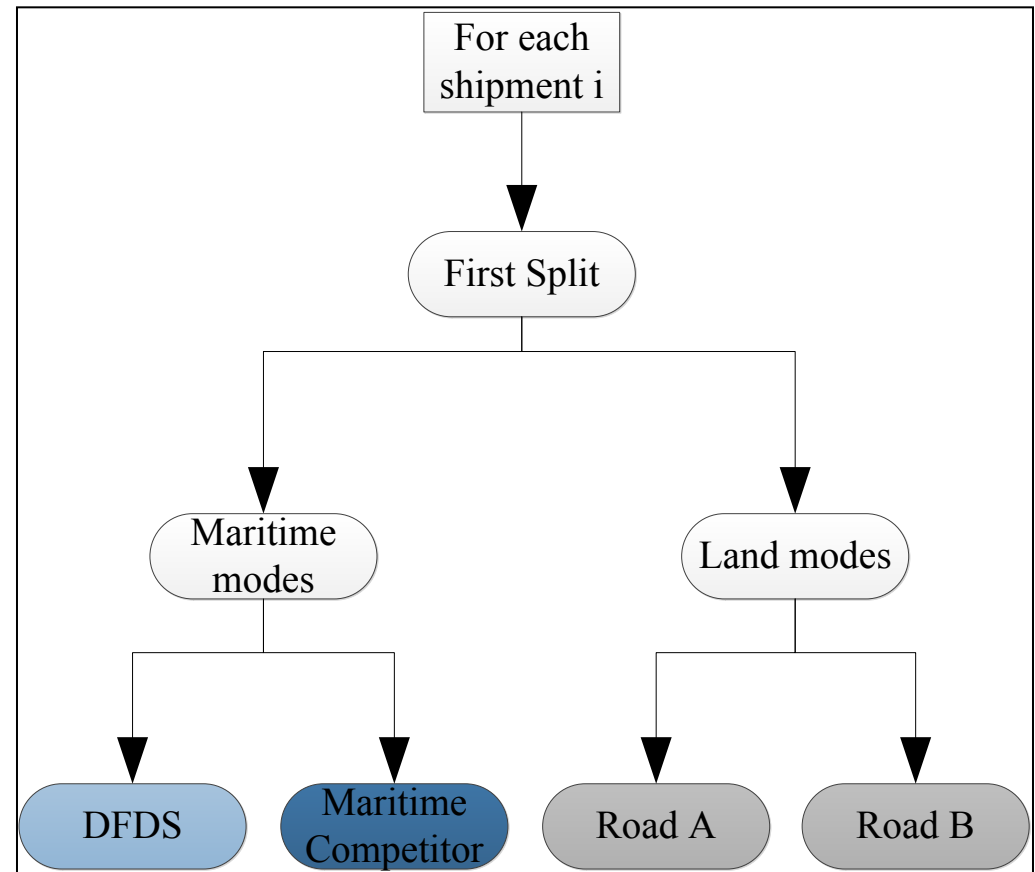
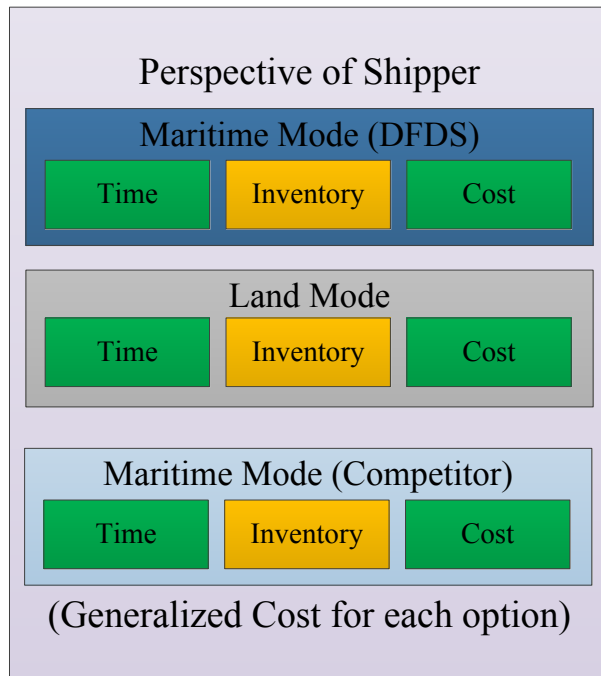


## Methodological Framework



# Perspective of the Shipper – a Bi-level model

- General Case – Hierarchical Structure



# Generalized Cost and probability of choice

- Probability of selecting mode  $i$  is

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

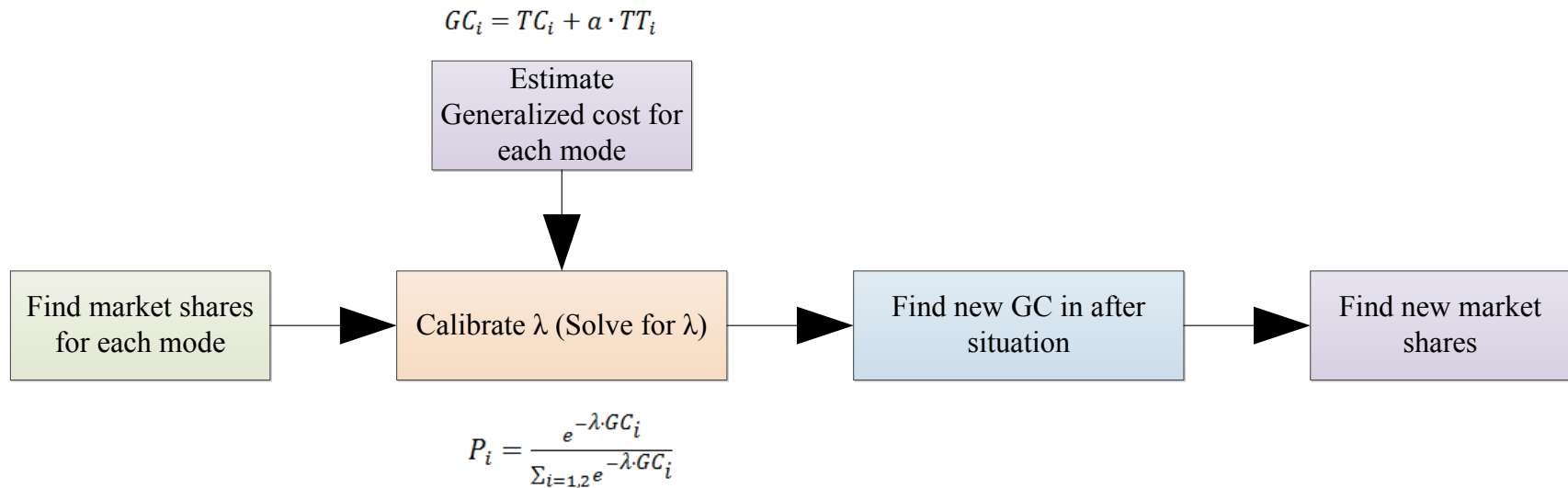
Where  $GC_i$  is the Generalized Cost of mode  $i$ :

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

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

- $\lambda$  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

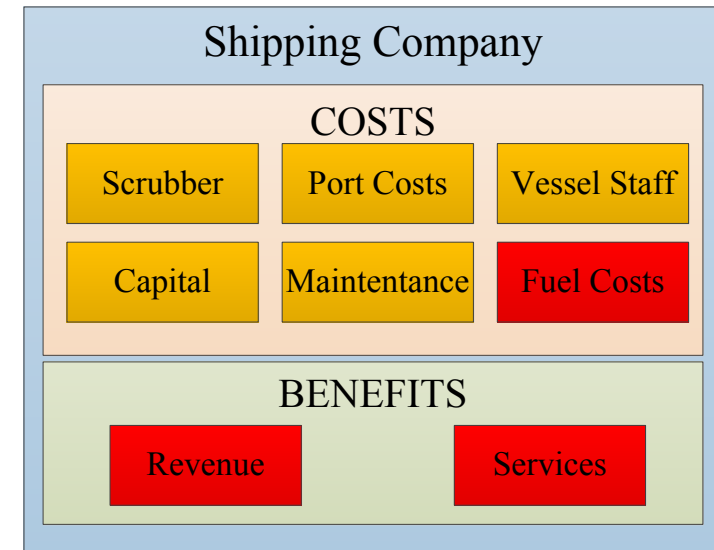
# Process of estimating the impacts of SECA



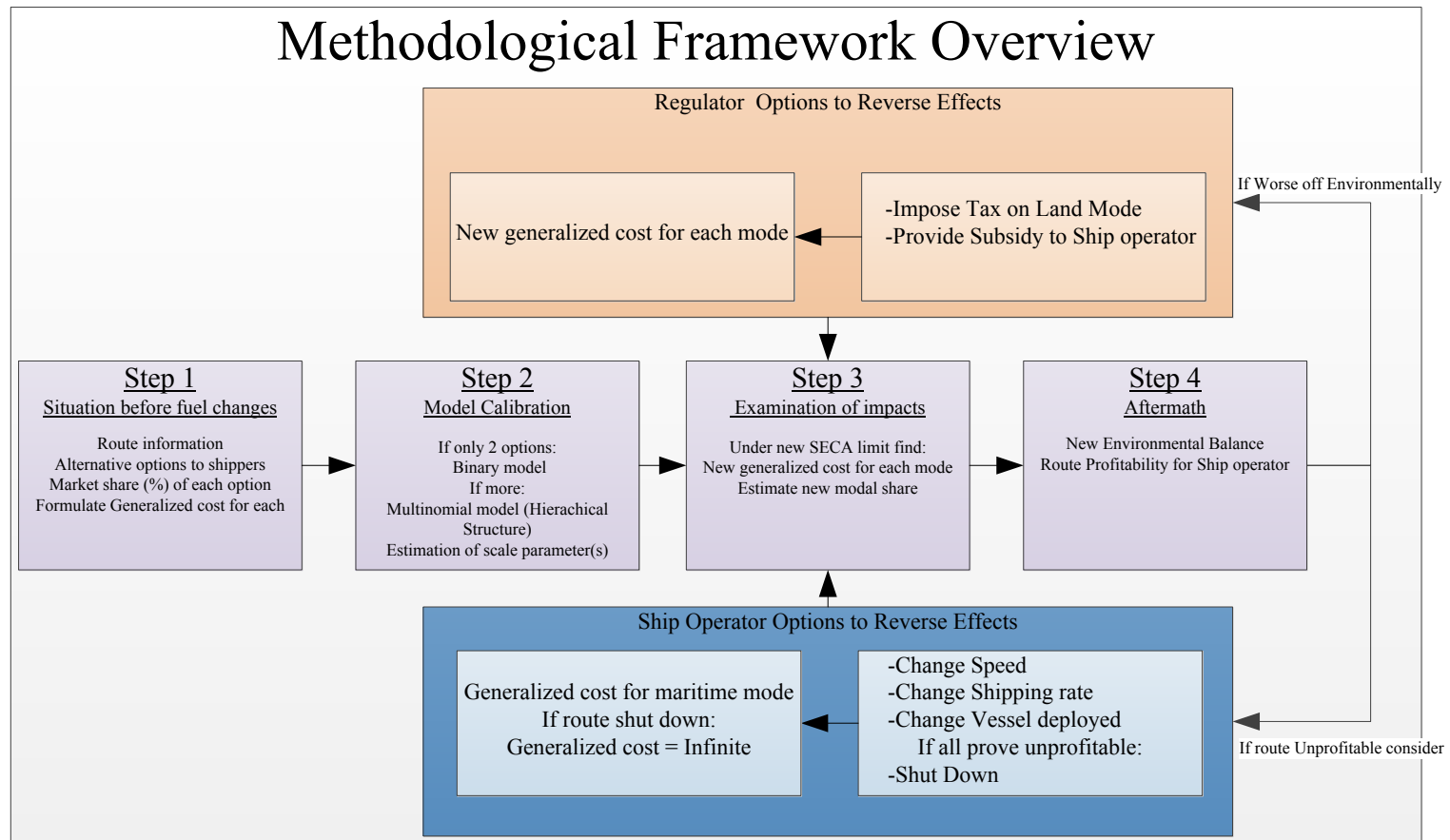


# Perspective of the Shipping Company

- 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



# Linking the various modules together

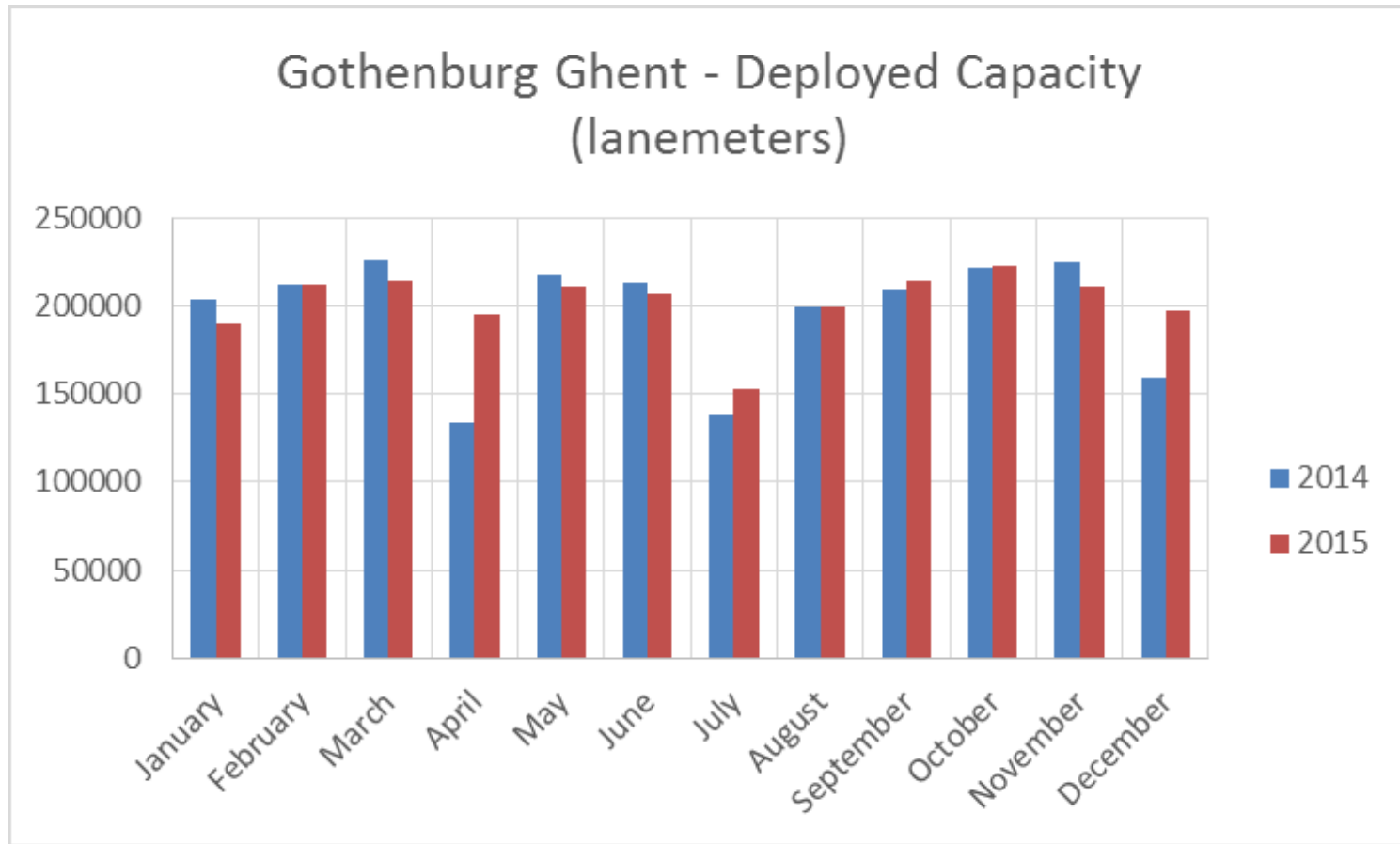


# Gothenburg - Ghent



# 2014 vs 2015

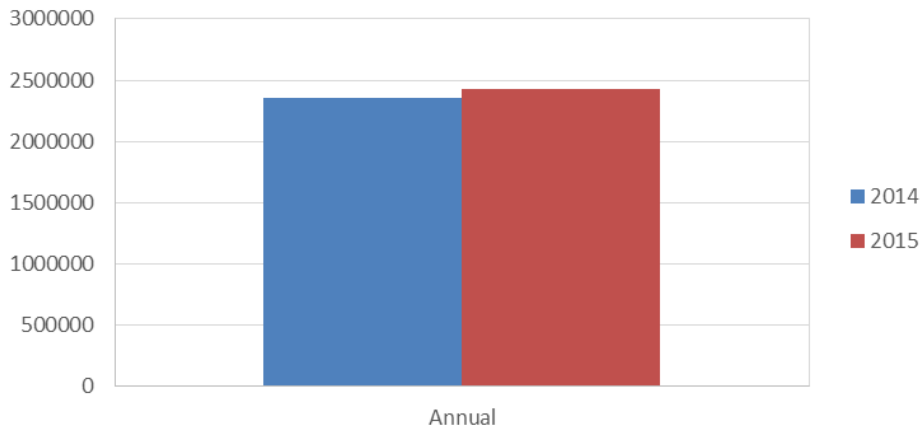
## Gothenburg Ghent



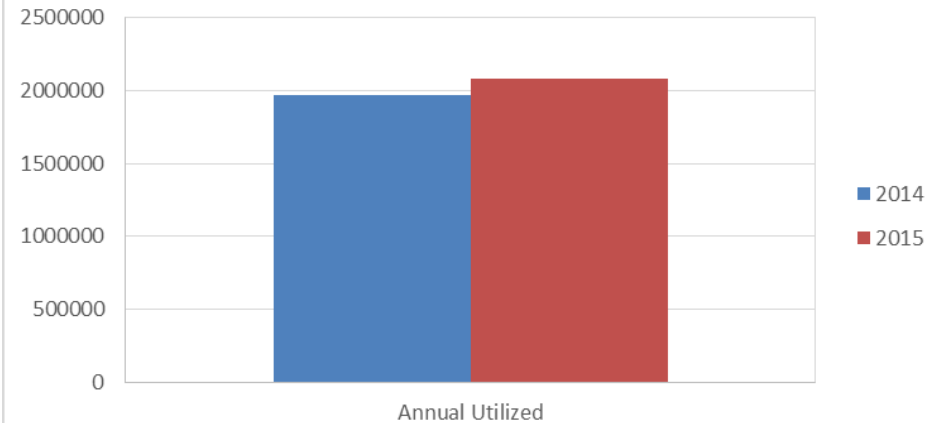
# 2014 vs 2015

## Gothenburg Ghent

Gothenburg Ghent  
Deployed Capacity increased 2.86%



Gothenburg Ghent  
Utilized Capacity increased 6.06 %

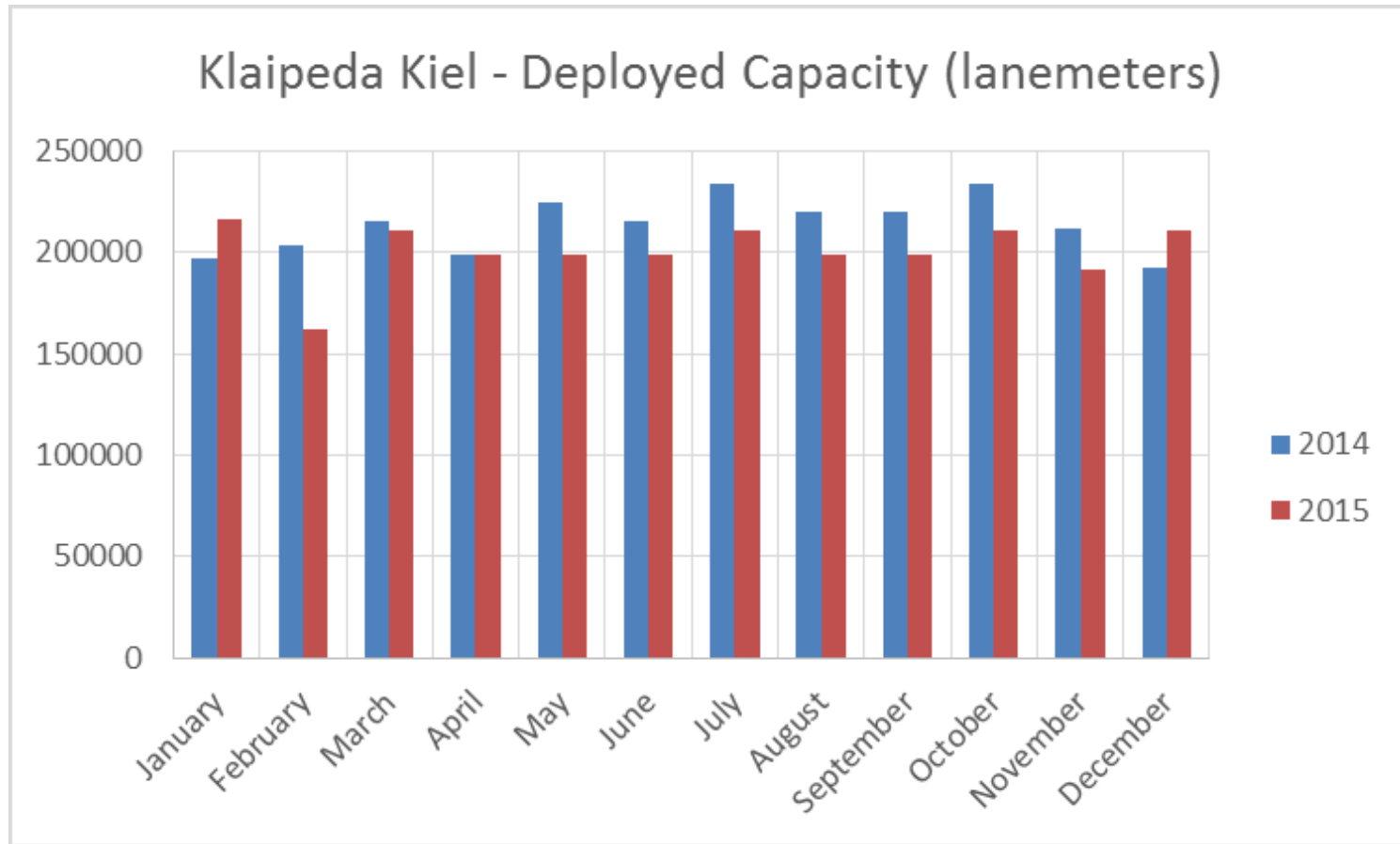


# Klaipeda - Kiel



# 2014 vs 2015

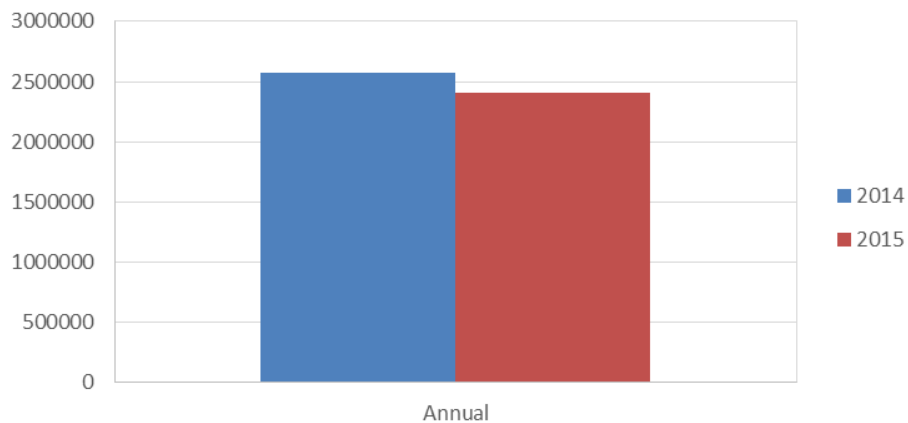
## Klaipeda Kiel



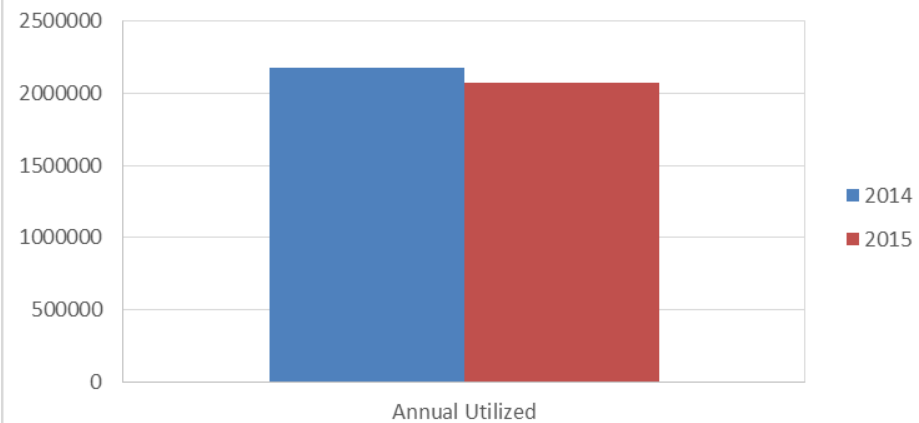
# 2014 vs 2015

## Klaipeda Kiel

Klaipeda Kiel  
Deployed Capacity decreased 6.22%



Klaipeda Kiel  
Utilized Capacity decreased 4.64 %



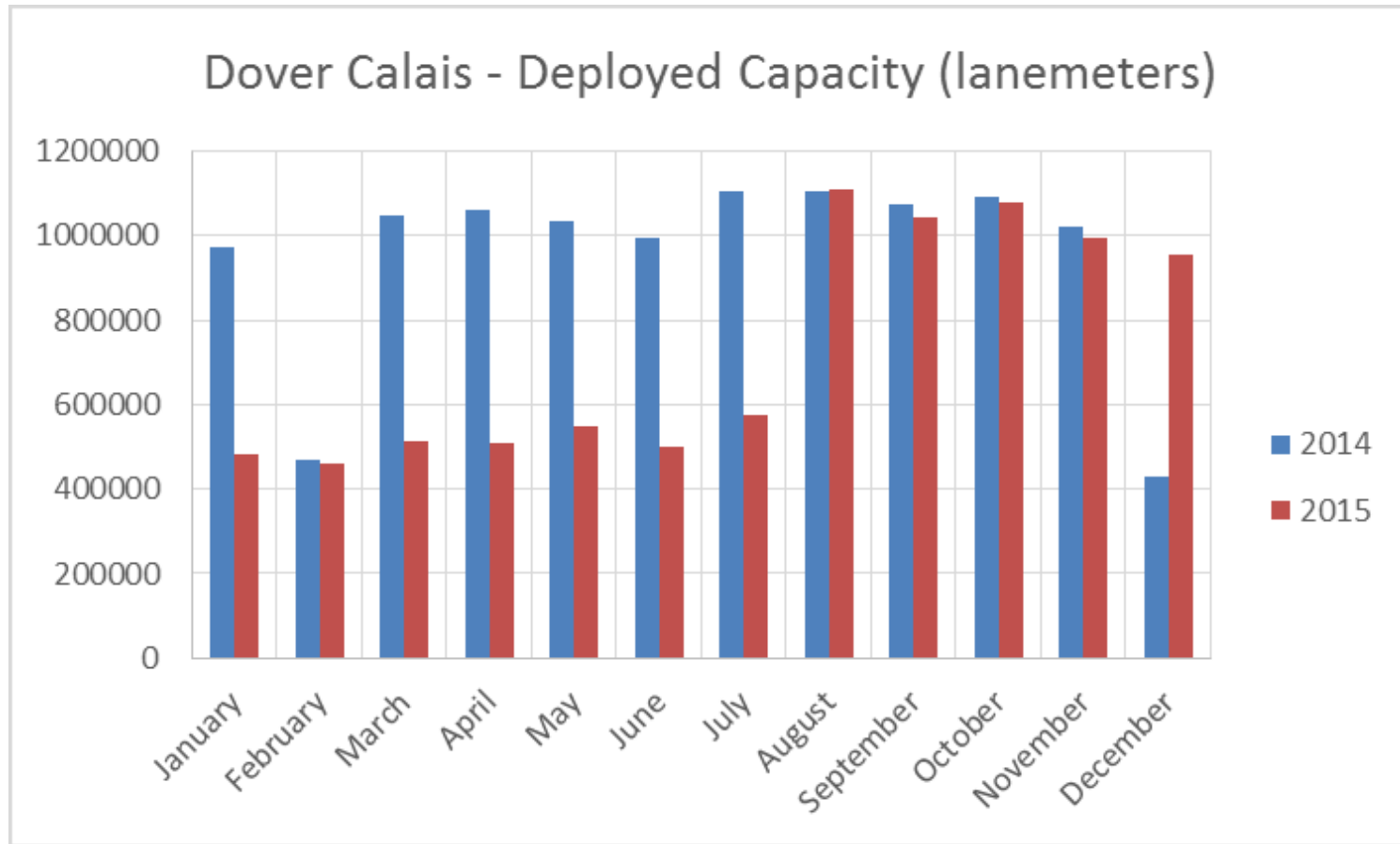


# Dover - Calais



# 2014 vs 2015

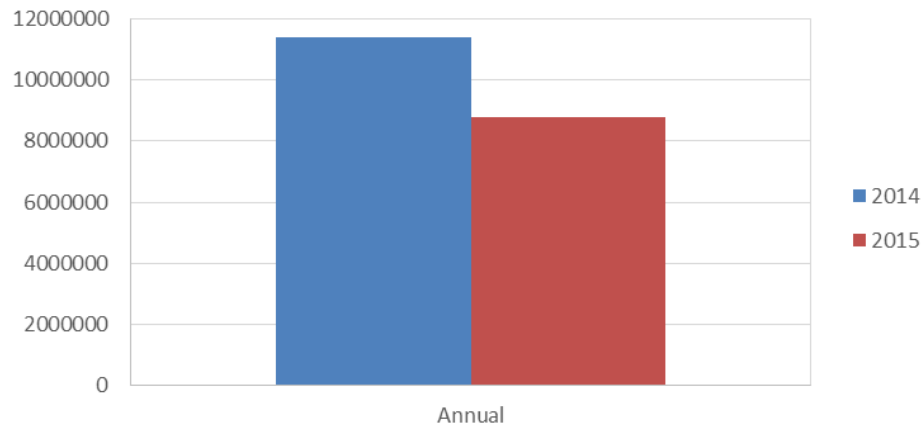
## Dover Calais



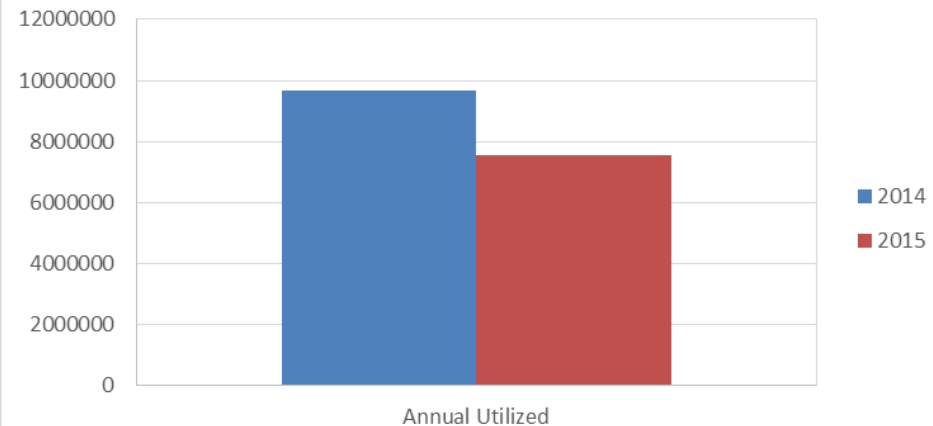
# 2014 vs 2015

## Dover Calais

Dover Calais  
Deployed Capacity decreased 23.17%



Dover Calais  
Utilized Capacity decreased 21.88%



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# Market picture and first conclusions

- Marseille – Tunis route (unaffected by SECA) also shows increase in traffic
- Routes that benefitted most from low fuel prices, are also more susceptible to a fuel increase
- Increased in travel demand of some routes can be attributed to closures of competing services
- Lack of precise data requires certain sensitivity analyses to be conducted
  - Market Shares
  - Breakeven Distance
  - Freight Rates for Road Transport

## Sensitivity Analyses – Variations on:

- Market Share for each Option
- Cargo Value
- Depreciation rate
- Freight rate per Im
- Change in Haulers' Transport Cost
- **Case 1: What actually happened (MGO with actual prices)**
- **Case 2: What would happen if HFO still allowed (Actual prices)**
- **Case 3: What would happen if MGO prices returned to 2014 levels**

# Gothenburg - Ghent

Gothenburg - Ghent									
	<i>Road only</i>			<i>via Maritime I - DFDS</i>			<i>via Maritime II (Gothenburg – Kiel)</i>		
	Share (%)	Distance (km)	Total Time (h)	Share	Road Distance (km)	Total Time (h)	Share	Road Distance	Total Time (h)
<b>Baseline (2014)</b>	39-49	1600±300	23±2	24-30	100-300	38±2	21-29	600-800	22±2
	New Road Share	% Change	$\lambda_{1(\text{road-Maritime})}$	New DFDS Share	% Change	$\lambda_{2(\text{DFDS-Maritime})}$	New Mar 2 Share	% Change	
<b>Fuel Case 1 (Base 2015)</b>	-0.22% IQ: -0.37:-0.06	-0.47%		+1.23% IQ: 1.09:1.56	+3.98%		-1.02% IQ: -1.21:-0.95	-4.71%	
<b>Fuel Case 2 (HFO 2015)</b>	-0.63% IQ: -0.44:-0.08	-1.38%		+1.68% IQ: 1.38:2.15	+5.56%		-1.05% IQ: -1.67:-0.76	-4.73%	
<b>Fuel Case 3 (MGO 2014)</b>	+0.58% IQ: 0.05:0.25	+1.35%		-1.02% IQ: -1.05:-0.49	-3.34%		+0.44% IQ: 0.37:0.80	+2.04%	

# Klaipeda - Kiel

Klaipeda Kiel						
	Road only				via Maritime - DFDS	
	Share (%)	Distance (km)	Time (h)		Road Distance (km)	Time (h)
Baseline (2014)	39-49	1600±300	23±2		100-300	28±2
	New Road Share	%Change			New DFDS Share	%Change
Fuel Case 1 (actual 2015)	-0.29% IQ: -0.29:-0.08	-0.62%		$\lambda_{(road-Maritime)}$	+0.29% IQ: 0.08:0.29	+0.55%
Fuel Case 2 (HFO 2015)	-0.73% IQ: -0.64:-0.16	-1.56%		0.012±0.05	+0.73% IQ: 0.16 :0.64	+1.31%
Fuel Case 3 (MGO 2014)	+0.93% IQ: 0.18:0.96	+2.12%			-0.93% IQ: -0.96:-0.18	-1.65%



# Dover - Calais

Dover Calais						
	Maritime DFDS				Eurotunnel	
	Share (%)	Distance (km)	Time (h)		Road Distance (km)	Time (h)
<b>Baseline (2014)</b>	39-49	1600±300	23±2		100-300	28±2
	New DFDS Share	%Change			New Eurotunnel Share	%Change
<b>Fuel Case 1 (actual 2015)</b>	-3.6% IQ: -6.9:-1.7	<b>-6.91%</b>		$\lambda_{(road-Maritime)}$	+3.6% IQ: 1.7:6.9	<b>+7.81%</b>
<b>Fuel Case 2 (HFO 2015)</b>	-4.8% IQ: -8.3:-3.3	<b>-8.95%</b>		0.015±0.05	+4.8% IQ: 3.3:8.3	<b>+10.78%</b>
<b>Fuel Case 3 (MGO 2014)</b>	-5.3% IQ: -9.1:-3.6	<b>-9.74%</b>			+5.3% IQ: 3.6:-9.1	<b>+11.71%</b>

## Additional analyses

- Comparison of fuel savings for ships using MGO vs scrubbers
- The current low fuel prices have affected the payback period of scrubbers
- Comparisons of actual fuel consumption with predicted outputs
- Estimation of fuel consumption under different circumstances for year 2 (e.g. Change of sailing speed, change vessel deployment, etc.)
- Initial findings show that there are negative repercussions to ship operators, even if these are not as obvious as anticipated 2 years ago

## Conclusion

- Maritime shares **increase** due to **observed low prices**
- Maritime shares **would increase** further if **HFO was still allowed**
- Maritime shares **would drop** at fuel levels of **2014 using MGO**
- **Freight Rate** is the most important component
- **Time is not crucial**, except for high-value cargoes. Slow steaming could be an option
- **Profitability** of ship operator is **masking the negative effects** of the regulation – a happy coincidence

## Further Work

- Reverse the negative changes: Introduce changes in the explanatories
- E.g. Change the GC of transport for maritime and competitive modes
- Ship operator measures:
  - Speed reduction in certain routes
  - Change of sailing frequency
  - Changes in fleet deployment
  - Alternative technologies including LNG as fuel
  - Changes in nominal capacity of a vessel
- Policy measures
  - Internalization of external costs
  - Adaptation of ECO bonus systems for hauliers choosing SSS modes
  - Subsidies for retrofits
  - Tax levy on competing modes

## 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.**

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