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ANALYSIS OF RECENT TRENDS IN EU SHIPPING AND ANALYSIS AND POLICY SUPPORT TO IMPROVE THE COMPETITIVENESS OF SHORT SEA SHIPPING IN THE EU

FINAL REPORT

CENIT CENTER FOR INNOVATION IN TRANSPORT
vito vision on technology
COWI

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Objectives

The objectives of the assignment are to analyse the current trends of the EU Short Sea Shipping sector; identify the main factors affecting the growth of the sector; analyse the evolution of SSS market regarding main drivers, supply developments and demand requirements; and propose policy actions and recommendations to reinforce the position of SSS in EU meeting the objectives of the White Paper.

In summary, this report is focused on characterizing the main critical factors hindering the competitiveness, to assess previous promotion measures and EU funding programmes and finally, to suggest a new approach for policy making.

Analysis of the evolution of SSS

A central step in the analysis of the EU shipping trends is to look into recent developments. The following trends have been observed during 2005 to 2012:

- Cargo transport by SSS has decreased by 1.6% between 2005 and 2012, mainly caused by decreases in the North Sea and the Atlantic Ocean sea basins, while other sea basins (Baltic Sea and Mediterranean Sea) have seen cargo transport growth.
- Liquid bulk accounted for 46% of the SSS of freight cargo whereas solid bulk share was about 20% of SSS within EU in 2012. Containerized and RoRo cargo reported about 13% each cargo segment. However, transport of liquid bulk goods such as oil products and LNG decreased 10.7% in 2012 w.r.t. 2005.
- There has been an increase in the SSS cargo transport via RoRo self-propelled units such as trucks; but since there here has been an increase within the non-SSS sector, the SSS market share has actually kept constant through last 15 years (the modal split have remained rather stable of about 37% for SSS transport).

Therefore, it seems that cargo transport by SSS has lost some momentum in recent years partly as a result of the economic crisis and partly via lost market shares to non-SSS in some sea-basins such as in the North Sea, North East Atlantic Ocean and Black Sea. While the former loss may be somewhat remedied when the EU economies hopefully recover, the latter loss may – which is a core question for the present study – require actions to regain market shares, since have remained constant whilst road transport share increased 3 points (up to 45%) during last 15 years.

Drivers of change

In order to understand the dynamics governing the sector an analysis of the drivers of change of the EU maritime transport have been developed. The main conclusions are:

Table 0-1 Expected impacts of drivers of change

Drivers of change		Impact	Effect on the SSS sector
Policy	Institutional	Long term	Improving SSS competitiveness
	Planning and investment	Long term	Improving SSS competitiveness
	Operational, regulatory and licensing	Short term	As a reaction of major environmental changes. Direct effect on price and operational costs.
	Pricing, cost recovery, taxation and subsidy	Short-medium term	Improve specific aspects of the transport supply (ship owners, ship yards, etc.)
Demography and social changes	EU population growth	Long term	Growth in transport demand which involves higher frequencies, cost reductions (scale economies) and fewer incentives for consolidation.
	EU population ageing	Long term	Growth in transport demand
	EU urbanization prospects	Long term	Changes in transportation chain since longer distances are expected. Better port connections and infrastructure efficiency
	Changing of work patterns	Long term	Additional international trade and freight movements
Energy and environment	Energy prices and fuel costs	Short term	Direct impact on demand because of price increases. The bunker cost is the most important operating cost and really sensitive to price changes.
	Climate change	Short-medium term	Direct effect on demand because of price increases. Thus, modal back shift is likely to occur.
Technology	Information and Communication Technologies (ICT)	Short-medium term	Useful to improve the competitiveness but it has not a big effect on SSS demand.
	Marine equipment/new propulsion systems		Useful to reduce vessel operating costs but at medium term
Economy	Economic growth	Long term	Impact on the whole transportation system. Growth in transport demand.
	Globalisation of production and consumption	Long term	The supply chain is extended and new routes and ports get into the global chain.
Finance	Financing instruments Access to liquidity/finance from banking/capital markets	Short-medium term	Big impact on the sector, especially when transport suppliers cannot afford big investments in small markets

Once the main drivers and impacts are determined, the next step is to study the SSS sector from both the supply and the demand side.

Consolidations trends

Regarding the consolidations in the sector we have found, through desk reviews and supplemented by interviews, the following trends:

- There is a tendency for consolidation even though it is difficult to quantify. This is more evident in the northern part of Europe and in the container and ferry/RoPax segments. A reduction in the number of players in the market as well as routes served would be expected.

- In ports, there is a certain tendency for specialisation in cargo among different ports, which increase the efficiency and productivity of ports. Cooperation and partnerships between ports within a region (win to win strategy) involved cargo specialization to reap from scale economies.

Measures to ensure innovation and increase competitiveness

Next, Table 0-2 introduces the most important measures to increase the SSS competitiveness from the supply side.

Table 0-2 Overview of measures examined

Type of Measure	Overview	Potential Impact on SSS	Variable of SSS competiveness affected	Impact on SSS demand (cost/price)	Impact on SSS demand (quality and flexibility
Promote competitiveness and ensure innovation	European Short Sea Network	Positive in enhancing awareness, cooperation and promoting solutions	Quality of the service, reliability and price	Moderate	Important impact on quality of service
Promote competitiveness and ensure innovation	Reporting Formalities Directive and EU initiatives (Blue Belt)	Positive in reducing customs costs in particular for regular services	Quality service and cost	Moderate-Important	Potential impact on quality of service
Promote competitiveness and ensure innovation	EU digitalisation initiatives (e-maritime, e-freight, e-customs)	Positive through reduction of reporting costs.	Quality service, cost and reliability	Moderate	Potential impact on quality of service
Promote competitiveness and ensure innovation	CEF (infrastructure, freight transport services and MoS)	Positive to the extent that they improve connections with the hinterland	Flexibility cost and reliability Ship cost	Important/ Moderate	Potential impact on quality and flexibility

Main decision factors affecting modal shift

Secondly, main decision factors for shippers, cargo-owners and freight forwarders (demand side) are determined. According to desk review, the factors influencing modal shift can be grouped in four categories: price/cost, transit time, frequency and reliability. In practice, major stakeholders state that price/cost of the service is the main decision factor.

The service reliability within the supply chain is put on the second place. Two aspects are related to reliability: (1) full-integration is not currently well addressed which is a major issue because SSS transport involves at least two different modes regarding door-to-door services; (2) reliability on shipping services. Some shipping companies receive financial aids but once these aids are over the service can no longer sustain itself and disappears.

Potentialities of SSS according to supply chain characteristics

The most convenient supply chain characteristics for SSS have been characterized through desk review and interviews. From the strategic approach, it can be noted that SSS offers great conditions when the product value is low (lead time is high) and when the cargo concentration and demand variability are high. Regarding the business models of trucking companies, SSS is seen as a potential solution when it can take profit from economies of scale. However, to reach an optimal performance in the unaccompanied model it is necessary to make a large investment in equipment, therefore, large demand concentration.

Factors affecting the growth of the sector

The application of the abovementioned decision factors differs for the SSS segments and sea-basins. This is caused by the competition between transportation modes but it also depends on the cargo characteristics and the geographical location. Namely three kinds of traffics can be distinguished:

- **Captive traffic**. Whenever no alternative mean of transportation exists, namely traffic connections from/to islands, within big land masses separated with a big water body (e.g. Mediterranean basin) or when the land connections represent big detours (e.g. East and West Baltic Sea or certain traffics between mainland Europe and Great Britain).

  Bulk cargo could be considered as a captive traffic for maritime transport and, of course, for SSS within Europe. It is generally shipped in specialized ships in large quantities. In this case maritime transport denotes a clear advantage over road and rail as it is demonstrated in SSS traffic statistics.

- **Deep Sea Shipping feeder traffic**. SSS lines distributing and/or collecting freight for DSS services. These lines are essential for maritime services using hub-and-spoke strategies based on transhipment. They typically focus on container SSS traffic, but there are also SSS services for other specialised traffics (oil, bulk, cars, etc.) needing feeder services from hub ports.
- **Domestic traffic competing with other modes**. Understood as freight with origin and destination within European countries. It may be the situation between Spain and Italy or across the Adriatic Sea because the road alternative is not good enough. This sector and type of traffic is the most sensitive to changes and its evolution has not been as expected since road transportation have increased while SSS remained constant or even decreased in some basins (i.e. Black Sea and Atlantic Ocean).

Factors affecting the modal shift

However, SSS is not seen as a potential alternative in some traffic segments because it presents few disadvantages compared to road transportation. From stakeholders' (i.e. shipowners, ports, shippers and cargo-owners) point of view, the most relevant critical factors affecting the development of SSS are:

1. Too many regulations are affecting SSS. In fact, SSS competes with other modes of transport such as road and rail that are not regulated in the same way.
2. Complex and extensive bureaucratic procedures are affecting SSS, especially in those sea-basins that involve third countries.
3. Accessibility costs to/from ports are costly due to inefficient infrastructures, capacity problems or poor intermodal facilities.
4. The extension of the road network and the flexibility and low cost of road transport reduce the competitiveness of SSS for most shipments.

5. The increase of SSS capacity and frequency requires high demand rates which are perceived as a big risk for shipping companies.
6. Scale economies in the RoRo/RoPax segment are not decisive because vessels are multi-purpose and designed for quick operation. This puts low limits to their size and to the reduction of unit costs.
7. Imbalance of traffic flows at origin/destination points. Back-haul transport is a big issue for SSS.
8. Inter-modality in ports is poorly developed. The links between the land modes and SSS are not fully integrated within the supply-chain.

New 2015 and 2020 sulphur emission rules

In addition, the new Annex VI agreement of the MARPOL Convention, which aims for a reduction in sulphur oxide emissions from ships, is very likely to have a negative impact on costs of the shipping industry and higher freight rates in ECAs in North Europe (Baltic, North Sea and English Channel) and, consequently, on the competitiveness of SSS compared to trucking.

Generally, three different compliance methods can be considered and their feasibility will depend on the type of vessel, newly build or retrofit and economical trade-off.

- Using alternative low sulphur content fuels, LNG fuel, methanol, liquefied petroleum gas (LPG) or biofuels;
- Introducing exhaust gas cleaning technologies to remove SOx from emissions (wet and dries scrubbing).
- Converting to Dual Fuel engines and install LNG Tanks.

The application of these measures will involve a price increase due to higher operating costs. In any case, the recent enforcement of sulphur regulation in ECAs in North Europe can be seen as an obstacle to SSS competitiveness. Even in the North and Baltic sea-basins, where SSS demand can be considered as captive, the introduction of sulphur regulation, according to ship-owners operating in the North EU basins, could represent a modal back shift of about 12-15%.

Evolution of SSS in the EU

Once main drivers of change and the current trends are identified, the next step is to quantify their impact in terms of SSS freight transport (demand).

The Baseline scenario is defined according to the main policy developments and initiatives and, on the other hand, by the effect of major drivers on future transport demand, such as oil prices and economic growth. That is: (1) drivers and trends that can be affected by policies; (2) and those that cannot be affected by policies (fuel costs and economic growth).The following table shows the proposed indicators and main response assumptions:

Table 0-3 Quantification of main factors and trends affecting SSS development

Driver	Baseline values	SSS response assumptions
Oil prices	According to EIA, the oil price has risen 78% in the period 2005-2014 but fell down in 2014 to 89$/barrel. However, it is expected to increase 11% up to 2025 w.r.t. 2015 (baseline scenario).	The transport types respond differently to fuel price changes depending on the type of fuel used and the share in total costs. It is assumed that cost

Driver	Baseline values	SSS response assumptions
		increasing will be directly reflected in the price.
Economic growth	Economic growth (GDP) has differed between sea basins (on the basis of Eurostat GDP data)	Elasticity of GDP/SSS traffic, that is: how much economic growth have/will affect SSS transport by type of transport Differences in response by transport type and sea-basin
Policy regarding sulphur regulation in ECA areas	It is assumed that HFO will hold 65% of the fuel share by 2025 because HFO with abatement technology is still considered the most cost-effective option. Then, 30% for MGO/MDO and 5% for LNG.	It is assumed that cost increasing will be directly reflected in the price. This assumption is just considered for North and Baltic Sea.
Consolidation	Increased co-operation, reduced competition. A decrease in capacity of between 5% and 10% over a five year period is considered. RoPax and container segments could be in the higher range.	Consolidation trends has been reflected in vessel occupancy and then in average cost (maritime link and port costs)
Directive on Reporting formalities Blue Belt (including e-Manifest)	Costs associated to administrative burden at ports and delays of vessels for customs clearance will be reduced. Thus, according to the EC, the consequence for shipping is significant in terms of extra administrative burden and costs.	It is assumed that cost savings will be translated to reduce operating speed during journeys and thus, a reduction of fuel consumption. It is expected a reduction of 3-5% of maritime cost per journey but the impact on the final price, due to power market, might be marginal.
Digitalisation initiatives (e-Maritime, e-Freight, e-Customs)	Cost savings are also expected although the final impact on price would be marginal. • For the e-Freight initiative, savings of 10 minutes per truck ("to be converted to cost savings") and a 50% reduction of manual check-in activities (automated gate solution, changes of road to ports) were estimated. • The e-Maritime will support the communications between maritime transport and multimodal logistics	It is assumed that digitialisation initiatives will help to reduce (on average) 1.5-2% of multimodal costs (port and maritime costs). No differentiation per sea-basin
Technological developments - ships	In particular for the container and RoRo/RoPax segments 10% to 20% efficiency improvement in fuel consumption	This is linked to the fuel cost and the assumed direct reductions: container (7.5-15.0%); RoRo (3.2-6.4%)
Technological developments - ports	According to interviews, surveys and suggestions from ESSF group the following statements were made: • This is potential for the container segment where automated handling can be a game change, but it should be considered that currently most terminals have	Cost savings within the range 5 to 10% are expected in following years for container segment and 5% for RoRo/RoPax segment. This is linked to port costs and

Driver	Baseline values	SSS response assumptions
	already introduced improvements. • For RoRo/RoPax, the incidence is low/moderate because cargo handling is mainly related to the vessel. • For bulk cargo this assumption is not applied	the assumed direct reductions to the price are: container vessel (0.5%); RoRo/RoPax vessel (0.4%)
Ecobonus initiative	Ecobonus basis as a percentage of the ticked paid, which differs from 10 to 25% and from 20-30% discount according to the maritime route and the amount of journeys (>80 journeys completed) for EU and national routes, respectively. The amount of tonnes transported in EU routes awarded by Ecobonus only represent only the 5% of total RoRo/RoPax cargo within the Mediterranean sea-basin	Great incentive for national routes (increasing rates about 40% between 2007 and 2010) but low impact in EU routes because of decrease of Spain GDP and EU economic crisis. It is assumed that no additional effect will be produced in future years because of this initiative is already implemented since 2007.

SSS demand evolution for upcoming years

In order to quantify expected SSS demand, a calculation tool has been defined specifically for this assignment. It projects future demand by considering the effect of drivers and trends over the historical SSS demand evolution (2005-2012). The output values for the baseline scenario stated that:

- The largest growth is expected in the Baltic Sea (annual increase rate of 2.1%) and the Mediterranean Sea (annual increase rate of 1.95%). Contrarily, the North Sea and the Atlantic Ocean sea-basin present the lowest perspectives for increase in future years.
- Regarding cargo types, the largest increases are expected for containers (annual increase rate of 4.4%) and RoRo cargo which is expected to increase on average by 3.0% per year. On the other hand, the transport of liquid bulk goods is expected to see a decline (about -0.55%).

Effect of economic growth and EU policies

Then, in order to quantify the expected individual effect of the economic growth, oil prices, EU policies and sector's consolidation on SSS future demand, three additional hypothetical cases were considered.

Output values show that the economic growth has a large impact on future demand, as the increasing percentage is 6 points lower than the Baseline scenario. Secondly, the effect of oil prices is contrary to the economic growth, without this driver the increasing annual rate would reach 1.55% in 2025 w.r.t. 2012. Finally, if only EU policies and consolidations are considered, the increasing rate of SSS demand in 2025 will be about 1.1% per year.

Economic and environmental impacts

Next, the impact of the SSS demand evolution over the transport sector (mainly road transportation) regarding economic, social, safety and environmental measures is estimated by a cost-benefit analysis. Considering few assumptions related to modal shift, we were able to quantify the response of the SSS market by defining the corresponding elasticities regarding price/cost. According to the projections undertaken, the SSS fuel costs are to increase in the future due to higher SSS demand. In particular, in 2025 they are estimated to be 88% higher than in 2010.

Regarding environmental impacts, the air pollution costs are projected to be reduced by more than half in 2025 (because of the reduction in sulphur emissions). In the same time, climate change costs are expected to increases as the total fuel consumption is projected to increase because of higher demand.

As regards to the impacts of the different scenarios (A and B) in comparison to the Baseline, the following conclusions are stated:

- The increase in total SSS fuel costs of the scenario "A" ranges between 30 and 45% while for the scenario "B" ranges between 21% and 34%.
- The environmental costs reduction for the scenario "A" ranges between 6% and 7% whilst for the scenario "B" costs increase by 2%-4%.

Policy actions and measures

Finally, some policy actions and recommendations have been proposed according to past experiences and taking into account main critical factors affecting SSS competitiveness. It was observed that direct subsidies to launch SSS lines are not an ideal solution for the long term maintenance of SSS services. Thus, there is a need, to promote the sector and the modal shift for a more sustainable transport system.

The majority of EU SSS policy measures have been oriented to the supply side (focus on reducing transportation cost with SSS), and more attention to the demand policies should be received in the future because policies affecting directly to the demand can have a self-enforcing effect: aside from improve the vessel occupancy, more demand makes possible a reduction of the average cost of the SSS, increasing then the SSS competitiveness.

In such context, we recommend that policy actions should be focused on (1) the shipping sector (supply side), in particular for RoRo/RoPax vessels and; (2) truck companies and cargo-owners (ideally for those products characterized by low product value, high cargo concentration and high demand uncertainty).

For the last case, initiatives to promote cooperation between carriers and consolidate cargoes are a major request to benefit of scale economies and thus, reducing final price to customers. In addition, cooperation between carriers from different countries and sea-basins is required to make sure that multimodal chain is fully integrated. To conclude, 13 policy actions and recommendations have been suggested to improve the development of SSS in future years.

1 Introduction

Purpose of this document

This **final report** is submitted by COWI, CENIT and VITO, as partners of the Consortium in collaboration with SPC Spain and UPC-BarcelonaTech, under the requirements of the assignment titled: "Analysis of recent trends in EU shipping and analysis and policy support to improve the competitiveness of Short Sea Shipping in the EU". The study was launched by DG MOVE under the Multiple Framework Service Contract with re-opened competition for economic assistance in the field of mobility and transport (SRD MOVE/ENER/SRD.1/2012-409 lot 5).

Assignment objectives

SSS is considered as a strategic component of the transport system since it can provide an important contribution to smart, sustainable and inclusive growth in the EU (White Paper). Nevertheless, the sector is facing some problems hampering the development of SSS. By removing these problems it is expected that the growth of SSS will lead to the reinforcement of the position of EU shipping, minimisation of road congestion, energy consumption as well as improved and guaranteed territorial continuity of the EU.

Thus, the purposes of the assignment are to provide a complete analysis of the SSS sector in EU, and in particular to:

1 Analyse the current, emerging and possible trends in EU shipping and SSS from the supply (ship owners, ports, operators) and demand side (cargo owners, freight forwarders and shippers);

2 Identify those factors (obstacles) affecting the growth of the EU shipping and SSS in particular;

3 Analyse the evolution of SSS in the EU and assess the readiness and promotion of SSS, including those implemented in particular sea-basins;

4 Propose policy actions and recommendations to reinforce the position of European shipping industry meeting the objectives of the White Paper.

The achievement of the abovementioned objectives will provide a thorough picture of the current situation of the overall SSS sector, and particularly, for the different market segments and sea-basins.

1.1 Overall approach and road map

Grouping of tasks in three main blocks

In line with the above objectives, the assignment is organized in three different areas (see Figure 1-1):

1 Analysis of the drivers of the maritime transport market and analysis of the current, emerging and future trends in EU Shipping from the supply and demand side of the sector.

The goal of this block is to define the main picture of the dynamics governing the key trends of the SSS. Once the big picture is characterized, the next step is to study the SSS sector from both the supply and the demand side.

In particular, the main trends regarding consolidations, measures to preserve know-how, innovation techniques and improvements in vessel design, port's facilities, terminal operations, shipping companies in order to increase the competitiveness of the SSS are identified. Secondly, main decision factors for shippers, cargo owners and freight forwarders (demand side) will be determined, and thus, major factors affecting modal shift in favour of SSS.

The inputs of the first block will be obtained through desk research, interviews and online surveys to stakeholders (ship-owners, terminal operators, port authorities, shippers, forwarders, cargo owners, etc.).

2 Market forecast and analysis of economic, social (safety) and environmental aspects of SSS

Once main drivers of change and the current trends of the sector regarding stakeholders from the supply and demand side are identified, the next step is to quantify their impact in terms of SSS freight transport (demand).

The Baseline scenario is introduced according to the main policy developments and initiatives and, on the other hand, by the effect of major drivers on future transport demand, such as oil prices and economic growth.

The calculation tool which has been particularly defined for this assignment, projects future demand by considering the effect of drivers and trends over the historical SSS demand evolution (2005-2012).

Next, the impact of the SSS demand evolution over the transport sector (mainly road transportation) regarding economic, social, safety and environmental measures is estimated by a cost-benefit analysis.

3 Policy actions and recommendations.

The goal of the last task is to propose policy actions and recommendations to increase the competitiveness of the SSS sector and reinforce its development.

This will be achieved by analysing, on one hand, what has been done so far and the achievements of EU funding programmes and initiatives and, on the other hand, by identifying in previous activities the main threats, obstacles and bottlenecks affecting the growth of the sector.

Thus, this task will be focused on those major concerns that are being identified by collecting experiences and feedbacks from main stakeholders involved in the sector.

Structure of the final report

According to previous statements, below we present an overview of the remaining chapters of this report:

Chapter 2 –An overview of the EU Shipping and Short Sea Shipping sector

This chapter presents an overview of the EU maritime transport market. A brief summary of the economic impact of the maritime transport in EU, an overview of the EU shipping fleet and main statistics regarding maritime freight and passenger transport and SSS, including its different market segments are analysed. Finally, we focus on the current situation of freight transport and on the evolution of the modal split in EU.

Chapter 3 – Analysis of the drivers of the EU maritime transport market

The third chapter is focused in identifying and analysing the drivers of change for the maritime sector. In particular, policy, economic, finance, social and demographic and environmental drivers are considered. In addition, the overall impact of main policy developments on the sector is provided.

Chapter 4 – Analysis of the current, emerging and possible future trends in EU Shipping and Short Sea Shipping from the supply side

In this chapter, an in-depth analysis of main stakeholders, internal and external trends, measures to ensure innovation and competitiveness of the SSS sector from the shipping side is undertaken.

Chapter 5 – Analysis of the current, emerging and possible future trends in EU Shipping and Short Sea Shipping from the demand side

This chapter is focused on analysing the demand side. First, an overview of demand evolution in recent years is done. Then, the main decision factors for cargo owners, shippers and freight forwarders are analysed through desk review and interviews. Finally, according to stakeholders' feedback, the threats and bottlenecks of the SSS sector are determined, identifying major reasons.

Chapter 6 – Analysis of the evolution of Short Sea Shipping

Once major issues are considered, this chapter is firstly focused on modelling future SSS demand in each sea-basin and cargo segment. Secondly, according to demand projections, the impact in economic, social and environmental terms is estimated by a cost-benefit analysis.

Chapter 7 – Development of policy actions and recommendations

The chapter 7 analyses past actions and initiatives to promote SSS and the development of MoS and secondly, according to previous results and stakeholders' feedback, propose policy actions and recommendations.

Chapter 8 – Conclusions

This chapter presents the preliminary conclusions of the assignment.

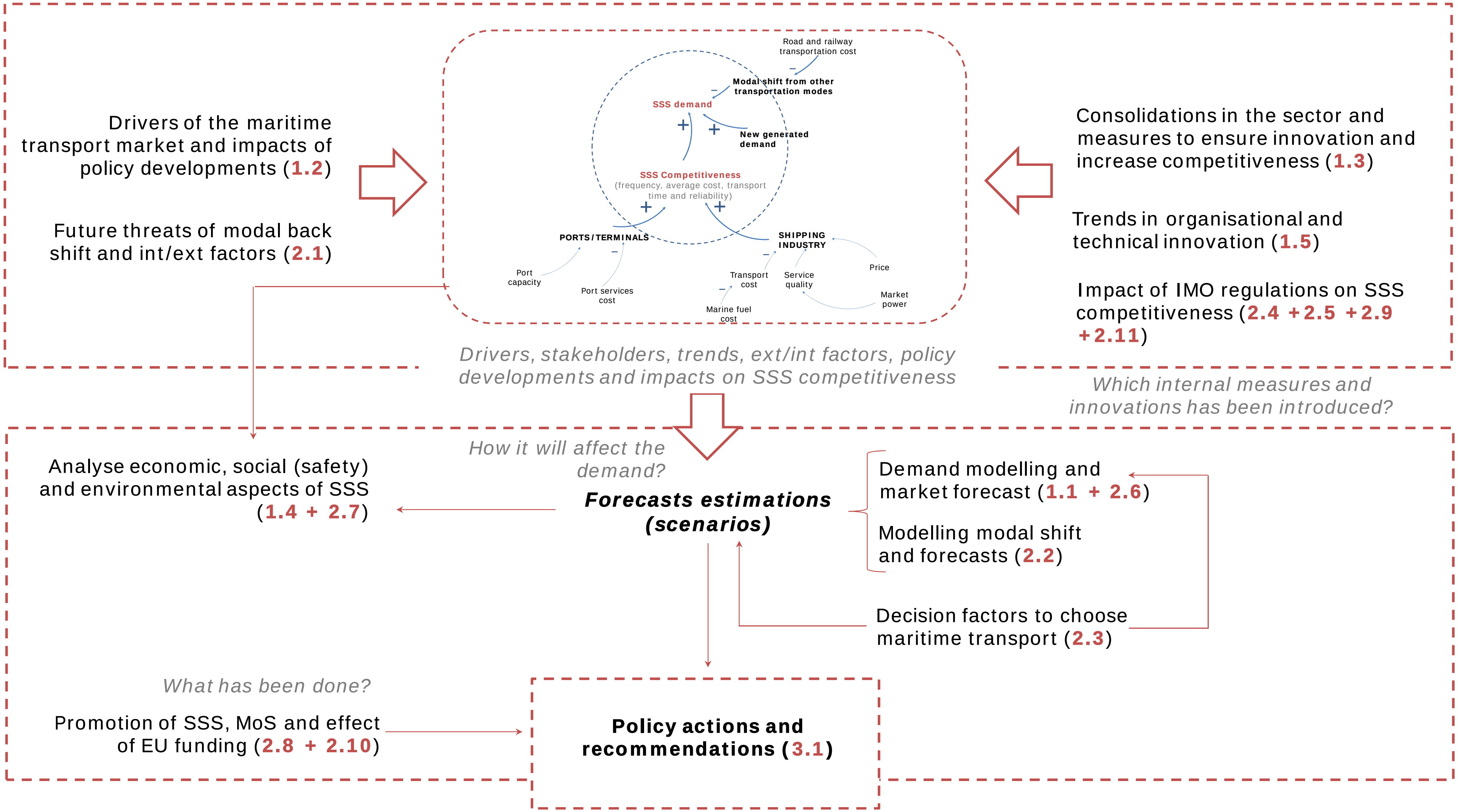

Figure 1-1 Overall approach of the assignment

1.2 Interviews and e-surveys

The following associations and single players from the different EU geographical sea-basins have been interviewed during the elaboration of the assignment. The goal is to get an extensive overview of the current situation of the SSS sector and to understand the dynamics of the different traffic segments and sea-basins, identifying both the potentialities and obstacles of the SSS.

Table 1-1 Stakeholders' Associations and single players interviewed

Association/Company	Stakeholder	Day
AGC Glass Europe	Cargo-owner	9th March 2015
CLDN	Shipowners	9th December 2014
CLECAT	Freight Forwarder Association	1th December 2014
Danish Shipowners Association	Shipowners	3th December 2014
DFDS shipping company	Shipowners	10th December 2014
DHL	Logistic Operator	5th March 2015
ECSA	Shipowners Association	4th November 2014
ESPO	Port Association	1th December 2014
European Shippers Council	Shippers	14th November 2014
Finnish Freight Forwarder Association	Freight forwarder	28th January 2015
GRIMALDI	Shipowners	9th December 2014
INBEV	Cargo-owner	17th March 2015
LOGIFRUIT	Cargo-owner	5th December 2014
NAVANTIA	Shipyard	5th December 2014
Port of Amsterdam	Port Authority	3th February 2015
Port of Antwerp	Port Authority	30th January 2015
PUIG	Cargo-owner	11th March 2015
SEAT	Automobile company Cargo-owner	29th January 2015
STENA	Shipowners	10th December 2014
TNT Express	Logistic Operator	26th February 2015
UASC	Shipowners	2nd March 2015
Wagenborg	Shipowners	9th December 2014

In such be mentioned that the success rate of getting an answer was about 45%, being the ship-owners and port authorities the most active and shippers and cargo-owners the fewer active. Shortsea Promotion Centres and Focal Points also registered a low answering rate (12%).

Regarding the e-surveys launched, we have received the following number of responses:

Table 1-2 Number of answers received during the interim phase through online platform

Association	Stakeholder	Launch day	Number of responses
CLECLAT	Freight forwarders	20/12/2014	1
	Cargo owners	20/12/2014	1
ECSA	Shipowners	01/12/2014	4
ESC	Shippers	17/11/2014	1
ESPO	Ports	03/12/2014	6
-	Oil companies and bunkering services	03/12/2014	1
SPC	Shortsea Network	24/11/2014	5/21
Focal Points	Member States Experts in SSS and MoS	24/11/2014	2/38
		TOTAL	**21**

It should be noted that ECSA launched a survey for ship operators in parallel in order to monitor the economic impact of low sulphur norms. Thus, in such context, we make use of their results and conclusions as input data for this assignment.

2 An overview of the EU Shipping and Short Sea Shipping sector

Taking into account the European geography, its history and the globalisation process, the European Union is still dependent on the maritime transport, which is essential for the European economy to compete globally. Nearly 75% of its external trade (Union's imports and exports) and 37% of the internal trade (but down from 43% in 1990) goes by sea[1]; on the whole, nearly 1.65 billion tons of freight are exported and imported by sea each year in EU-27 and more than 400 million sea passengers pass through European ports each year.

Economic impact of EU maritime transport

The shipping and related services are an important contributor to the European economy and to the quality of life of EU citizens, providing jobs and being essential for EU competitiveness. It is estimated that the shipping industry have directly contributed 56 billion € to GDP, employed 590.000 people and generated tax revenues of 6 billion € in 2012. In addition, the shipping industry indirectly supported an estimated 59 billion € contribution to GDP and 1.1 million jobs through its EU supply chain[2].

EU shipping fleet

Europe plays a major role in today's shipping world, with EU companies controlling 40% of world gross tonnage (GT) and 39% of world deadweight tonnage (DWT) in 2014. In such context, Greece has the largest controlled fleet within Europe (36% of GT and/or 43% of DWT) whilst Germany represents a further 21% of GT. Moreover, according to the report prepared for the ECSA, at the beginning of 2014, the EU controlled fleet comprised of 660 million deadweight tonnes, 450 million gross tonnes and 23.000 vessels.

The EU fleet is dominated by three types of vessel: bulkers (28% of GT), oil tankers (25%) and container ships (25%), which represent 60% of the world's container ships in GT terms.

[1] COM (2013) 295. Ports: an engine for growth, Brussels, 23.5.2013.
[2] The economic value of the EU shipping industry. A report for the European Community Shipowners' Associations (ECSA). Oxford Economics, April 2014.

Modal split in EU transport

The Figure 2-1 shows the modal split during the period 1995-2012 according to Eurostat data.

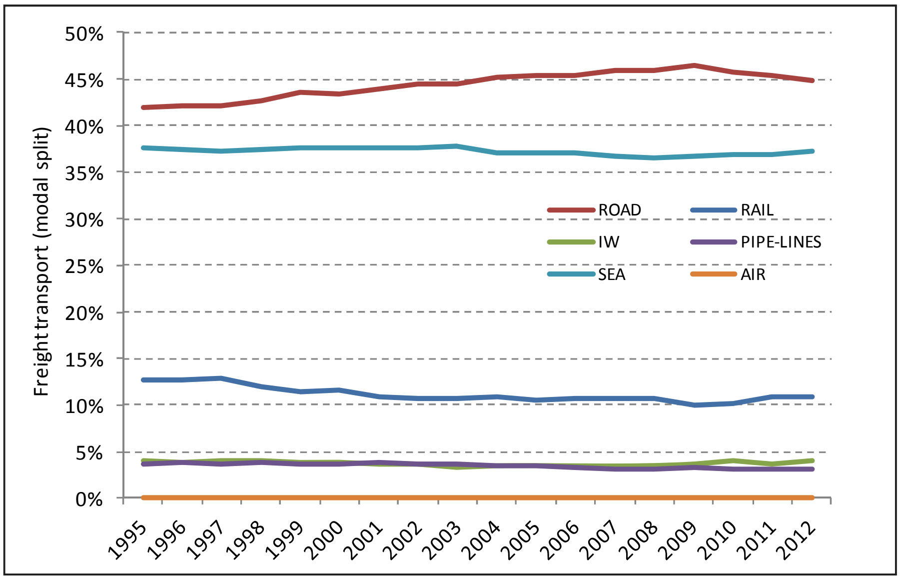

Figure 2-1 Freight Transport (modal split) EU-28 Performance by Mode. Source: Transport Statistic Pocketbook 2014.

Although there has been a significant increase in the volume of freight transported within the EU, most of the additional freight traffic has been transported by road. Despite policy initiatives and funding programmes to encourage modal shift away from road, road traffic has a modal share of nearly 45% and congestion is a major concern on the roads (Figure 2-1). So, there is an imbalance between modes which is increasing annually as demand for both freight and passenger transport services increases.

In 1992, the White Paper[3] was published and the Common Transport Policy was adopted. Among other important policy decisions declared, there is one concerning the special transport mode of short sea shipping (SSS); shifting cargoes from land modes to the sea. In due course SSS should relieve the congested road networks and improve the competitiveness of the EU economy.

Short sea shipping in the EU

SSS has attracted a lot of attention in the EU in the last 20 years since it is considered as a mode favoured to reduce the number of trucks that daily congest about 4,000 km of road network (with its associated social costs), which cannot be removed unless huge investments in infrastructure are made at the expense of more social costs[4]. Later on, the White Paper on European transport policy for 2010 highlights the role that SSS can play in curbing the growth of heavy goods vehicle traffic, rebalancing the modal split and bypassing the bottlenecks.

In 2012, the SSS in the EU-28 was close to 1.8 billion tonnes of freight and represented 60% of total maritime transport of goods within Europe. However, the share of SSS in total maritime transport varies widely between countries. For instance, the predominance of SSS was particularly pronounced (more than 80%) in Bulgaria, Denmark, Ireland, Croatia, Cyprus or Latvia because of geographical

[3] COM (92) 494 final. The Future Development of the Common Transport Policy: A Global Approach to the Construction of a Community Framework for Sustainable Mobility - White Paper.
[4] Short Sea Shipping in Europe. European Conference of Ministers of Transport, OECD, 2001.

considerations. A large volume of feeder services may also explain the high degree of SSS in countries that function as transhipment point, such as Malta. In contrast, the share of SSS is lower than 60% in countries with major ports concentrating on intercontinental trade, such as Belgium, Germany, Spain, the Netherlands, Portugal and Slovenia.

Short sea shipping in EU per sea-basins

SSS of goods between main EU-28 ports and ports located in the Mediterranean was 577 million tonnes in 2012. This accounts for about 29% of the total SSS tonnage declared by the main EU-28 ports. SSS with the North Sea and the Baltic Sea followed, with 506 and 421 million tonnes, respectively (25% and 21% of the total).

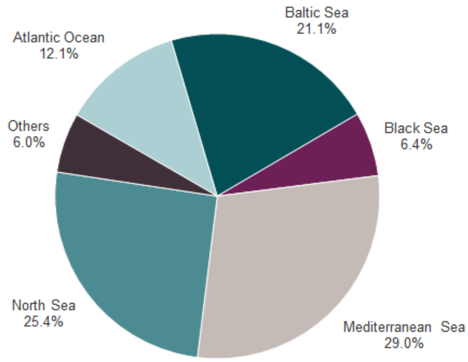

Figure 2-2 EU-28 short sea shipping of freight transport by sea region in 2012. Source: Eurostat, 2014

In general terms, the highest share of shipping of goods through SSS takes place between ports located in the same sea region. There are some exceptions, like Latvia, where about half of the SSS of goods came from or was destined to ports located in the North Sea. Romania and the Netherlands are two other exceptions, with the Mediterranean taking the largest share of SSS for Romania and the Baltic Sea taking the largest part for the Netherlands.

Short sea shipping transport per segment

Liquid bulk accounted for 46% of SSS freight cargo to and from the EU-28 in 2012, followed by dry bulk at 358 million tonnes (20%). Regarding liquid bulk, the Netherlands had the largest volume (155 million tonnes), followed by Italy and the UK, with 142 and 130 million tonnes, respectively.

Containers accounted for 28 million TEUs and RoRo ships carried 234 million tonnes of goods in 2012 (both cargo types accounted for about 13% of total tonnage). In that context, the UK had by far the largest SSS of RoRo units (83 million tonnes) in 2012. At 48 million tonnes, Germany was the main country in terms of SSS of containers, followed by Spain and Belgium, at 43 and 41 million tonnes, respectively.

As observed in Figure 2-3, liquid bulk remained the largest cargo type in all sea regions in 2012. However, while liquid bulk goods accounted for almost two thirds of total SSS of goods in the Black Sea, the comparable data for the Atlantic Ocean was 34%. There was variation in the share of dry bulk goods between the sea regions, with a range from 15% in the Mediterranean to 25% in the Black Sea. At 19%, the Mediterranean had the largest share of SSS of containers in 2012. For

RoRo units, the Atlantic Ocean (where the two main RoRo ports, Dover and Calais, are located) accounted for 21% of the total.

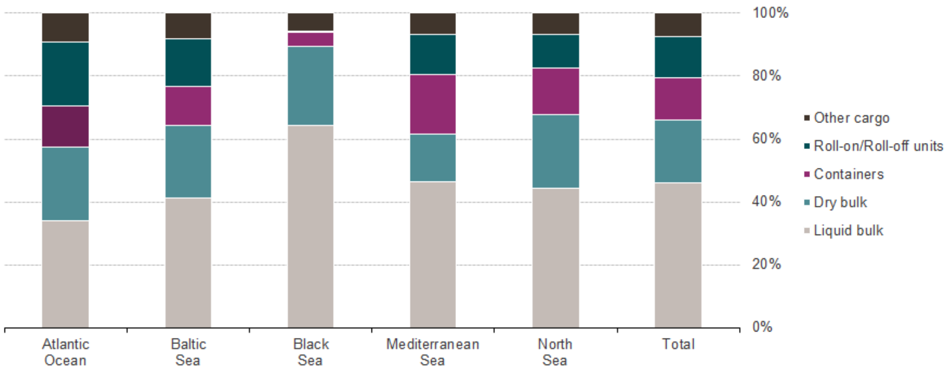

Figure 2-3 EU-28 short sea shipping of freight transport by sea region and type of cargo in 2012. Source: Eurostat, 2014.

Main European ports

The top-20 ports accounted for 35% (839.3 million tonnes) of the total goods transported by SSS in the EU-28 in 2012. Rotterdam in the Netherlands remained the largest EU-28 port by far, with a share of 7.3% (174.3 million tonnes). The top-5 ports were unchanged with Antwerp, handling the second largest amount of SSS in 2012 (86.5 million tonnes), followed by Marseille (53.3 million tonnes), Hamburg (45.2 million tonnes) and Immingham (42.9 million tonnes) in the UK.

Except for the main deep-sea hub ports – Rotterdam, Antwerp, Hamburg, Algeciras and Valencia- the top-20 ports had shares of SSS in total seaborne transport of freight cargo higher than 50%, underlining the port of Riga (90%) and the port of Augusta (95%) in Italy.

Motivation and objectives

Despite major efforts provided by the EU with its modal shift policy, objectives of freight transfers from road to the sea remain disappointing (i.e.: the road share within the EU market increased slightly to 46.6% in 2012). Such results have led to some criticism of the initiatives undertaken. Thus, it is really important to address the obstacles hampering the development and to reinforce the position of the European Shipping industry.

Intra-European shipping is expected to increase between now and 2018 and new infrastructures should be created and existing infrastructures should be strengthened in order to make SSS more attractive. In such context, SSS shall play an important role in order to meet the objectives set by the 2011 White Paper on transport policy[5] and to reduce the growth of road transport and restore the balance between modes of transport.

To resume, this assignment aims to provide an in-depth analysis of the SSS sector and to understand the reasons why this sector has not progressed as expected despite several efforts to promote it. Finally, according to main threats and bottlenecks, this report provides some policy actions with the aim of increasing and enhancing the development of the SSS sector.

[5] COM(2011) 144 final. White Paper. Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system.

3 Analysis of the drivers of the EU maritime transport market

Motivation of chapter 3

Over the years, maritime transport, which is understood as a composition of the maritime shipping and the ports, has evolved in response to the changing economic, institutional, regulatory and operational setting. In view of emerging issues, including a changing global economic scenario, rising environmental and energy sustainability imperatives and growing climate change concerns, maritime transport will have to cope with several new trends.

Therefore, in order to understand the EU market sector, it is important to identify those driving forces for the EU maritime transport market economy including the impact of policy developments across the EU regions and globally.

According to desk research on this topic (ECMT[6;] EEA[7]; TRANSvisions study[8]), the methodological approach distinguishes between external drivers (i.e.: energy and environment, economy, finance, demography and society, technology and social changes) and internal transport drivers, which are originated in the transport sector or as a consequence of the impacts on the environment and technological development such us new infrastructures, vehicles and alternative fuels. In addition, policy drivers should be considered which affect the evolution of the transport system and its governance.

3.1 Drivers of change of the EU maritime sector

Policy

Types of policy actions

The transportation sector is subject to many forms of policy measures that can be classified in four categories (based on World Bank's guidelines[9]): institutional; planning and investment; operational, regulatory and licensing; and pricing, cost recovery, taxation and subsidy.

[6] ECMT, (2002) The driving forces behind transport growth and their implications for policy, International Seminar, Brussels.
[7] EEA (2008) Beyond transport policy — exploring and managing the external drivers of transport demand. Illustrative case studies from Europe, Technical report, NO 12/2008.
[8] TRANSvisions (2009) Study on Transport Scenarios with a 20 and 40 Year Horizon, Service contract A2/78 2007 for the DG TREN, Task 2 Report "Quantitative Scenarios".
[9] http://siteresources.worldbank.org/INTTRANSPORT/Resources/tp-19_NTS.pdf

- Institutional policy measures relate to the role of governments, public authorities and private sector in developing and operating transport infrastructure and services.
- The planning and investment policies define the criteria for economic, financial or environmental and safety standards to govern public investments and controls that should be applied to the private sector investments.
- Operational, regulatory and licensing policies aim to (1) define how public safety and environmental should be protected; (2) define how should regulations be imposed in a way that is effective, minimizes costs to transport operations and allows responsiveness to demand; (3) to regulate and control infrastructure and service operations; (4) to encourage competitive markets; and (5) to curb congestion are other objectives that are addressed through this policy category.
- Finally pricing, cost recovery, taxation and subsidy policies define the principles for tariff setting, level of cost recovery to be achieved for publicly owned transport infrastructures, and the circumstances in which subsidies are justified.

EU shipping policy measures and macro-regional strategy

There are some regulations that try to encourage a transport mode in order to increase its competitiveness and, on the other hand, regulation which is derived from a major driver (e.g. climate change). In Appendix B, Table 8-1 shows the most important shipping policy measures that affect the EU shipping market and, complementary, Table 8-2 contains most important maritime strategies related to promote and create a favourable environment for SSS at the different EU sea basins related to Macro-Regional strategy.

Demography and social changes

EU population growth

The demographic changes, such as population growth, ageing, urbanization and changing of work patterns lead to changes in transport activities, demand mobility, levels of consumption, travel trends, etc.

According to Eurostat[10], the majority of the EU regions are projected to have a larger population (natural change and total net migration) in 2030, which is expected to rise by 5% between 2008 and 2030, but considerable variations between regions are shown.

In fact, population may increase in Cyprus, Luxembourg and Malta and in all regions in Belgium, Denmark, Ireland, the United Kingdom, Norway and Switzerland by 2030. Similarly, the most heavily populated regions of the main European countries are projected to increase in population over the period. On the other hand, Baltic countries and the majority of regions in Eastern and Central European countries are expected to have a lower population by 2030.

EU population ageing

In the EU27 as a whole, the median age of the population was 40.4 years in 2008, but is projected to increase in almost all regions. The combined effect of three factors – the existing population structure, fertility lower than replacement levels, and steadily rising numbers of people living longer – is likely to increase the median age to 45.4 in 2030 and almost one in four regions may have a median age

[10] http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-10-001/EN/KS-SF-10-001-EN.PDF

of the population higher than 48 years. Moreover, the proportion of the regions' population aged 65 or over is projected to increase from 17.1% in 2008 to 23.5% in 2030[8].

EU urbanization prospects

The process of urbanization historically has been associated with other important economic and social transformations, which have brought greater geographic mobility, lower fertility, longer life expectancy and population ageing.

In today's increasingly global and interconnected world, over half of the world's population (54%) lives in urban areas although there is still substantial variability in the levels of urbanization across countries[11]. In 1950, 30% of the world's population was urban, and by 2050, 66% of the world's population is projected to be urban. Regarding Europe, the73% of its population in 2014 is living in urban areas, and is expected to be over 80% urban by 2050 (United Nations, 2014).

Changing of work patterns

The world of work is changing because of (1) the development imperative (need for a more equitable global development path); (2) the technological transformation which involve new means of information processing and communications; (3) an intensification of global competition following trade and financial liberalization as well as a dramatic reduction of transport and communications costs; and (4) a shift in political thinking towards greater reliance on markets and a reduced role for the State, accompanied by, and sometimes at odds with, increased political pressure for improved living and working conditions released by the spread of democratic mechanisms of representation and accountability.

As a consequence, new trends in the global labour market are developing in order to adapt to the drivers of change. In Europe, dramatic changes are taking place in the way work is organised and in the structure and age profile of workforces. The number of workers who are permanently employed is falling and companies are increasingly concentrating on their core businesses, transferring secondary activities to contractors.

Energy and environment

The transport sector is one of the most important sectors for the development of energy consumption and the related environmental emissions. According to the TRANSvisions study (2009), the energy consumption by the transport sector was the 31% of total energy consumption in 2005 and is expected to rise up to 32.9% in the year 2030, although the share of road transport is about 82%.

Thus, global environmental degradation and the effect of energy price changes are considered as significant driving forces of change for the maritime sector.

Energy prices and fuel costs

The energy price is without doubt one of the most important drivers in the world, especially in recent years when prices have been increasing (i.e.: oil prices have increased fivefold over the last decade). Consequently, transportation costs are expected to rise on the short and medium term, and transport demand will be readjusted, depending on the price elasticity of each mode of transport.

Climate change

Along with the aviation sector, shipping is one of the fastest growing sectors in terms of greenhouse gas emissions, causing climate change. Emissions from the global shipping industry amount to around 1 billion tonnes a year, accounting for

[11] World Urbanization Prospects: The 2014 Revision. United Nations. Department of Economic and Social Affairs. New York, 2014.

3% of the world's total greenhouse gas (GHG) emissions and 4% of the EU's total emissions.

In such context, the global community recognises the need to reduce global emissions in order to limit the chance of experiencing dangerous climate change.

The European Union and its Member States lead by the International Maritime Organization (IMO) are currently considering various policy measures for tackling shipping emissions and mitigate the GHG associated with shipping. For instance, in 2011 the IMO made progress by adopting the Energy Efficiency Design Index, which sets compulsory energy efficiency standards for new ships, and the Ship Energy Efficiency Management Plan for ship-owners.

Particularly for the EU's market, the Commission's 2011 White Paper on transport suggests that EU CO2 emissions from maritime transport should be cut by at least 40% of 2005 levels by 2050, and if feasible by 50%. In order to achieve it, the European Commission set out a strategy (COM (2013) 479 final) for progressively integrating maritime emissions into the EU's policy for reducing its domestic GHG.

Role of biofuels

Bioenergy and biofuels are of growing interest at a time of rapidly rising world energy demand and high oil prices. In fact, biofuels are currently the most important type of alternative fuels, accounting for 4.4% in EU transport (COM(2013) 17). They can contribute to a substantial reduction in overall CO2 emissions, if they are produced sustainably and do not cause indirect land use change. They include bioethanol, biomethanol and higher bioalcohols, biodiesel pure vegetable oils, hydrotreated vegetable oils, dimethyl ether and organic compounds.

However, such biofuels may be able to meet up to 10% or 20% of current transport demand (TRANSvisions, 2009), but no more than this without major advances in technology. On the other hand, the consumer acceptance of biofuels has been hampered by the lack of coordinated action across Member States and common technical specifications.

Technology

Technological progress is a considerable driving force behind economic growth, structure of production, job creation and the use of leisure time. Information and communication technologies (ICTs), in particular, are reshaping many aspects of the world's economies, governments, and societies, and is a potential tool that can also contribute to decelerate the exploitation of the environment (e.g. air pollution controls).

Advanced information and communication technologies contribute towards co-modality by improving infrastructure, traffic and fleet management and facilitating a better tracking and tracing of goods across the transport networks. Moreover, it also will help to minimize risks for safety and the environment, while maximizing the efficiency of waterborne transport and the whole supply chain.

Economy

Economic growth

In most industrialized countries there has been a strong positive relationship between economic and transport growth, although recent studies stated that the current trend towards a sustainable transport system promotes the decoupling of transport growth (especially for road and passenger transport) from the economic development.

Previous studies (e.g. TRANSvisions, 2009) showed that freight transport demand grew faster than GDP in time of economic growth in the EU-15 area, but not in the EU-10, where there was a shift from heavy industries towards the service sector.

Nonetheless, according to past evidence maritime transport has shown a tight correlation between maritime trade growth and GDP growth rates.

Globalisation of production and consumption

The globalisation which has changed the world economy and trade has been reinforced by China, India, Brazil and Russia. As a consequence, the increasing globalisation has led to a strong increase in international shipping activity.

As consequence of globalisation, the length and complexity of logistical chain have grown faster, resulting in the increase of the average distance of freight trips and their frequency. Moreover, a reduction in the costs for production and distribution caused by economies of scale, location advantages and warehouse is expected.

Finance

Transportation infrastructures are highly capital intensive because of their size and technological complexity, assets value and the revenue they generate.

Nevertheless, available funding from traditional sources (i.e.: allocations from national and EU budgets, loans and cohesion funds) falls short of the investment needs of the EU transport sector due to the significant financial gap in public resources. Under these conditions, one way is to mobilise private investment in infrastructure projects or investigate mechanisms for generating more resources from off-budget sources. The public-private partnerships have played an important role in this process as well as new financial instruments.

The recent emerging trends in the financing of EU transport infrastructure and the innovation financial arrangements are the TEN-T programme in cooperation with the European Investment Bank (grants managed by INEA and financial instruments by the EIB) although now are offered through the CEF, EBRD’s financing and co-financing and the EU Structural & Cohesion funds for transport infrastructure.

ESSF sub group of financing and competitiveness feedback

As stated during the ESSF Group of financing and competitiveness meeting (25/09/2014), CEF provides a real leverage instrument for EU maritime transport. The amount of grant-funding available for maritime projects is about € 250M for the MoS plus an additional € 100M for Member States eligible to cohesion funding in 2014. In addition, €900 million for MoS plus additional allocations under other objectives are granted to improve the environmental performance of maritime transport. However, suitable risk-sharing mechanisms such as loan guarantee schemes, risk facility funds and a better use of off-budget sources via fees and charges will define the future financing scenarios.

3.2 Impact of drivers and policy developments

In order to evaluate the impact and assess how main drivers of change of the SSS sector, a qualitative analysis is done, identifying which and how much the main variables directly related to the SSS’s competitiveness are affected by the drivers of change and policy developments.

In particular, policy measures may have several effects, on the one hand, meeting a certain objective and, on the other hand, affecting the output of other measures.

Thus,

Table 8-3 in Appendix B shows the economic, social and environmental qualitative impacts of policy developments on maritime sector according to desk review and our own experience on this area. On the other hand, Table 8-4 illustrates the qualitative impact of remaining drivers of change.

Conclusions about drivers' impacts

In general terms, the following conclusions can be stated according to the assessment undertaken in abovementioned tables, that is:

Table 3-1 Most important impacts on the SSS of main drivers of change

Drivers of change		Impact	Effect on the SSS sector
Policy	Institutional	Long term	Improve the competitiveness in general. The most important impacts are allocated in the efficiency of the transport system, reduction of the administrative efforts and climate change.
	Planning and investment	Long term	Improve the competitiveness in general
	Operational, regulatory and licensing	Short term	As a reaction of major environmental changes. Mostly, these have a direct effect on prices and operational costs, social and environmental aspects
	Pricing, cost recovery, taxation and subsidy	Short-medium term	Improve specific aspects of the transport supply (ship owners, ship buildings, etc.)
Demography and social changes	EU population growth	Long term	Population developments are aligned with the interest of SSS but acting at long term. However, any important changes are expected in the next coming years. Growth in transport demand involves higher frequencies, reduction of unit cost (scale economies) and fewer incentives for consolidation.
	EU population ageing	Long term	Growth in transport demand
	EU urbanization prospects	Long term	Changes in transportation chains since longer distances are expected. Better port connections and efficiency of infrastructures
	Changing of work patterns	Long term	More international trade and movements of freight
Energy and environment	Energy prices and fuel costs	Short term	The energy cost plays an important role because it might involve a direct reduction of SSS's competitiveness and as a consequence, on demand. The bunkering cost is one of the most important operating cost and really sensitive to price changes
	Climate change	Short-medium term	It has a direct effect on demand because of price increases. The unit cost is increased and thus, modal back shift is likely to occur.
	Role of biofuels	Short-medium term	It has a direct effect on demand because of price increases. The unit cost is increased and thus, modal back shift is likely to occur.
Technology	Information and Communication	Short-medium	Useful to improve the competitiveness in general but it has not a big effect on the

Drivers of change		Impact	Effect on the SSS sector
	Technologies (ICT)	term	sector.
	Marine equipment/new propulsion systems	Medium term	Useful to reduce fuel consumption and improve the energy efficiency. Environmental reduction costs.
Economy	Economic growth	Long term	Impact on the whole transportation system. Growth in transport demand, both for SSS and non-SSS sectors. However, economic and financial crisis situation is creating in short term an increase of the risk of the shipping business, increasing the investment cost and making then easier the consolidation of the sector, as a reaction.
	Globalisation of production and consumption	Long term	Impact on the whole transportation system. The supply chain is extended and new routes and ports get into the global chain.
Finance	Financing instruments Access to liquidity/finance from banking/capital markets	Short-medium term	Big impact on the sector, especially when transport suppliers cannot afford big investments in small markets

Lastly, Figure 3-1 indicates those variables affected by main drivers of changes and policies and, on the other hand, the relationships between main variables of the SSS sector.

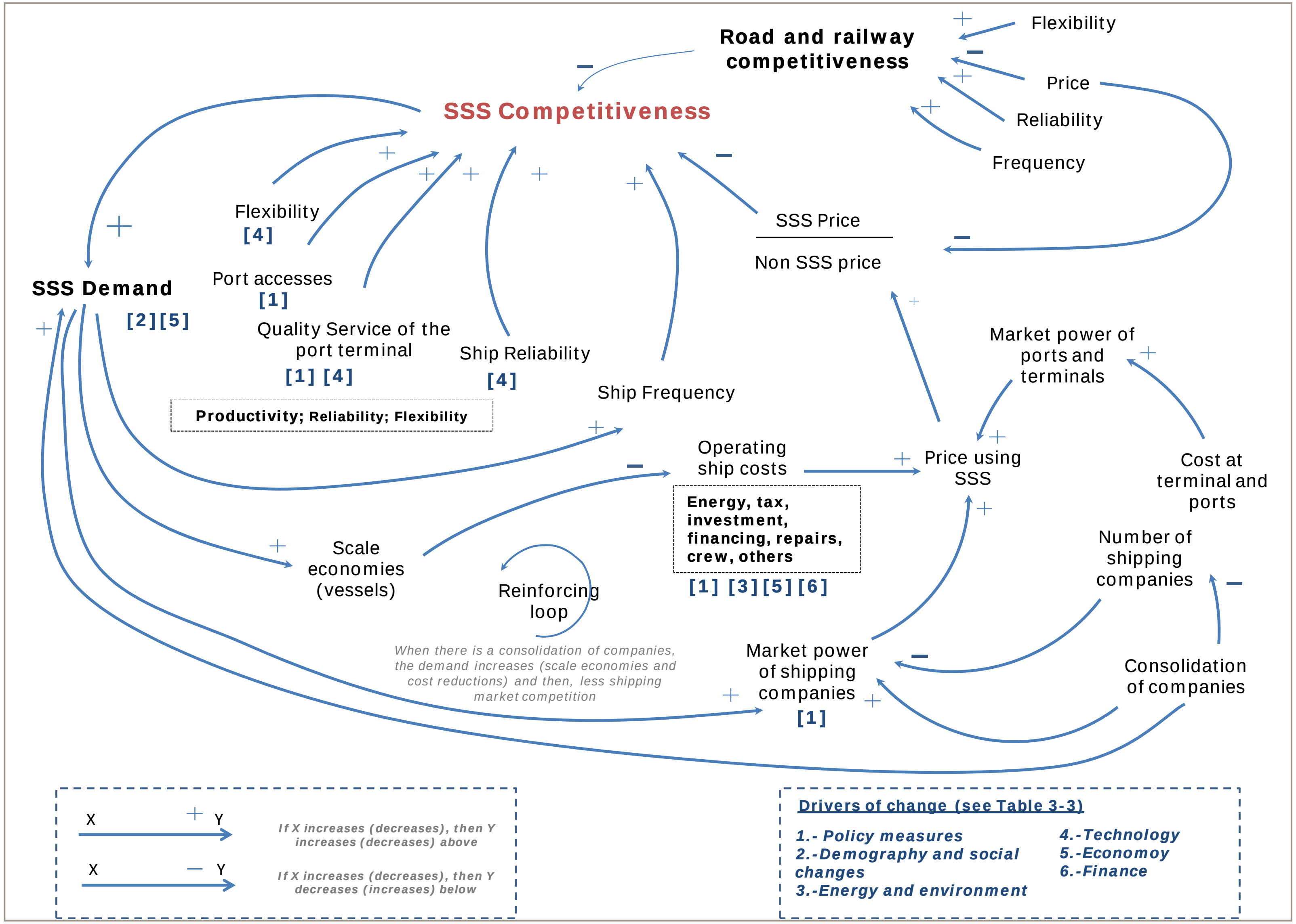

Figure 3-1 Loops of drivers affecting the main variables defining the competitiveness of SSS

4 Analysis of the current, emerging and possible future trends in EU Shipping and Short Sea Shipping from the supply side

4.1 Identification of consolidations and measures to preserve know-how in the sector, ensure innovation and increase competitiveness

The aim of this activity is to identify current and future tendencies with regard to consolidations in the sector as well as measures taken by the industry in preserving expertise, ensuring innovation and increasing competitiveness. The methodology in this section is based largely on desk reviews which have been supplemented and cross checked through interviews and the e-survey.

Consolidations

Regarding the consolidations in the sector we have found the following trends:

Concerning the North Sea and the Baltic routes a trend for consolidation has appeared in the past years as this part of the SSS market is subject to the general economic pressures and declining cargo volumes[12]. Similar is the situation regarding the Mediterranean ferry market as shown by reports on the Greek[13], as well as the Italian, French and Spanish markets[14].A report from the Spanish short sea promotion centre finds for the period 2009 to 2013 a reduction in the number of lines from 55 to 44 for the Atlantic and from 131 to 121 for the Mediterranean. For the number of vessels the reductions are respectively from 36 to 33 and from 79 to 70[15].

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[12] http://www.joc.com/maritime-news/short-sea-shipping/unifeeder/consolidation-cooking-european-short-sea-shipping_20130318.html
[13] XRTC, Annual Report on the Greek Ferry industry, 2014
[14] Bulletin of the Observatory of Transport policies and strategies in Europe, Short sea shipping in Europe, January 2013
[15] SPC Spain, OBSERVATORIO ESTADÍSTICO DEL TRANSPORTE MARÍTIMO DE CORTA DISTANCIA EN ESPAÑA 2009-2013

The reason behind consolidation seems to be more efficient operation and cost saving but other option could be related to the emerging economic and regulatory environment that make even more difficult the scenario for small players to remain in the market.

Ports

In ports, there is a certain tendency for specialisation in cargo among different ports, which increase the efficiency and productivity of ports. Cooperation and partnerships between ports within a region (win to win strategy) involved cargo specialization in order to reap from scale economies. For instance, in Belgium Antwerp plays a leading role in containers and bulk, with Gent focusing on dry bulk and Zeebrugge in RoRo[16]. A 2013 overview of the European Short Sea Shipping market[17] finds Hamburg followed by Bremen being the main German port for SSS of containers, while Lübeck, Rostock and Kiel are the main ports for unaccompanied intermodal transport mentioning further that ports would develop competitive relations as they are more linked with the "Länder".

SSS industry

Regarding consolidation in the SSS industry, stakeholders so far have mixed reactions. Replies from SPCs do not mention such clear tendency (with the possible exception of merging shipping lines). On the other hand, most ship owners reported a tendency for consolidation in the market in particular in the container and ferry/RoPax sector segment, with a closure also of routes.

The reason behind consolidation seems to be more efficient operation and cost saving (by using the vessel’s economies of the scale) as a reaction to economic (crisis) and regulatory pressures (sulphur legislation). Some respondents tend to agree that the market conditions will become more difficult for smaller players who might not be able to raise the necessary capital required to keep up with regulatory requirements. The example of the difficulties faced by the model of "captain owner" was mentioned by one respondent, with another pointing at small containerships. Two respondents consider that this tendency will continue, with a slow pace, even though the SSS market would have a positive trend in the future[18]. Stakeholders representing the port sector point out that the impact of this process is the introduction of larger vessels in an effort to reduce the costs per transport unit. A few stakeholders also indicate at a small tendency in vertical consolidation (ports, shipping companies, but also mentioning railroads). They also point to a concentration of services along the main freight corridors. According to respondents the consolidation is less evident in the Mediterranean sea-basin. Some ship-owners considered that consolidation could lead to the provision of more efficient services.

Consolidation trends

Based on the above, we conclude that there is a tendency for consolidation even though it is difficult to quantify. This is more evident in the northern part of Europe and in the container and ferry/RoPax segments. A reduction in the number of small players in the market as well as reduction in the routes served would be expected. Even though an improvement in efficiency of services might be expected, no

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[16] National Bank of Belgium (2012), ECONOMIC IMPORTANCE OF THE BELGIAN PORTS: Flemish maritime ports, Liège port complex and the port of Brussels – 2010.

[17] Bulletin of the Observatory of Transport policies and strategies in Europe, Short sea shipping in Europe, January 2013

[18] The respondent estimated for the ferry market an annual reduction of volume of demand by 2% for passengers (effect of low cost airlines) and an increase of 2% to 3% for cargo (following the trends in the truck market).

evidence was identified to support this argument or to estimate its potential size. At the same time the exit of players might lead to monopolies in certain lines. However again there is currently no evidence to support an assumption on the extent of such an impact.

Measures taken by the industry to preserve know-how

The importance of know-how in the success of the maritime sector was recognised in 2008 in the Report from the Group of Senior Shipping Professionals[19]. The 2011 report of the Task Force on Maritime Employment and Competitiveness[20] examined the reasons impacting the attraction and retention of seafarers to the maritime profession pointing at lack of awareness of job prospects, piracy, and "criminalisation of seafarers" as well as issues relating to working and living conditions on board (including shore leave and use of Internet) as factors having a negative impact.

A study undertaken for the Commission on 2011[21], to support the work of the Task Force, notes that the figures presented "*confirm the strong decline of officers from developed countries in the total of active officers in the world, which has been partly compensated by an increasing number of officers from eastern countries*".

A range of initiatives and projects to preserve know-how in the sector have been developed. Most of them aim at retention of qualified seafarers in the maritime cluster in order to offer better price and reliability of service. These include the KNOWME[22] and SKEMA projects[23].

Regarding the answers from stakeholders, the SPCs did not identify any specific industry related measures to preserve know-how. Ship-owners mentioned image building measures, support in training and employment of seafarers under their own flag. According to respondents, this is a problem affecting the maritime sector in general; however, it is less impacting SSS than DSS. In particular short sea shipping has a higher concentration of domestic seafarers According to ship-owners, higher concentration of domestic seafarers is found in particular in ferries/RoPax vessels, the reason being the frequency in serving national ports. Ship-owners stated that Commission initiatives can help in raising awareness but that specificities should be dealt at Member State level. Among the respondents from the ports sector the measures noted include training of personnel, investment in information technology, as well as improving cooperation with the shipping and the freight forwarding sector.

This study expects that the trends with regard to supply and demand of seafarers will remain the same at least in the short term. Domestic seafarers appear to be more concentrated in short sea shipping than in deep-sea and more concentrated in ferries/RoPax vessels. While early to estimate the impact of EC projects such as SKEMA or the Vasco da Gama, it is expected that they will contribute in the retaining knowledge in the sector. It is however not possible to quantify this impact.

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[19] http://ec.europa.eu/transport/modes/maritime/studies/doc/2008_09_22_report_en.pdf
[20] Report of the Task Force on Maritime Employment and Competitiveness and Policy Recommendations to the European Commission, 9/6/2011
[21] European Commission, STUDY ON EU SEAFARERS EMPLOYMENT, 2011
[22] http://www.know-me.org/
[23] SKEMA, SE 2.2.3. "Port Related Training", 2011

Measures to ensure innovation and increase competitiveness

A number of measures have been identified which aim to ensure innovation and increase competitiveness. These include:

- European Short Sea Network. This initiative linking the industry and the EU aiming to promote SSS and to enhance awareness, cooperation and promoting solutions.
- EU legislative measures such as the Directive on reporting formalities for ships (2010/65/EU) and the Blue Belt initiative (both for intra EU shipping and for ships to calling in third country ports), incorporating the so-called “Single Window”, which aims at simplifying procedures in ports and avoiding unnecessary controls and expenses[24].
- Digitalisation initiatives (e-Maritime, e-Freight, e-Customs). These measures aim to foster the use of advanced information technologies and to optimise ship and cargo related processes and the reduction of administrative burden. From the logistics perspective, e-Freight aims at connecting stakeholders for an efficient access and use of information in the freight transport in all modes of transport.
- Connecting Europe Facility (CEF) programme in order to improve the port connections with the hinterland (accessibility) and through the freight transport services (that replaced Marco Polo II).

Stakeholders were positive in the impact of promotion measures like the short sea network as measures to promote best practices and increase awareness. They were, however, not able to point to any measurable impacts while some pointed to different levels of impact in different Member States. At the same time one stakeholder expressed the view that the "need to promote SSS is overrated as shippers are already well aware of SSS and its capacities".

Concerning innovation, a stakeholder reported that this is not originating from the Short Sea Shipping sector but from shipbuilding. Another respondent focused on containers (higher impact on price and reliability of service), engines and fuel, and vessel design (higher impact on reliability of service). Major ship-owners (and in particular those dealing in the ferry market) reported continuous efforts for innovation through internal departments. The majority of the stakeholders agree that the focus of innovation is currently on energy efficiency and on environmental performance. At the same type a ship-owner pointed out that "all ships are unique" and as such it is not easy to make generalisations. Stakeholders from the port sector highlighted also the investments in new technologies (e.g. port community systems and port management systems) as well to a specialized workforce. Close cooperation with ship-owners regarding LNG, onshore power supply, wastewater handling and safety were also mentioned. Finally management practices including networking, exchange of best practices, education of personnel and management and inclusion in cluster were also presented.

For increased competitiveness, the focus according to the respondents is on business practices (innovative projects) as well as cost reduction and improved

[24] The 2013 Blue Belt Communication foresees two elements. The first is the simplification of regular intra EU shipping services applicable since March 2014. The second involves vessels carrying both EU and no EU goods with intermediate call at non EU ports and promoted the creation of an electronic harmonised cargo document identifying EU and non EU goods (e-Manifest).

reliability and quality of service. Regarding the geographical and market segment differentiation, the views of the respondents were again divergent and not conclusive. One respondent supported EU measures, however considered that they have not yet reached the expected result (e.g. Blue Belt has not yet delivered), while for IT measured underlined the need for consistency and single requirements throughout the EU. One main point to note is that stakeholders were either not able to provide a quantifiable estimate on the impact of these measures or did not wish to do so (possibly for commercial reasons). Among the measures stated by respondents from the port sector the importance of links with the hinterland was highlighted along with investments in automation. Operational aspects such as shorter turnaround times, efficient handling and storage of cargo and were also presented. One respondent supported the view of increasing competition between operators and concentrating on main corridors and high frequency goods.

Of interest is also the feedback by a number of ship-owners regarding the Marco Polo programme, which was considered as having distorted competition and noting that "*if a line needs to appear for commercial reasons it will do so*". A stakeholder considered that SSS already benefits from support in area of taxation. While other stakeholders considered that market forces are sufficient to ensure the optimum functioning of the market and that additional regulatory measures could be counter-productive, others raised the argument that a level playing field for all transport modes is required. Finally it should be noted that ship-owners stated that time savings at port that would arise from the implementation of competitiveness measures would not impact the voyage schedule but would be used for "slow steaming" that improving efficiency.

The following table presents a summary of the measures examined in this section. All measures are assessed to have a positive impact, however the extent of the impact is difficult to quantify. Initiatives based on the industry are hard to identify (as some might refer to commercial practices). EU related initiatives are distinguished in two main categories. Legal binding initiatives have been evaluated to have a positive impact in the maritime sector and per extension to the Short Sea Shipping. For non-binding initiatives (e.g. SKEMA) the final impact is dependent upon the level of uptake of the projects results by the industry. Regarding consolidation in the industry, stakeholders considered that this could have a possible positive impact, however, it should be noted that such activities should not lead to monopolistic situations.

Table 4-1 Overview of measures examined

Type of Measure	Overview	Main responsible actor	Potential Impact on SSS	Variable of SSS competiveness affected	Impact on SSS demand (price/cost)	Impact on SSS demand (quality, flexibility, etc.)
Consolidation	Increased co-operation, reduced competition. No clear trends or areas of impact	SSS sector	Possible benefits through efficient operation and cost savings, but possible monopolies	Ship cost and frequency, but, if monopoly, the prices could increase	Potential impact on cost savings	Increase efficiency of operations
Preserving know-how	Range of initiatives and projects aiming at retention of qualified seafarers in the maritime cluster	Industry with EU assistance	May benefit whole cluster through retention of skills and knowledge (in particular in offering better price and reliability of service).	Quality of the service	Moderate	Important impact on quality of service, safety and security
Promote competitiveness and ensure innovation	European Short Sea Network	Industry with EU assistance	Positive in enhancing awareness, cooperation and promoting solutions	Quality of the service, reliability and price	Moderate	Important impact on quality of service
Promote competitiveness and ensure innovation	Reporting formalities Directive and EU initiatives such as Blue Belt	EU	Positive in simplifying formalities and procedures. Reducing costs and delays.	Quality service and cost	Important	Potential impact on quality of service
Promote competitiveness and ensure innovation	Digitalisation initiatives (e-Maritime, e-Freight, e-Customs)	EU, MS	Positive through reduction of reporting costs. Possibly low impact in modal share	Quality service, cost and reliability	Moderate	Potential impact on quality of service
Promote competitiveness and ensure innovation	Infrastructure (CEF)	EU	Improving port connections with the hinterland	Flexibility cost and reliability	Moderate	Important impact on flexibility and quality service
Promote competitiveness and ensure innovation	CEF (freight transport services and MoS)	EU	Positive limited in core network	Quality service, maritime and port cost	Moderate	Important impact on flexibility and quality service

As seen in previous table, the impact of digitalisation initiatives (e-Maritime, e-Freight, e-Customs) might be moderate impact on SSS demand as regards to the final price to customers. Even there is direct effect on the time and cost savings and assuming that reductions on total operating costs are directly translated to final price to customers, the expected incidence is small (about 1-2%) as can be seen in Section 3.6. It should be mentioned that port costs are estimated about 6.50% of total variable operating costs of vessels according to PWC and Panteia (2013).

However, when it comes to making the choice of moving the cargo by maritime transport (including SSS), also the variables of quality service and flexibility are considered by the side of both cargo-owners and operators. Thus, in order to evaluate the impact of EU initiatives on the market, Table 4-1 also includes the potential benefits of each measure as regards to other decision factors as a complement to price/cost.

Attempt at quantification

Despite the fact that as explained above the extent and nature of these initiatives makes it difficult to provide a quantifiable impact, the information examined in this chapter allows us to proceed with at least some assumptions of possible impacts in a number of areas. These assumptions were proposed to the ESSF for discussion/validation with a view to reaching acceptable indicators for use in the analytical part of this report. The main proposals indicators where quantification is considered possible, along with the main assumptions and sources (including inputs from the ESSF joint meeting on 24/03/2015) are presented in Table 4-2. A more detailed explanation on the assumptions and quantifications is included in Appendix B.

Table 4-2 Assumptions of quantifiable impacts of examined measures

Type of Measure	Proposed indicator	Main assumptions	Sources
Consolidations	Decrease in supplied capacity between 5% and 10% over a five year period	RoPax and container segments could be in the higher range. This is assumed to apply more in the northern sea basins. Due to efficiency and economies of scale a price decrease of 15% is assumed for a 10% consolidation and a price decrease of 10% for a 5% consolidation.	- XRTC, Annual Report on the Greek Ferry industry, 2014 - Bulletin of the Observatory of Transport policies and strategies in Europe, Short sea shipping in Europe, January 2013 - SPC Spain, observatorio estadístico del transporte marítimo de corta distancia en España 2009-2013 -COMPASS, 2009 -Interviews
Digitalisation initiatives (e-Maritime, e-Freight, e-Customs)	Cost savings are expected although the final impact on price would be marginal 2% reduction on multimodal costs (port and maritime link)	RoPax small on the smaller range, RoPax large on the higher range Impact not distinguishing for sea basins	COMPASS, 2009 Recommendations from ESSF subgroup competitiveness

4.2 Analysis of current trends in organisational and technical innovation in sea transport, navigation and port operations

Objectives

The target of this activity is to identify current trends in organisational and technical innovation in sea transport, navigation and port operations.

There are a number of developments at technical and organisational level in sea transport. Quite often, these reflect individual company or commercial solutions. In this respect, it is not possible to make a complete listing of available options due to the number of options (affecting numerous parts of a vessel) and to the technical level of detail needed. However, it is possible to identify different categories of developments and the trends related to them.

The desk review found that such developments are often linked with specific commercial aspects or too technical/detailed in nature. As such, the study presents an overview of the general trends in research that is aimed to improve the performance of SSS. Table 4-3 below provides an overview of the organisational and technical developments examined.

Table 4-3 Overview of organisational and technical developments examined

Type of development	Overview	Potential Impact on SSS
Safety and environmental aspects	Improvements in vessel design, equipment and procedures that benefit the externalities of short sea shipping by reducing accidents (increased safety) and environmental impact (reduced emissions)	Positive potential in the long term through reduced externalities. However, in the short term operational and or investment costs could increase leading to a potential modal-back-shift
Specific vessel design	Design of vessels to serve the specific requirements of the short sea market	Reduced operational costs, better adapted to market requirements
Automated ship operations	More efficient and effective inter-modality, through automated control of vessels approaching/departing port using intelligent systems and improved navigational aids	Increased efficiency and safety of ship handling
Cargo unitisation	Promoting modulisation or all-purpose loading units. Better connectivity with other modes of transport	Reduced time at port and loading/unloading costs
Management practices	Developments in crewing, technical, financial and quality management, as well as procurement.	Reduced costs through streamlining or procedures
Data exchange and IT tools	Planning tools, IT applications for real time location of vessels and cargo. Information and data exchange	More efficient exchange of information would lead to improved operations and service levels
Ship / Shore Systems Integration	Improved ship/shore inter-phase including automated manoeuvring and mooring of vessels and cargo handling process	Reduced time at port and loading/unloading costs
Hinterland connection	Improving connection with hinterland and with rail and inland waterways	Improved service levels

Stakeholders' feedback

Stakeholders commented on the bottlenecks affecting the development of SSS both in terms of sea transport and ports. Among the factors presented are non-industry related (general economic situation, imbalance of exports-imports) as well as industry related (hinterland connections, port efficiency). The "non-completed internal market" for sea services was also presented as an important bottleneck. These bottlenecks were judged as having a moderate to high impact on the service provided. The effects are considered to differ between the market segments as well as through sea basins. Policy decisions (e.g. in the area of customs) as well as infrastructure investments were considered as appropriate measures to deal with the bottlenecks. As far as technical trends is concerned, ship-owners pointed more to engine and fuel developments and in particular in cost benefits that could come from future applications. On ship design issues no clear trend is identified with few new built vessels reported. The ship-owners pointed to the variety of vessels employed (with different characteristics) as well as the variety of technological options available. While not able to point to specific impacts of certain solutions, they were able to provide a general estimate of the expected efficiency targets when implementing such options. A range of 10% to 20% on fuel efficiency was proposed by different ship-owners[25]. On the port side, they underlined the differences in efficiency in ports along the EU (including the hinterland connections) and was reported as an issue that could affect the introduction of lines and the provision of services. While all ship-owners agreed that technological improvements in ports would have benefits in respect to time and cost, they pointed out that time saving would be used for "slow steaming" while respecting the timetable of the line.

Attempt at quantification

As explained above the complexity of estimating the potential impacts of technological and organisational developments along with the fact that the results of the research projects examined will only be available in a few years does not leave room for a detailed quantifiable approach. However, information from the desk review, interviews and ESSF recommendations allows us to present some general assumptions. The main proposals indicators where quantification is considered possible, along with the main assumptions and sources are presented in Table 4-4.

Table 4-4 Assumptions of quantifiable impacts of examined measures

Type of Measure	Proposed indicator	Main assumptions	Source
Technical and operational developments in sea transport	10% to 20% efficiency improvement in fuel consumption	Overall impact of technology improvements	Interviews Recommendations from ESSF subgroup competitiveness
Technical and operational developments in port operations	Cost savings within the range 5 to 10% are expected in following years for Container sector Cost savings about 5% are expected in following years for RoRo/RoPax sector	Overall effect in all sea basins but only for container and RoRo/RoPax sector	COMPASS, 2009 Recommendations from ESSF subgroup competitiveness

[25] According to one stakeholder fuel costs can reach 40% of the turnover. A literature reference points to fuel expenses in the area of 47% of voyage costs (Stopford, M. Maritime Economics, 3rd Edition, Rutledge, 2009).

4.3 Analysis of the evolution of future fuel demand, new technologies and retrofits for vessels and the readiness of the sector regarding new sulphur directives

Motivation

The new Annex VI agreement of the MARPOL Convention, which aims for a reduction in sulphur oxide emissions from ships, may have an impact on costs for the participants in the shipping industry (supply side of SSS sector) and higher freight rates for SSS demand in ECAs in North Europe and, consequently, on the competitiveness of SSS compared to trucking.

4.3.1 Assess and forecast the evolution of fuel used (2000-2025) and the availability of and demand for these fuels including refuelling infrastructure

As of 1 January 2015, ships in the Baltic, the North Sea and the English Channel are required to use fuels with a sulphur content of no more than 0.10%. Higher sulphur contents are still possible, but only with the appropriate exhaust cleaning systems, such as the scrubber technology.

Traditional and alternative fuels

Those fuels with higher sulphur content are Heavy Fuel Oils (HFO) or intermediate fuel oils IFO 380 and IFO180, marine gasoil (MGO) and distillate/blended marine diesel (MDO) which usually is used by smaller craft. However, due to new regulation, we can find low sulphur (LS) fuels in the market (LS380, LS180, LSMGO).

Alternatively, the use of LNG fuel is an option offering the shipping market great potential but it is only available for new builds and on retrofits vessels. Finally, since electricity is not possible for vessel engines, only gaseous and liquid biofuels would be alternative fuels – for example BioLNG, methanol, hydrogen and biomass – derived products equivalent for marine distillates and residual fuel, but the shipping sector is still in a very early stage towards biofuels (COM(2013) 17).

In order to characterize the fuel demand two periods of time are differentiated: (1) from 2000 to 2012 which can be achieved by analyzing historical data; and (2) from 2013 to 2025, which requires a forecast consistent with different traffic and fuel price projections and, as a consequence, to shipowners' preferences.

Marine fuel demand in EU until 2012

According to IEA data, the global fuel consumption was about 200 million tonnes in 2012, while EU consumption was around 28% (58 million tonnes) and some 13% of this is diesel with the remainder being fuel oil. In the European ECAs, the maritime fuel use was estimated at 20 million tonnes, most of which was bunker fuel oil (Europia, 2012[26]).

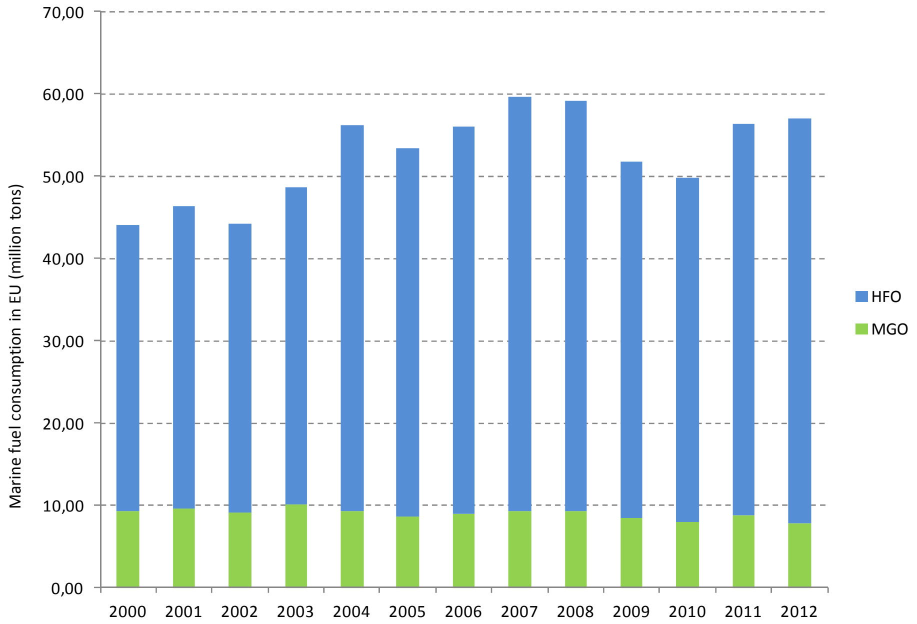
The next step is to estimate EU marine fuel consumption, per type of fuel (HFO; MGO), between 2000 and 2012. This can be achieved by transforming the GHG emissions data, in equivalent tonnes of CO2 (Eurostat, 2014), to tonnes of

[26] https://www.fuelseurope.eu/dataroom

combusted fuel. According to the IMO (2014)[27] the emission factors are 3.1140 gCO2/gfuel and 3.2060gCO2/gfuel for HFO and MDO, respectively.

Then, taking into account that (1) HFO is mainly used by the main engine and boiler and MGO for the auxiliary engine; and (2) the annual fuel consumption in 2012 by vessel type and machinery component (main, auxiliary and boiler) presented by IMO (2014), the fuel demand in EU was as shown in Figure 4-1.

Figure 4-1 Marine fuel consumption in the EU from 2000 to 2012. Source: Pocketbook 2014 and Europia (2012), based on data from PFC Energy.



It should be mentioned that the demand of LNG bunkering is not included in Figure 4-1 because its volume might be considered as negligible (about 0.07 million tonnes according to DNV, 2013).

Forecast of marine fuel demand in EU until 2025

By 2015, the maximum allowable sulphur content in ECAs needs to be cut to 0.1%, well below what is feasible for bunker fuel oil. Thus, fuel demand in ECAs will be met, mainly, by maritime gasoil (LSMGO). However, despite some studies stated that the penetration of LNG into the maritime fuel market is also highly uncertain prior to 2050, LNG may also serve as a possible replacement for oil-based fuels, since it has the best chance of becoming economically viable, principally for ships operating in ECAs, where LNG is available. Actually, 42 LNG fuelled ships (excluding LNG carriers and inland vessels) were in operation worldwide in 2013 but most of them belongs to car/passenger ferries which are owned by Norway's ferry companies (i.e.: Fjord1;Torghatten Nord)[28].

In addition, we consider the fuel consumption projections indicated in Table 4-5.

[27] Reduction of GHG Emissions from ships. Third IMO GHG Study 2014 – Final report. MEPC 67/INF. 3, 25 July 2014. IMO
[28] DNV(2013). LNG for Shipping – Current status. Small Scale LNG 22nd Oct 2013.

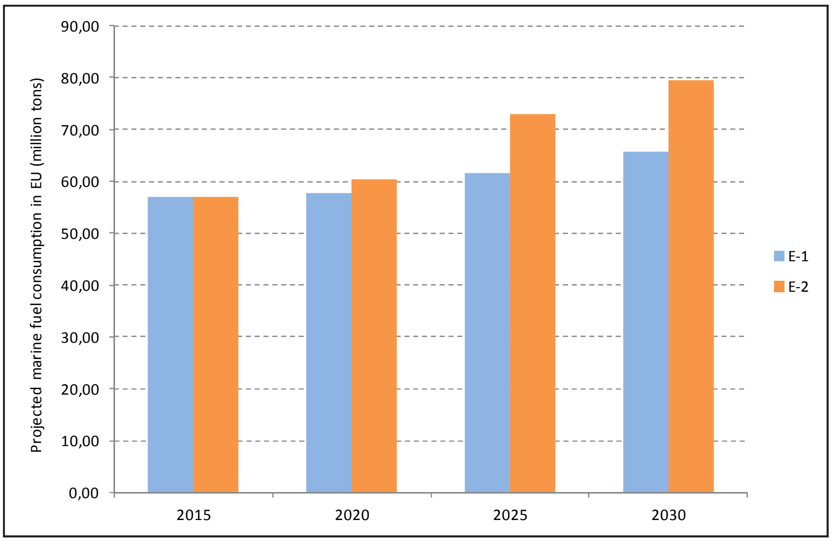
Table 4-5 Fuel consumption projections by 2025. Source: OECD, IEA, EIA.

Source/Study	Projections
IMO (2014)[29]	The IMO projected 4 BAU scenarios for the maritime CO2 emissions, depending on future economic and energy developments. For these scenarios it was assumed that LNG incidence is low and no additional ECA zones arise. All BAU scenarios show an increase in emissions, ranging from 50% to 250% in 2050. The average emissions growth across all 16 scenarios in 2020 amounts to 7% of 2012 emissions; 29% for 2030; and 95% for 2050.
IEA/OECD (2009)[30]	The IEA's Baseline scenario projects slightly more than a doubling of shipping tonne-kilometres (tkm) between 2005 and 2050; in the High Baseline scenario, it triples. Assuming about a 25% reduction in energy intensity over this period, fuel use increases by 60% in the Baseline scenario and by 140% in the High Baseline scenario by 2050. The IEA Baseline scenario assumes that a vast majority of future shipping fuel will be HFO or marine diesel. The BLUE Map scenario assumes that policy support enables low-GHG biofuels to achieve a 30% market share by 2050.
Lloyd's Register Marine (2014)[31] Global Marine Fuel Trends 2030	HFO (with abatement technology) will still be very much around in 2030, taking 47%-66% of the fuel mix. The space left by the declining share of HFO will be filled by low sulphur alternatives and by LNG. A considerable proportion of the fleet (older tonnage) will rely on MDO/MGO for ECA compliance (20-30%). LNG will reach a maximum 11% share by 2030. Segments with the higher proportion of small ships see the highest LNG uptake.
DNV Shipping 2020 study.	In 2020, approximately 1000 vessels will be fuelled by LNG and sailing within regions, primarily in ECA zones. Offshore vessels and ferries dominate the LNG fuelled fleet and order book today. Consequently, the demand in 2020 is expected to be within the range 1.4-2.2 million tonnes in Europe and Baltic Sea.

Thus, according to IMO projections and corresponding baseline scenarios, the lower and the upper fuel consumption forecast for the second period (2013-2025) is estimated and depicted in Figure 4-2.

[29] IMO (2014). Third IMO GHG Study 2014 – Final report.
[30] IEA (2009). Transport, Energy and CO2. Moving Toward Sustainability.
[31] LR(2014). Global Marine Fuel Trends 2030. Lloyd's Register Marine. University College London.

Figure 4-2 Projected marine fuel consumption per scenario (E-1;E-2). Source: authors based on IMO (2014).



Secondly, in order to estimate the fuel demand per type, the Global Marine Trends established by Lloyd's Register in 2014 (LR, 2014) are briefly introduced:

- **Strong uptake of conventional fuels**. In this scenario is assumed that HFO stills holds almost half of the fuel share by 2030 because HFO combined with abatement technology is still considered the most cost-effective option for the majority of the fleet. LNG will be adopted gradually and the least penetration for the containership segment.
- **Uptake of LNG due to regulatory drivers**. It was assumed a universal sulphur regulation (no ECAs) which is the primary reason for the sustained use of HFO, with MGO/MDO continuing to be used primarily for the smallest ships and for auxiliaries.
- **Low uptake of LNG**. HFO maintains a high share of nearly 60% of the marine fuel mix by 2030. This scenario is characterised by high protectionism, regulatory uncertainty and increased barriers and assumed a high fuel price scenario but the price differentials result in HFO being the most cost-effective option.

Finally, Figure 4-3and Figure 4-4 show the fuel consumption evolution, differentiating by HFO, MGO and LNG, for the next years and for the two scenarios considered (E-1; E-2) in EU sea basins.

Figure 4-3 Projected marine fuel consumption per typology according to scenario E-1. Source: own elaboration based on IMO (2014) and LR(2014)

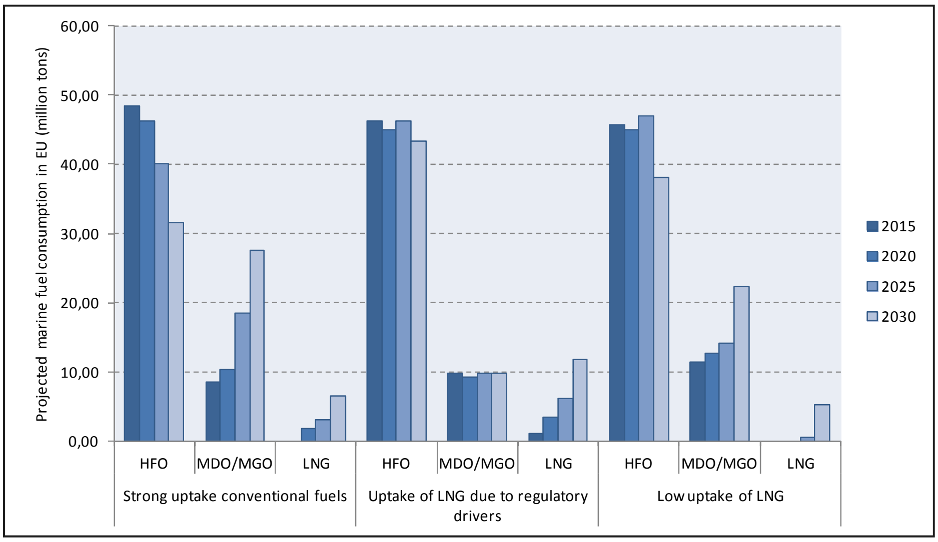
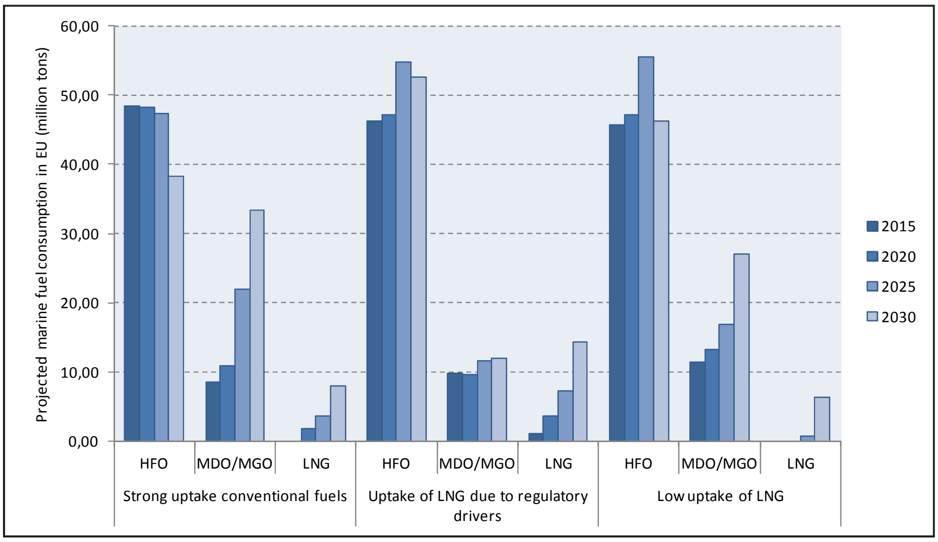


Figure 4-4 Projected marine fuel consumption per typology according to scenario E-2. Source: own elaboration based on IMO (2014) and LR(2014)



Despite that the HFO consumption increases by years (due to the global fuel demand is projected to increase), which confirms that marine transportation market heavily depends on it, the HFO share decreases in favour to LSMGO and LNG fuel which is slowly introduced in the bunkering market. For instance, for the second scenario (E-2), the HFO share goes from 85% to 65% share, considering the low uptake of LNG scenario.

4.3.2 Assess the evolution in retrofitting of vessels versus new buildings using alternative fuels and the potentiality of new technologies

Retrofit solutions as potential alternatives for new sulphur regulation

Besides using alternative low sulphur content fuels, LNG fuel, methanol, liquefied petroleum gas (LPG) or Biofuels which whilst potentially attractive to new build projects, there are two additional compliance methods that involve retrofitting of vessels. Table 4-6 shows the main features of retrofitting options regarding financial, technical and regulatory issues.

Table 4-6 Financial, technical and regulatory issues of retrofit options

Compliance method	Financial issues	Technical issues	Regulatory issues
Exhaust gas cleaning technologies: scrubbers	Financial loss due to the need to pause the operation of a ship, approximately for one month, in order to fit scrubbers onboard. Shipowners stressed that retrofitting for compliance methods requires high investments. For many shipowners this option is not feasible because there is no financial support by the private entities, therefore such projects are only feasible if there is financial support by EU programs. The investment costs ranges from 100-200€/KW for new installations and from 200-400€/kW for retrofit installations. In other words, it is about 1.2 to 2.2 M€ for new vessels and from 2.2 to 4.5 M€ for retrofit vessels[32]. However, other sources said that the investment cost is 10M$ for an engine of 10,000kW or within the range from 4 to 8 M€ (according to e-survey) Then we should consider an additional use of fuel about 2%, maintenance cost (about 0.5-0.7 million €/year) and purchasing cost of NaOH and fresh water for closed systems and cost for disposal of sludge. Due to the vessel lifetime is 20 years on average it is just recommended for new ongoing vessels since the amortization period is about 3	Companies are facing various technical challenges, since the installation of a scrubber is complicated due to the size of such equipment (mainly in small vessels). Also the weight and the impact of this technology onboard should not be underestimated.	There is a currently lack of regularity clarity on whether the discharge of was water and bleed off water is permitted in EU ports due to conflict between the Water Framework Directive and the Sulphur Directive. In fact, wet scrubbing is associated with wash water discharge that this was water is subject to internationally agreed controls for pH<6.5, PAH and turbidity which are continuously monitored and recorded (MEPC 184(59)).

[32] COMPASS final report (2009)

Compliance method	Financial issues	Technical issues	Regulatory issues
	to 5 years.		
Converting to dual fuel engines and LNG tanks	Financial loss due to the need to pause the operation of a ship, approximately for 75 days, in order to fit scrubbers onboard. The converting cost, which includes engines and fuel tanks, is very costly. If the engines are substituted the cost could reach the 25-30% of the total vessel cost whereas it will be about the 10% if the engine is just adapted. From the e-survey it was estimated about 15-20%	Dual engines will be able to consume both HFO and LNG fuel, according to the regulation applied. In practice, all vessels can be converted where available space (key factor) exists for the LNG tanks onboard the vessel. But, the installation of the LNG tanks will reduce the vessel capacity because the LNG cannot be stored in the double bottom tanks. It must be stored in independent tanks. It requires about 1.8 times more volume than MDO with equally energy content. But if the tank insulation is need, then the volume is about 2.3 times higher[33].	The use of LNG involve compliance for a range of potential future legislation (SOx, GHG, harmful particulates). Burning LNG produces 85-90% less NOx than the conventional fuel, and GHG emissions are reduced by 15-20%.

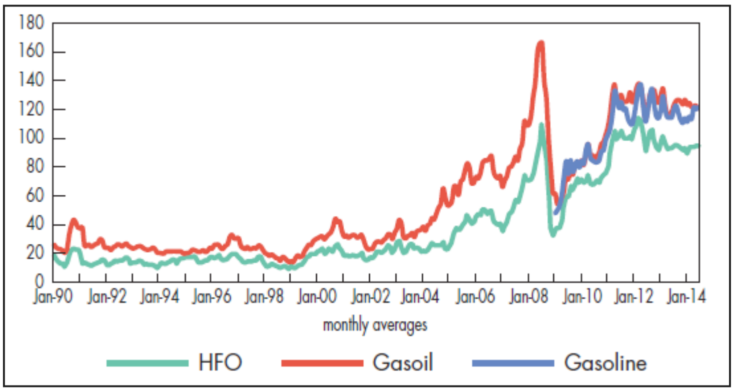
Abovementioned options are recommended for vessels operating in EU sea basins. However, for ocean-going vessels that operates periodically with European ports and stays for short periods in ECAs it is suggested to use low-sulphur content fuels and assume higher rates instead of doing a large investment to transform its engines.

Fuel price evolution and operating costs increases

During the last years, the cost of bunkering fuel has been characterized by large fluctuations. Despite the dip in 2009, an increasing trend has been observed until last months of 2014, when oil price collapsed. Figure 4-5 shows this price evolution from the nineties.

[33] TransBaltic (2012). Implications of new regulation regarding sulphur content in ship's fuel on maritime transport sector within Baltic Sea Region. Baltic Ports Organization Secretariat.

Figure 4-5 Rotterdam bunker oil prices (USD/barrel) evolution from the nineties Source: Key World Energy Statistics, IEA (2014)



As it can be observed, at the beginning of the nineties bunker price was rather low so the difference per tonne between HFO and distillates was not too high and was about 50-100USD per barrel. As the bunker prices increased the difference deepened. According to the evolution depicted in previous figure, distillates fuels were from 30 to 100% more expensive than HFO.

Additionally, from the 1st January 2015, low-sulphur content fuels (0.1%) get more importance in SECA areas. The differences per metric tonne between those fuels and HFO or MGO are depicted in Figure 4-6.

Figure 4-6 Rotterdam bunker and Brent price ($/metric tonne) evolution from January 2014 to January 2015. Source: www.shipandbunker.com

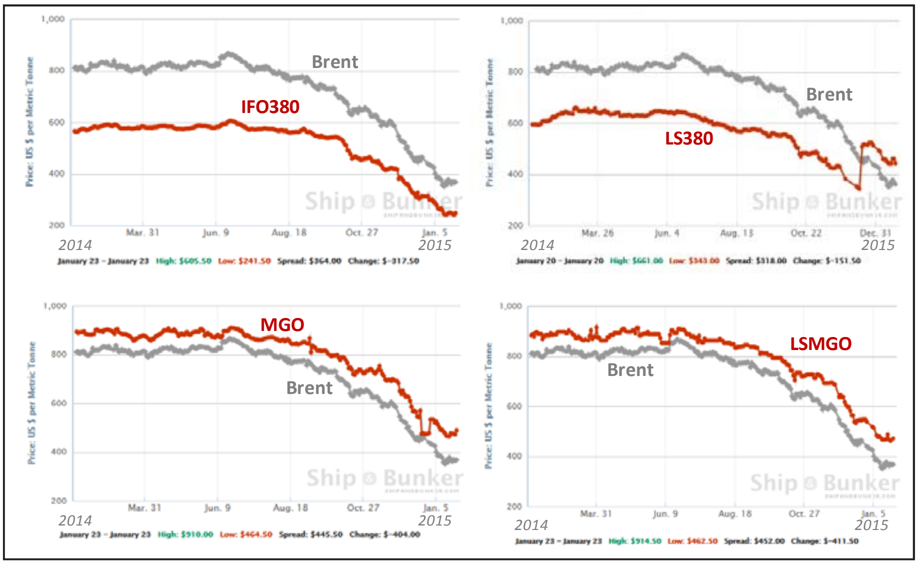


Figure 4-6 shows the evolution of daily prices reported by Ship and Bunker for the port of Rotterdam during 2014. For instance, the price differences registered the 23th of January 2015 in the Port of Rotterdam are indicated in Table 4-7:

Table 4-7 Daily prices (metric tonnes) of by Ships and Bunker for the port of Rotterdam (23th January 2015)

Type of fuel		Price	Change (vs. non LS)	Change (vs. LS MGO price)
HFO	IFO 380	247,50 $/mt	-	+90%
	IFO 180	280,50 $/mt	-	+68%
Marine diesel	MGO	489,00 $/mt	-	-4%
	LS380	442,50 $/mt	+79%	-
Low-sulphur fuels	LS180	366,50 $/mt	+31%	-
	LSMGO	471,00 $/mt	-4%	-

As it can be observed, there are large differences between low-sulphur fuels (0.1%) and conventional HFO fuels, while differences between marine diesel prices are small. Actually, at mid December 2014, LS380 prices increased drastically while IFO380 kept decreasing. Thus, price differences between low-sulphur and non low-sulphur are currently about 80% for LS380, while for LS180 price change is lower (about 40%).

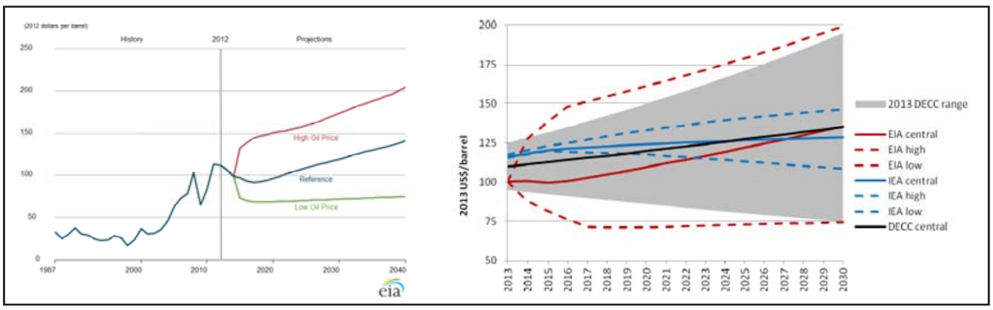
Low-sulphur fuel prices projections

The future price of low-sulphur content fuels is unforeseen and different projections have been made. The following table summarize most relevant:

Table 4-8 Fuel price projections by 2025. Source: OECD, IEA, EIA.

Source/Study	Projections
Maritime Fuel Price and Uptake Projections to 2035 (based on energy and fuel projections produced by the OECD, the International Energy Agency (IEA) and the US Energy Information Administration (EIA). (see Figure 4-7)	The variation in HFO prices is correlated to the movement of oil prices. Its prices will range between $350 per tonne to $1,000 per tonne in 2015, and from $300 to $1,200 per tonne, in 2025. MGO prices will range between approximately $500 ($12/mmBTU) per tonne and $1,500 ($37/mmBTU) in 2015, and from $480 to $1,800 per tonne by 2025.
DECC Fossil Fuel Price Projections (2013)	Three different scenarios are defined to project oil price evolution: central, high and low. The projections are sense-checked against external forecasts such as those made by the IEA and EIA.

Figure 4-7 Energy prices projections by EIA ($ per barrel) and DECC (2013). Source: www.eia.gov



LNG price projections

The future price of LNG as shipping fuel is also uncertain. Its price may be indexed to that of oil, as is the case for most current long-term LNG contracts. Similarly to previous table, the following shows the different price projections assumed:

Table 4-9 LNG price projections by 2025. Source: OECD, IEA, EIA.

Source/Study	Projections
Maritime Fuel Price and Uptake Projections to 2035 (based on energy and fuel projections produced by the OECD, the International Energy Agency (IEA) and the US Energy Information Administration (EIA)).	LNG prices evolution goes from 320 to 800$ per tonne (7 to 17$/mmBTU) in 2015 to the range of 400-1200 US$ per tonne (9 to 26$/mmBTU) in 2025.
World Ports Climate Initiative (WPCI). IAPH – Port Environment Committee.	Based on a relatively constant projected oil price of 100$ per barrel through to 2030, future oil-indexed LNG contracts at prices of 10-15$/mmBTU (1mmBTU=293kWh) have been used in a range of studies assessing the costs and benefits of LNG as a shipping fuel34.
Ocean Shipping consultants (*Royal Haskoning*), LNG as a bunker fuel: future demand prospects & port design options (2013).	A Danish Maritime Authority study[35] focusing on Northern Europe estimated future LNG prices in comparison to MGO price forecasts. The results of the analysis stated that LNG prices will be within the range 60-80% of the HFO price on energy basis.

Vessels' operating costs

It should be noticed that not all types of vessels will be similarly affected by the increased bunkering prices. It depends on the share of bunker costs (oil prices changes) on vessel's voyage operating cost and on the route concerned and operational speed of vessels.

According to the COMPASS report and price costs expressed in €2005, bunker costs represents on average 47% of the daily operating costs for a container vessel, 32% for a RoRo vessel, and 22% and 12% for large (12,000 DWT) and small (3,000 DWT) RoPax vessels, respectively. The total daily cost included manning, insurance, repairs and maintenance, stores and lube oils, administration, capital investments, interests, bunkering costs and port fees. Nevertheless, it should be considered that fuel consumption is very sensitive to the vessel speed. In fact, the relationship between fuel consumption and vessel speed follows a logarithmic function.

In such a context, a Finnish study36 estimated the effect of the estimated price rise for fuel on the day-to-day running costs for container vessels according to the Finnish Vessel Cost Survey 2006 and Karvonen (2007). From such study, it was stated that Car and passenger ferries have by far the highest operational and fuel costs per transport unit. The running costs for RoRo ships are clearly higher than other cargo ship types when costs are examined for each transported unit (Karvonen et al, 2006). Then, the fuel cost per travel day for the different types of

[34] World Ports Climate Initiative (WPCI). IAPH – Port Environment Commitee. (http://www.lngbunkering.org/lng/business-case/incentives)
[35] Ocean Shipping consultants (Royal Haskoning), LNG as a bunker fuel: future demand prospects & port design options (2013).
[36] Ministry of Transport and Communications Finland (2009). Sulphur content in ships bunker fuel in 2015. A study on the impacts of the new IMO regulations on transportation costs.

vessel is: container vessels 75%, conventional dry cargo vessels 65%, dry bulk vessels 65%, tankers 60 %, RoRo vessels 50%, and car and passenger ferries 55%.

It should be taken into account, as seen in Figure 4-5, that oil prices in 2006 and 2007 were 40-50% higher than in 2005 which justified because bunker costs rates are higher. Currently, oil prices are similar to 2007 and 2008, thus we proceed by using percentages from the Finnish study.

Impacts on operating costs

Thus, the increasing range on daily operating cost can be estimated according to the following expression: $S(\%)(P_{LSMGO}/P_{HFO} - 1)$; where S(%) is bunker cost share per type of vessel. Table 4-10 shows increasing ranges when the price of LSMGO ranges from 1.2 to 2.0 in comparison to the price of conventional fuel HFO.

Table 4-10 Increasing rates on daily operating costs per type of vessel. Source: Finnish study and own elaboration

Type of vessel	Increasing range(%) [1.2 P_{HFO} - 2.0P_{HFO}]	Type of vessel	Increasing range (%) [1.2 P_{HFO} - 2.0P_{HFO}]
Container vessels	[15-75%]	Tankers	[15-60%]
Conventional dry cargo vessels	[13-65%]	Ro-Ro vessels	[10-50%]
Dry bulk vessels	[13-65%]	Car and passenger ferries	[11-55%]

4.3.3 Assess the readiness of the sector to comply with the new 2015 and 2020 sulphur emission rules

In previous sections we have seen the different alternatives to comply with the new 2015 and 2020 sulphur emissions rules and its main advantages and disadvantages. From previous analysis, Table 4-11 shows most relevant aspects and some recommendations according to several stakeholders' feedback.

Table 4-11 Main economic and technical aspects of each compliance method and recommendations to assess the future readiness of the sector.

Type of fuel	Main economic and technical aspects	Observations and recommendations
Low-sulphur content fuels (LS380, LSMGO)	Higher fuel price of LSHFO but it is not required to invest in new engines and retrofit vessels	This option is the most useful for ongoing vessels that sail during short stays (routes that are not fully in intra-EU countries) in SECA areas. The incidence over the final price depends on the type of vessel. Containerships are the most sensitive to bunker prices while RoRo and RoPax vessels are the less sensitive (see Table 4-10).
Scrubber installation	The most important parameters determining the costs for scrubbers are: -Installed in new vessel or retrofitted to an existing vessel -The system: an open or a closed circuit and wet/dry scrubbing It allows using HFO fuel which is cheaper than low-	HFO combined with abatement technology (e.g. scrubbers) is still considered the most cost-effective option for the majority of the fleet and especially the tanker (crude) segment. However, this option is just recommended for new-build vessels or ongoing vessels mainly in SECA areas that are recently working, since amortization period is expected from 3 to 5 years, being 20 years the vessel's lifetime.

Type of fuel	Main economic and technical aspects	Observations and recommendations
	sulphur fuels but initial investment and operating and maintenance costs are high.	In addition we should consider some barriers such us the Water Framework Directive 2000/60/EC and local water quality controls that require solutions from the maritime administrations. According to the ESSF sub-group EGCS WFP report, this interaction has created uncertainty and a perceived risk that wet scrubbing will not be a viable solution for many operators if they are not allowed to use these systems.
LNG fuel	Gas engines can be divided in two main categories: -Dual fuel engines: this runs on both LNG and conventional fuel. It is a flexible solution when the availability of LNG fuel is uncertain. -Lean-burn gas engines: It is a simpler installation on board and is a more suitable solution for ships operating in regions with a developed grid of LNG bunkering services. The additional cost for a gas fuelled ship will be of 10-15% of the total cost of a conventional ship, mainly produced by LNG tanks and the fuel piping system[37]. No additional abatement measures are required in order to meet the IMO requirements.	Due to the difficulties to find space for the larger fuel tanks is very likely that existing ships will be using conventional fuel instead of LNG. Then it is expected that LNG as fuel will be used for new-build ships. In particular, for vessels that can be re-fuelled quite often in order to reduce bunker capacity (short autonomy). Shortsea, ro-ro and ferries vessels are the most suitable. Segments with the higher proportion of small ships are expected to see the highest LNG uptake. It should be mentioned, that not all ports offer LNG bunkering. Then, this option could be rejected in some sea-basins.

Shipowners' preferences

According to the new ECSA survey (2014)[38], the most predominant choice was switch to low sulphur fuel (97.4%), followed by the scrubber installation and the use of LNG fuel (15.4% each). It should be noted that choosing more than one option was allowed. Complementary, the answers received through the e-survey launched by the authors of this study stated that the favourite option (3 of 4 received answers) to comply with the new sulphur regulation is changing to low sulphur fuel (LS MGO) because most of their vessels were too small for scrubbers or LNG tanks. The remaining answer was using HFO with scrubber technology.

Besides to the shipowners, there are other stakeholders involved that are required to get ready for the current market situation, that is, ports and State Members as regards to the compliance of rules and regulations. Table 4-12 resumes briefly most relevant inputs from ports placed in the North and Baltic Sea.

[37] TransBaltic (2012). Implications of new regulation regarding sulphur content in ship's fuel on maritime transport sector within Baltic Sea Region. Baltic Ports Organization Secretariat.
[38] ECSA-ESSF survey for ship operators – Monitoring Economic Impact of Low Sulphur Norms. First edition November 2014.

Table 4-12 Major inputs on port readiness according to surveys and interviews

Ports readiness

Port	Readiness and current status according to 2015 and 2020 sulphur regulation
Port of Amsterdam	At this moment they bunker LNG to inland vessels via truck-to-ship; They follow the procedures developed by the WPCI-LNG expert group of IAPH. Their national government decided that all type of scrubbers are allowed in all ports; the water from all type of scrubbers can be discharged overboard, under the condition that the scrubbers meets the IMO-demands. Monitoring this process is a task of the authority for water quality, in the Netherlands Rijkswaterstaat. This decision is already described in dutch national law. They work together with the Government, Port State Control, to focus on controls regarding sulphur regulation. Development of e-noses and a possible role for drones is investigated. Truth is at the moment, that enforcement is behind and as lot of work is to be done.
Port of Antwerp	Truck-to-ship (TTS) bunkering service with LNG already exists, but the construction of a bunkering station (TPS), that will be ready in 2016, will make LNG continuously available for barges (partially subsidised by the EC TEN-T programme). In particular, the LNG Master Plan for the Rhine-Main-Danube aimed at promoting LNG as a fuel and as a cargo for European barges. The Ship-to-Ship (STS) for vessels is currently under project. Only closed loops (scrubber technology) are allowed in the port of Antwerp according to the Flandes regulation (Water Framework Directive)
Port of Turku (Finland)	LNG bunkering is already available and bunkering procedures have been developed. It is served through truck-to-ship bunkering and they are considering different port dues for "Greener Vessels". However, the LNG demand is really short.
Danish Ports	Readiness of investment in facilities when demand for LNG, on shore power supply and scrubbers. Danish ports are very active in port's environmental management plans and are developing best practices guidelines.

As observed, most of the ports are ready to supply LNG fuel at ports. Different fuelling options are available at ports, but the vast majority offer truck-to-ship services. Further improvements, such as the direct bunkering from Terminal-to-ship via pipeline will be suitable at the Port of Antwerp in 2016.

Regulation compliance

However, the regulation about waste disposal from scrubbers which differs from State Members could be seen as a potential threat for the success of this alternative. In some ports, according to local water quality controls, it will not be able to use all kind of scrubbers systems. This interaction creates uncertainty and is perceived as a risk for many shipowners. Thus, it can be concluded that under this context, the SSS sector is not ready due to a lack of a common regulatory framework.

Finally, special attention should be given to inspections and controls to verify that vessels operating in SECAs are following ongoing regulation. From Directive 2012/33/EU, the responsibility is given to State Members. Moreover, the IMO resolution MEPC 181 (59) gives the guidelines to Port State Controls inspectors to verify that the fuel used is appropriate and that the crew is informed about SECA's directives. For example, The Port of Antwerp is in constant communication with Port State Control to assure that the enforcement is achieved.

5 Analysis of the current, emerging and possible future trends in EU Shipping and Short Sea Shipping from the demand side

5.1 Evolution of SSS cargo transport in the different European sea areas

Decreasing cargo transport by SSS …

A central step in the analysis of the current, emerging and possible future trends in EU shipping and SSS is to look into recent developments.

Table 5-1 shows for this purpose the developments in EU cargo transport by SSS and by non-SSS (i.e. deep sea shipping) during the period where we have such detailed data from Eurostat – i.e. 2005 to 2012. Hence, we have data from a few years before the recent economic crisis and until 2012 when there were only few signs (which somehow still is the case in November 2014) of an emerging recovery.

However with this in mind, Table 5-1 shows that cargo transport by SSS has decreased by 1.6% between 2005 and 2012, mainly caused by decreases in the North Sea and the North East Atlantic Ocean sea basins, while other sea basins – hereunder the Baltic Sea and the Mediterranean Sea – have seen cargo transport grow. These latter sea basins have actually seen even stronger growth in cargo transport by non-SSS, and so the SSS market share has fallen in all sea basins.

Table 5-1 Cargo transport by SSS and non-SSS, by sea basin, 2005-2012. Source: Eurostat, Maritime transport statistics.

	2005	2012	Change
SSS (m tonnes)			
Total(2)	1,808	1,778	-1.6%
Baltic Sea	412	424	3.0%
North Sea	558	506	-9.3%
North East Atlantic Ocean	288	243	-15.6%
Black Sea	133	127	-4.1%
Mediterranean Sea	567	578	1.9%
Other sea basins	110	120	8.7%

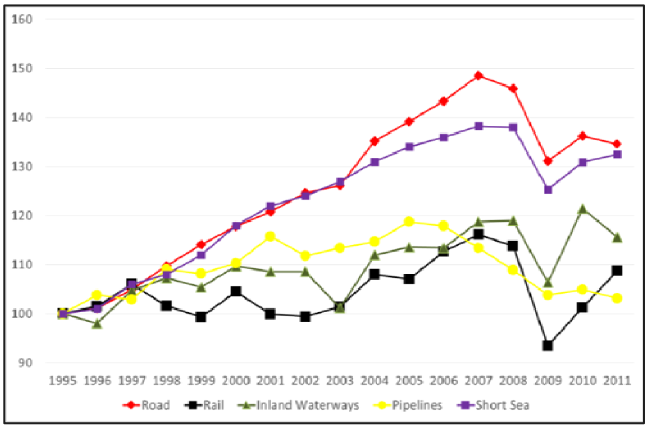
	2005	2012	Change
Non-SSS (m tonnes)(1)			
Total(2)	1,094	1,202	9.9%
Baltic Sea	183	221	20.7%
North Sea	300	289	-3.5%
North East Atlantic Ocean	173	167	-3.6%
Black Sea	67	73	8.1%
Mediterranean Sea	321	373	16.4%
Other sea basins	50	79	58.2%
SSS share			
Total(2)	62.3%	59.7%	-2.6pp
Baltic Sea	69.3%	65.8%	-3.5pp
North Sea	65.1%	63.6%	-1.4pp
North East Atlantic Ocean	62.5%	59.3%	-3.2pp
Black Sea	66.4%	63.7%	-2.7pp
Mediterranean Sea	63.9%	60.7%	-3.1pp
Other sea basins	68.9%	60.3%	-8.6pp

Notes: (1) Eurostat does not directly provide data for non-SSS cargo transport by sea basin, and so the figures are calculated on the basis of data by Member States and cargo type.
(2) The totals are less than the sum of the sea basin data, as they have been adjusted for double-counting of cargo transport in between sea basins.

This declining trend shown in Figure 5-1 must be seen in the light of a strong growth in cargo transport by SSS in the period 1995 to 2005, i.e. at a rate almost equal to that of road cargo transport.

Hence, from these data sources it seems that cargo transport by SSS has lost some momentum in recent years partly as a result of the economic crisis and partly via lost market share to non-SSS (and possibly also to other transport modes). While the former loss may be somewhat remedied when the EU economies hopefully recover, the latter loss may – which is a core question for the present study – require actions to regain market share, in particular in the North Sea, North East Atlantic Ocean, and Black Sea - basins.

Figure 5-1 EU cargo transport, 1995-2011. Source:http://www.shortsea.info/statistic.html. Note:Short Sea development for 2006-2011 is estimated by CENIT/VITO/COWI on the basis of Eurostat data for cargo transport in tonnes.



… mainly for liquid bulk goods

In section 2, we could realize that liquid bulk accounted for 46% of the SSS of freight cargo whereas solid bulk share was about 20% of SSS within EU in 2012. Containerized and RoRo cargo reported about 13% each cargo segment. However, Table 5-2 shows that the decrease in SSS cargo transport since 2005 mainly is caused by a decrease in the transport of liquid bulk goods such as oil products and LNG (-10,7%).

There has also been a fall in the SSS transport of other cargo not elsewhere specified. This fall has, however, been even larger for the non-SSS sectors and so the market share of SSS has increased.

In contrast, there has been an increase in the SSS cargo transport via RoRo mobile self-propelled units such as trucks; but since there has been an even larger increase within the non-SSS sector, the SSS market share has actually fallen.

Table 5-2 Cargo transport by SSS and non-SSS, by type of cargo, 2005-2012. Source: Eurostat, Maritime transport statistics.

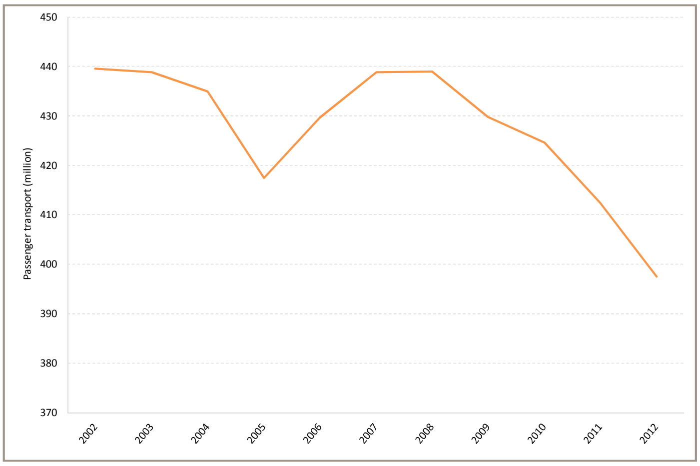
	2005	2012	Change
SSS (m tonnes)			
Total	1,808	1,778	**-1.6%**
Liquid bulk goods	914	816	**-10.7%**
Dry bulk goods	352	356	**1.1%**
Containers	183	242	**31.7%**
Ro-Ro, mobile self-propelled units	123	135	**10.1%**
Ro-Ro, mobile non-self-propelled units	97	98	**1.1%**
Other cargo not elsewhere specified	138	130	**-5.4%**
Non-SSS (m tonnes)			
Total	1,094	1,202	**9.9%**
Liquid bulk goods	269	342	**27.2%**
Dry bulk goods	391	328	**-16.0%**
Containers	276	366	**32.4%**
Ro-Ro, mobile self-propelled units	57	76	**31.8%**
Ro-Ro, mobile non-self-propelled units	44	45	**3.8%**
Other cargo not elsewhere specified	56	44	**-21.2%**
SSS share			
Total	62.3%	59.7%	**-2.6pp**
Liquid bulk goods	77.2%	70.5%	**-6.8pp**
Dry bulk goods	47.4%	52.1%	**4.7pp**
Containers	39.9%	39.8%	**-0.1pp**
Ro-Ro, mobile self-propelled units	68.2%	64.1%	**-4.0pp**
Ro-Ro, mobile non-self-propelled units	68.9%	68.3%	**-0.6pp**
Other cargo not elsewhere specified	71.2%	74.8%	**3.6pp**

Decreasing passenger transport by SSS

Eurostat data for the EU-28 maritime passenger transport point, as shown in Figure 5-2, also to a decrease during the recent economic crisis. Eurostat does though not explicitly distinguish between SSS and non-SSS, but since the passenger transport mainly takes place along the coast, the development is envisaged to be representative for SSS.

Furthermore, it is not that obvious how to measure the SSS market share vis-á-vis land passenger transport by road or rail. Although many Member States have comprehensive rail networks they are rarely designed with the main purpose of connecting coastal cities. Hence, any comparison should thus be with that of road transport. In this context, it should be acknowledged that part of the SSS transport such as that of cruise ships is not really competing with the roads.

Figure 5-2 Maritime passenger transport, EU-28, 2002-2012. Source: Eurostat, Maritime transport statistics.



5.2 Analysis of SSS freight typologies and potentialities

Types of traffic

There are three main kinds of freight movements (or traffic sources) that can be considered, all labelled as Short Sea Shipping, having different degrees of sensitiveness to the identified drivers of modal shift:

- **Captive traffic**. Whenever no alternative mean of transport exists, namely traffic connections from/to islands, within big land masses separated with a big water body (e.g. south and north of the Mediterranean basin) or when the land connections require significant detours (e.g. East and West Baltic Sea or certain traffics between mainland Europe and Great Britain). For instance, in 2012, more than 85% of Finnish foreign trade was transported by sea[39]. Its main destinations were Germany, Denmark, Sweden, Poland and UK. Due to Finland's location (oversea), road transport is not seen as a potential alternative as it is too costly in terms of time and money, compared to short sea shipping. The same situation can be extended to parts of Sweden, Norway and the UK.

- **Deep Sea Shipping feeder traffic**, SSS lines distributing and/or collecting freight for DSS services. These lines are essential for maritime services using hub-and-spoke strategies based on transhipment. They typically focus on container SSS traffic. However, there are also SSS services for other specialised traffics (oil, bulk, cars, etc.) needing feeder services from hub ports. Examples can be found in the biggest EU ports such as Rotterdam, Hamburg or Antwerp, but also in smaller ports (Algeciras,

[39] http://www.ulkomaankaupanreitit.info/english/foreign_trade_transports_map_big_2012.jpg

Valencia, Marsaxlokk or Gioia Tauro for containers or Fos-Marseille, Sines for oil and bulk, etc.).

- **Domestic traffic competing with other modes**. Understood as freight with country of origin or within European countries. It may be the situation between Spain and Italy or across the Adriatic Sea since the road alternative is not sufficient enough.

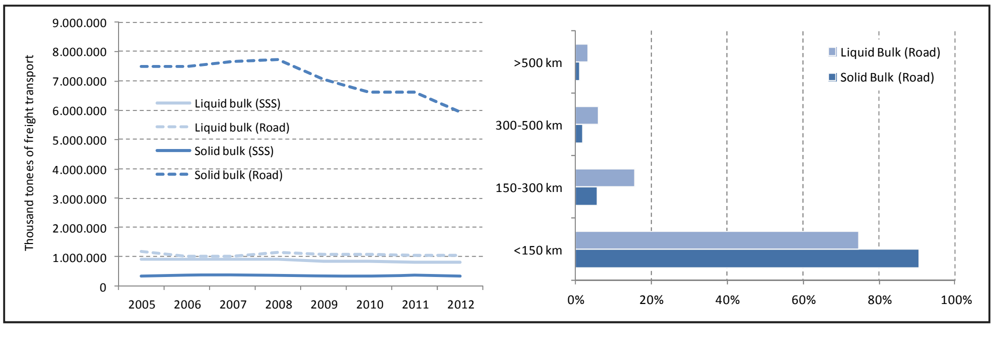
Lessons from the dynamics of shipping cargo segments

SSS traffic should also be analysed through the type of freight being shipped. Previously, the importance of the bulk cargo for the maritime sector was shown. This type of cargo is shipped in large quantities and can be easily stowed in a single hold with little risk of cargo damage. It usually requires the use of specialized ships operating under irregular services (tramp). Conventionally, this kind of cargo has a single origin, destination and client. Economically it is characterized by important economies of scale.

All this aspects make the concentration in a hub and distribution by SSS a competitive solution compared to direct services to the smaller terminals. On the other hand, SSS distribution is usually competitive in compared to road transportation. The final destination of oil, coal and many other bulks is a limited number of facilities (power plants, industrial complexes, etc.) so the optimisation of the supply chain using maritime transport for the last leg is very stable. Traffic reductions of this type of cargo must be analyzed more in terms of the bulk cargo demand evolution rather than in terms of possible (back) modal shifts.

Figure 5-3 is a good indicator of why bulk cargo can be considered as a competitive traffic for short sea transport. On the left side, the evolution of liquid and solid bulk traffic for SSS and road is shown, while the right side shows the quick decline of bulk road transport with distance. The first graphic confirms that, despite of the demand decrease in the EU, SSS traffic remained constant, while road traffic decreased (in particular for solid bulk). This denotes the inelasticity of the demand for certain bulk cargo segments served by SSS, whilst road transport, which serves a wider range of bulk goods has much more volatility. The strong reduction of road market share with trip length makes SSS very competitive for distances above 300km. This applies to countries located in the Baltic and North Sea basins (3% of EU road transport) and for the distances above 500 km to the EU central countries (1% EU road transport).

Figure 5-3 a) Road and short sea transport for dry and liquid bulk evolution; b) Road transport per distance in EU. Source: Eurostat (2014)



Therefore, despite a small loss of market share of SSS liquid bulk (6.8pp in 2012 w.r.t. 2005), the evolution of road and SSS transportation follows similar trajectories. Secondly, the competitiveness of SSS for long distances denotes that bulk cargo is a captive traffic for this sector.

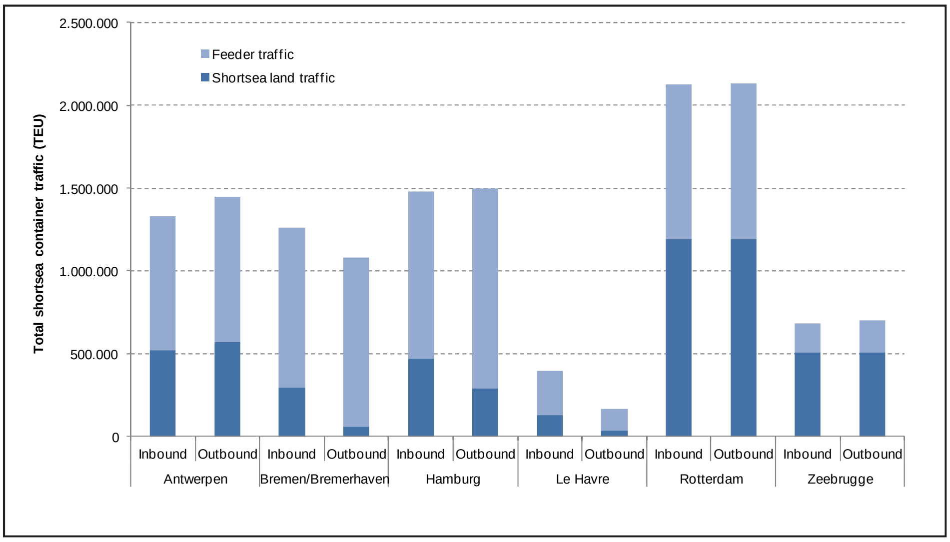
Container cargo

The containers segment follows its own dynamic. It is quite different from that of road transportation, since it is more associated to international flows, gateway ports and containership companies operating at the international level. The main hubs provide feeder services to many ports, however theses can be also provided by rail or road. When a port handles containers efficiently, SSS usually can offer competitive transport costs from the origin or to the final destination. This applies particularly to longer distances and where the road system is deficient (in terms of network or congestion). This competitiveness explains why the evolution of the container shortsea sector shows increases of 32% in 2012 (compared to 2005), parallel to total international container trade increase.

In such context, as containership size is growing, carriers have to come together in alliances to fill these vessels, thus a change in the nature of demand is expected. Demand for bigger ports and higher capacity terminals due to consolidate volumes and a greater peak volume (decrease in frequency of vessels) is required. This involves the need for extended feeder services connecting transhipment hubs with smaller spoke ports. Thus, container SSS services in the North Europe range are expected to increase at short/medium term because of this incoming scenario.

Figure 5-4 shows the past situation (2013) of short sea container traffic of the 6 main North Range ports. The feeder traffic and short sea land based traffic are differentiated, in which the former is related to the hinterland traffic of the reporting port and the latter to the cargo having its origin or destination in Europe (domestic traffic between EU countries which could be considered as captive traffic).

Figure 5-4 Short sea container traffic in the North Range. Source: North European Container Traffic Model developed by Institute of Shipping Economics and Logistics (ISL, 2013).



For instance, in case of traffic from Antwerpen to the rest of EU ports, it can be observed that 1.45 million TEU are exported through short sea shipping, of which 0.57 million TEU (40%) are hinterland traffic of Antwerp. It should be mentioned that this excludes container traffic being transhipped in the destination port to overseas destinations and, of course, the transhipment traffic in Antwerp (i.e. all containers that arrived in the port of Antwerp by sea).

The previous figure and traffic data from ISL (2013) show that deep sea shipping feeder traffic represents 61% in Antwerp, 85% in Bremen/Bremerhaven, 74% in Hamburg and Le Havre ports, 44% in Rotterdam and only 24% in the port of Zeebrugge of inbound and outbound cargo. The rest of traffic is related to short sea traffic based on the hinterland with EU countries as origin or destination.

Table 5-3 provides detailed traffic data for each port indicating the origin/destination of short sea cargo.

Table 5-3 SSS container traffic data from the point of view of the 6 major ports within the North range indicating origin and destination and type of traffic. Source: North European Container Traffic Model developed by Institute of Shipping Economics and Logistics (ISL, 2013).

PORT	SEA-REGION	Inbound/outbond	Total TEU	Shortsea-land traffic	Feeder traffic
Antwerpen	**UK/Ireland**	Inbound	197,624	**73%**	**27%**
		Outbound	230,147	**68%**	**32%**
	Baltic Sea	Inbound	373,917	**25%**	**75%**
		Outbound	309,736	**16%**	**84%**
	North Range	Inbound	251,606	**12%**	**88%**
		Outbound	224,769	**16%**	**84%**
	Continental Atlantic	Inbound	866	**62%**	**38%**
		Outbound	42,083	**57%**	**43%**
	Mediterranean	Inbound	95,007	**41%**	**59%**
		Outbound	287,110	**44%**	**56%**
	Black Sea	Inbound	409,167	**51%**	**49%**
		Outbound	356,333	**49%**	**51%**
Bremen/Bremerhaven	**UK/Ireland**	Inbound	127,456	**72%**	**28%**
		Outbound	10,415	**50%**	**50%**
	Baltic Sea	Inbound	716,384	**22%**	**78%**
		Outbound	692,141	**4%**	**96%**
	North Range	Inbound	314,175	**9%**	**91%**
		Outbound	277,973	**0%**	**100%**
	Continental Atlantic	Inbound	1,727	**95%**	**5%**
		Outbound	5,942	**95%**	**5%**
	Mediterranean	Inbound	39,946	**35%**	**65%**
		Outbound	33,854	**43%**	**57%**
	Black Sea	Inbound	58,127	**13%**	**87%**
		Outbound	58,214	**12%**	**88%**
Hamburg	**UK/Ireland**	Inbound	154,083	**71%**	**29%**
		Outbound	30,790	**55%**	**45%**
	Baltic Sea	Inbound	885,377	**29%**	**71%**
		Outbound	920,368	**19%**	**81%**

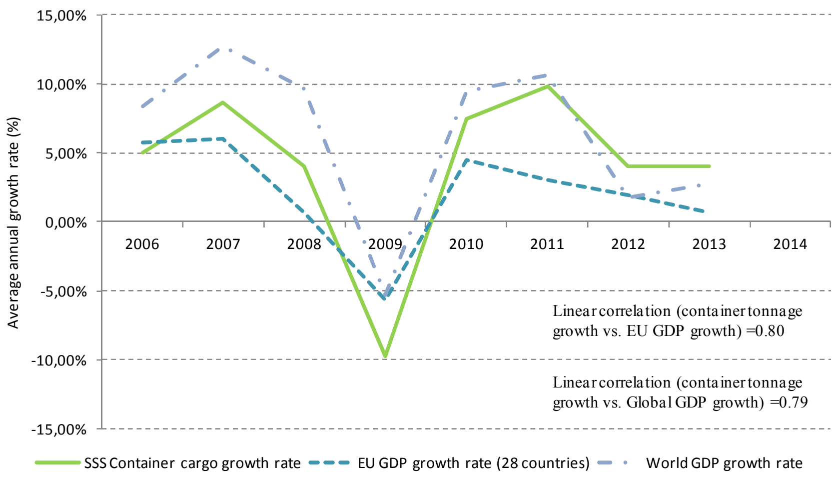
PORT	SEA-REGION	Inbound/outbond	Total TEU	Shortsea-land traffic	Feeder traffic
	North Range	Inbound	349,071	**11%**	**89%**
		Outbound	410,083	**2%**	**98%**
	Continental Atlantic	Inbound	2,995	**71%**	**29%**
		Outbound	4,161	**70%**	**30%**
	Mediterranean	Inbound	52,342	**66%**	**34%**
		Outbound	83,923	**51%**	**49%**
	Black Sea	Inbound	31,851	**95%**	**5%**
		Outbound	45,323	**95%**	**5%**
Le Havre	**UK/Ireland**	Inbound	115,018	**29%**	**71%**
		Outbound	50,941	**20%**	**80%**
	Baltic Sea	Inbound	4,680	**24%**	**76%**
		Outbound	4,173	**27%**	**73%**
	North Range	Inbound	174,900	**30%**	**70%**
		Outbound	56,061	**2%**	**98%**
	Continental Atlantic	Inbound	10,148	**21%**	**79%**
		Outbound	4,437	**20%**	**80%**
	Mediterranean	Inbound	38,577	**25%**	**75%**
		Outbound	22,123	**33%**	**67%**
	Black Sea	Inbound	52,641	**53%**	**47%**
		Outbound	25,841	**52%**	**48%**
Rotterdam	**UK/Ireland**	Inbound	956,361	**85%**	**15%**
		Outbound	956,361	**85%**	**15%**
	Baltic Sea	Inbound	693,190	**34%**	**66%**
		Outbound	688,369	**34%**	**66%**
	North Range	Inbound	233,308	**13%**	**87%**
		Outbound	241,077	**13%**	**87%**
	Continental Atlantic	Inbound	59,269	**40%**	**60%**
		Outbound	59,269	**40%**	**60%**
	Mediterranean	Inbound	168,046	**45%**	**55%**
		Outbound	169,841	**45%**	**55%**
	Black Sea	Inbound	16,298	**95%**	**5%**
		Outbound	17,647	**95%**	**5%**
Zeebrügge	**UK/Ireland**	Inbound	498,143	**97%**	**3%**
		Outbound	462,371	**97%**	**3%**
	Baltic Sea	Inbound	72,312	**16%**	**84%**
		Outbound	90,256	**21%**	**79%**
	North Range	Inbound	89,196	**3%**	**97%**
		Outbound	111,488	**14%**	**86%**
	Continental Atlantic	Inbound	-	**-**	**-**
		Outbound	-	**-**	**-**
	Mediterranean	Inbound	23,152	**37%**	**63%**
		Outbound	27,443	**41%**	**59%**
	Black Sea	Inbound	43	**100%**	**0%**
		Outbound	10,490	**100%**	**0%**

According to the provided data, the following conclusions can be made:

- The shortsea container cargo from/to UK and Ireland is mainly generated in the hinterland of main EU ports (higher than 70% of the total short sea traffic), which could be considered as domestic traffic. Due to the geographic location of the UK, this kind of traffic can be also considered captive for the maritime transport.
- The shortsea container cargo from/to the Baltic Sea is mainly based on feeder traffic from the main North range ports. In such case, feeder traffic is also considered as captive due to the geographical location of Baltic countries including Norway.
- The container cargo traffic within the North range ports is feeder traffic generated from deep sea traffic (about 80% on average). In such region, feeder services transport cargo from/to hub ports to the rest of countries.
- The traffic from/to the Mediterranean Sea region is, on average, 40% domestic and 60% feeder traffic.
- Finally, it should be mentioned that continental Atlantic and the Black Sea traffic is affected by Portugal and Turkey (respectively).No detailed cargo data regarding other countries was found.

Finally, in order to confirm the international role of SSS container sector, Figure 5-5 shows the correlation between increasing rates of traffic cargo and GDP, which are quite high (about 0.8) for both EU and Global GDP. This allows to state that the container cargo origin is mainly derived from hub ports.

Figure 5-5 Container cargo growth versus EU and Global GDP growth rates



RoRo cargo

The Ro-Ro sector (including RoPax) is the most sensitive to market changes, as it competes directly with road transportation. Until 2012, its evolution was almost flat (increasing rates lower than 1% compared to 2005 traffic) while EU road transportation increased around 30%. Short Sea Shipping in Ro-Ro ships is characterized by its bureaucratic burden and time consuming administrative procedures at ports and cross-borders, which do not help its competitiveness.

In such a context, the next section analyses the main factors affecting the growth of the SSS sector, and particularly the features of RoRo and RoPax segment, since it is considered as the most elastic to external and internal changes. The cost of switching from SSS to road transportation (modal back shift) is negligible. The flexibility that road transportation offers cannot be currently compared to SSS, which still has severe integration difficulties.

As an example, according to the interview with the managers of the Port of Antwerp, a recent evidence of back shift occured when the SSS services between Antwerp and Copenhagen were closed because of the lower prices offered by the road transport companies. For the same reason (short distance and lower prices offered by big trucking companies), the French West Coast and North Spain are not competitive for SSS from Antwerp.

According to the previous analysis, Table 5-4 summarizes the expected potentialities of SSS.

Table 5-4 SSS potentialities regarding the type of SSS considered, the stakeholders that make the decision and the traffic source

SSS type	Possible stakeholders involved on deciding transport	SSS potentialities	Extra considerations regarding traffic source		
			Domestic traffic	DSS / port originated traffic	Captive traffic
Bulk	Forwarder Cargo Owner Logistic Operator	Scale economies Tramp shipping unavoidable Traditionally linked to maritime transportation	Modal shift is feasible; however scale economies are usually too big to have a back shift to road transportation.		Traffic is unlikely to be lost and almost all demand already travels by ship. Only threat comes from changing the cargo origin.
Container	Forwarder Cargo Owner Logistic Operator Trucker (unlikely)	Scale economies Demand adaptability (variability in demand is easily absorbed by the shipping line)	Attractive whenever time is not a requirement (against other modes of transportation) or cost is much lower. Benefits from restrictions on road traffic and internalisation of external costs.	SSS is beneficial since no modal change has to be produced at port. Better for longer distances. Scale economies and demand adaptability are important, especially through shipping frequency.	Traffic is unlikely to be lost or increased. Only threat comes from changing the cargo origin. A change of maritime SSS type used is feasible.
RoRo/RoPax	Forwarder Cargo Owner Logistic Operator	Scale economies Demand adaptability Negotiation power with shipping line	Attractive whenever multimodal route behaves in competitive terms of time and cost. It benefits of adaptation to variations in demand.	Modal change is unlikely to happen at port, since it does not have sense to shift from container to RoRo at port (bigger costs).	Traffic is unlikely to be lost or increased. Only threat comes from changing the cargo origin. A change of maritime SSS type used is feasible (from RoRo to container or the other way round).
	Specialized RoRo operator (multiplatform)	Port behaves as a hub or break-bulk point Tractor heads can be reused for other services	Reason to be of this kind of operator. Figure to be promoted to take maximum advantage of RoRo or MoS lines through pooling of platforms.		
	Trucker	Tractor heads can be reused for other services Drivers can take profit of their rest time to continue their journey	Competes against road, beneficial for trucker whenever factor values perform better than road.		

5.3 Analysis of factors affecting modal shift and the main decision factors for cargo-owners, shippers and freight forwarders

Factors affecting modal shift from the literature

There is no unanimity in the literature about the factors influencing modal shift. From the findings from previous projects and the review of the existing literature (Grosso et al. (2010)[40], it is reasonable to group the factors influencing SSS modal choice into 5 main blocks, in terms of quantification units, specifically:

- Price / Cost related
- Transit time related
- Frequency / schedule related
- Quality of the service provided in terms of resiliency or reliability, ease of documentation, safety and security, etc.
- On-board facilities (whenever the truck driver travels with the cargo in RoRo/RoPax vessels).

The view of the stakeholders. Main decision factors for cargo-owners, shippers and freight forwarders

A survey has been carried out to obtain the opinion of truckers, forwarders, ship operators and shippers directly and through the SSS Promotion Centres, ESC and CLECAT in order to assess the factors influencing the decision to use or not SSS. In addition, individual in-depth interviews to particular shippers from different cargo segments and nationalities have been conducted. The significant results are summarized in Table 5-5.

Table 5-5 Main decision factors for cargo-owners, shippers and freight forwarders

Stakeholder	Main factor	Comments and decision factors	Additional comments
Anonymous freight forwarder (Baltic sea)	Lowest price option as a main criteria	Sometimes they care about the reliability of the service (risk related to the transportation and supply chain continuity).	
Anonymous cargo-owner (Atlantic sea)	The lowest price option and reliability of the service provided	As secondary criteria, they also consider the carbon footprint as a decision factor	
AGC Glass Europe	The choice of transportation alternatives depends definitively on cost	The glass industry is very sensitive to economic and financial crisis since its demand is directly related to building and automobile sectors, thus they are required to minimize costs. They need a fast service to satisfy client requirements, thus road transportation is seen as the best option.	Currently using SSS for the following cases: between Antwerp and Finland; Antwerp to the islands; Antwerp to Saint Petersburg; and from Valencia to Morocco. The main reason is because the transport alternatives are not longer

[40] Grosso, M., Lynce, A., Silla, A., Vaggelas, G.K., 2010. Short sea shipping, intermodality and parameters influencing pricing policies: the Mediterranean case. Netnomics 11 (1), 47–67.

Stakeholder	Main factor	Comments and decision factors	Additional comments
			available in terms of cost and time.
DHL	As a logistic operator, they mainly care on transportation time and safety (quality of service)	In general terms, they stated that they do not trust on SSS and maritime services due to longer transportation time and low flexibility	
European Shippers Council (ESC)	The most important factor is service quality. They would like to receive the same service quality than road transport, which is the most flexible system and faster (door to door and 7/24 service.	Second factor is reliability. Price is considered a third decision factor but transport time may be placed at the same level. Frequency is really important for shippers but also the sustainability of the shipping lines. Usually, many shipping lines receive financial aids but, when they are discontinued, the shipping service disappears.	Bulk products (liquid and solid) are very interested in SSS because they can afford dedicated ships instead of groups of 100-150 trucks on the road.
Finnish Freight Forwarder Association	The cost of transportation is the only decision factor to choose an alternative. For example, if the road option through Latvia is cheaper they will choose it.		From the perspective of Finland (country behind the sea) SSS is mainly the only mode of transportation for their international trade. So, it can be said that there is a captive traffic.
PUIG	The lead time and the quality of service is very important for the company	They argued that nobody wants stock to reduce costs. Thus, deliveries to customs are previously agreed and cannot afford delays.	They also concern on the consolidation of cargo, since they prefer to do it only at final destination and not in any previous terminal/warehouse or logistic hub.
SEAT (automobile company)	The lowest cost option is the main decision factor. They argued that maritime transport is dominated by few shipping companies (in certain sectors there is a monopoly or lack of competition) and thus, the main difference between modes is the final price.	Regarding modal shift, they stated that if there is a risk or uncertainty involved in the alternative, then the price should be much lower. However, when there are no additional risks, the probability to change the mode of transport is high and just depends on price (supply and demand as regular market theory). For such reason the accompanied Ro-Ro traffic is too volatile, because the cost to change the transportation mode is negligible.	They compared the transport as a commodity. There is a need to find real integrators of logistic services (providing a full transport service from origin to final destination)
TNT Express	As a logistic operator of express and special transport services, they mainly care on transportation time and secondly, on	They usually work with dedicated trucks and planes and have an extended hub network within EU. Their core business is also focused on optimal hub locations in order to reduce transportation costs.	Despite they consider that SSS is seen as a favourable option regarding costs, they do not rely on this services

Stakeholder	Main factor	Comments and decision factors	Additional comments
	cargo safety	They offer daily services in EU and a door-to-door service within 48h for 1,000Km. As their core business is transportation in a short time, they currently do not trust in shipping services within EU.	because of transportation time. For example, services from/to regions close to ports such as Barcelona-Geneva could be a potential option but they are not using yet.

As expected, the main decision factor for cargo-owners, shippers and freight forwarders to choose an alternative is the transportation cost, followed by reliability and quality (understood as flexibility). It is worthwhile to mention, as pointed out by the cargo owner, the importance of providing origin-final destination logistic services. Changing from an only road solution to SSS is easier for self-propeller SSS and when the supply chain does not involve several transport modes.

Strategic approach

Previous sections have analyzed the potentialities of SSS from an operative level, in terms of time and cost according to specific situations of interviewed cargo-owners, and, on the other hand, by analyzing the particular characteristics of the three types of traffic considered and their particular dynamics.

However, in order to analyse the feasibility of SSS for the different industrial sectors and freight-distribution strategies a strategic approach is required. To achieve the objective, some standard freight-distribution strategies are defined based on the requirements of the industry, the demand and the product being transported. Ultimately, this will provide information whereas a SSS is being used or has ever. For such an objective, we are considering three sets of characteristics:

- **Concentration of cargoes and volumes (geographically or in time)**: Concentration eases the apparition of full-load transportation units, allowing for cheaper transportation. Since ships are bigger than truck trailers, they need bigger cargo volumes to benefit from lower unitary costs and, therefore, it takes longer to gather enough cargo to take advantage of its economies of scale. The critical volume that makes SSS viable and the optimal frequency of shipments by road are essential to have a competitive transportation cost and service SSS with large volumes of benefit.
- **Variability in demand during periods similar to the lead time required**: Both seasonality issues and uncertainty issues are considered here. Fluctuations in demand can be assumed by the shipper or the carrier/3PL manager (third-party logistics) (for chains that run across land only) and/or the shipping companies (in the case of chains including SSS). In any case, the variability of the volume in each shipment is relevant to the dimensions of the transportation fleet as well as the extra space necessary to cover potential demand peaks.

  Variability benefits SSS competitiveness since the aggregation of flows implies a reduction in global variability, improving the performance of the equipment used for transportation (vessels). A lower global variability also implies a more efficient use of transportation equipment. Additionally, when transported cargo is the commodity being considered, SSS RoRo segment benefits cargo shippers as it is able to absorb the fluctuations in the outflow of the production company without incurring extra costs for the owner of the cargo.

- **Product value and life**: Cargo value limits the amount of time that can be spent waiting for a possible consolidation at the origin because its opportunity cost (fixed assets) is especially relevant. Perishable products are in a similar situation. Both facts directly affect the stock policy and the kind of flow prevailing in the supply chain.

  Thus, higher value of the product favours short lead times and flow-through and thus the relative weight of transportation costs lose relevance in favour of time and safety.

To sum up, the main characteristics of the transportation chain are introduced as follows:

Table 5-6 Main characteristics of the transportation chain affecting SSS competitiveness. Source: Morales-Fusco et al., 2013.

	Studied area	Factors
Concentration of cargoes and volumes	Supply chain	Multiple/few/one final supplier or client Decentralized/centralized/cross-docking/transcontinental Proximity/remoteness of suppliers and final distribution points
	Production process	Continuous vs. discontinuous production Demand stability/variability
Variability in demand during periods similar to the lead time required	Demand and suppliers	Demand volume/traffic flow needed Required frequency of receptions Demand seasonality (constant, seasonal, hot, etc.)
	Demand uncertainty	Deterministic/stochastic/random
Product value and life	Goods (cargo)	Degree of manufacturing/added value/ fixed assets/opportunity costs/inventory costs Perishable products/specialized transport equipment needed
	Stock policy	JIT/BTO/pull/flow-through/BTS/push/stock flow

At this point, in order to evaluate the potential of including SSS within the supply chain from a strategic point (in the forms of container or RoRo vessels), Figure 5-6 is introduced (Morales-Fusco et al., 2013).

Figure 5-6 Major types of transportation chains according to variability of shipments, cargo value and degree of volume concentration. Source: Authors and Morales-Fusco et al., (2013).

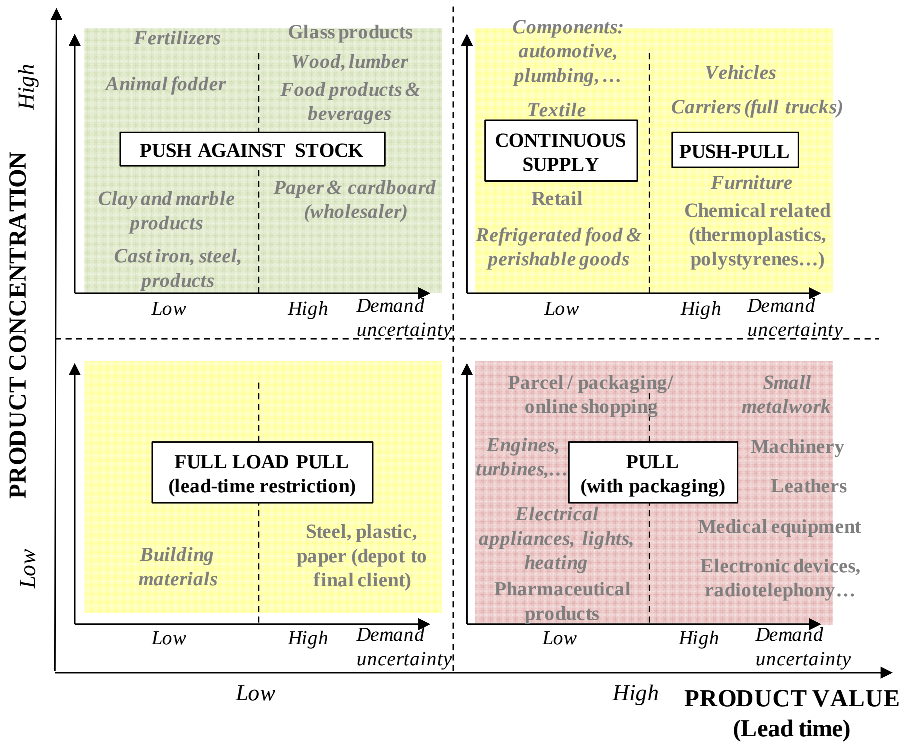


Figure 5-6 shows different examples of supply chains depending on the role of the three main requirements identified previously (according to an extended survey to an extended set of interviews with producers). It should be mentioned that it represents a general approach since many products (and companies) within the same sector can be organized differently. Then, according to the interviews and e-survey launched to shippers, cargo owners and freight forwarders we have double checked previous analysis done by Morales-Fusco et al. (2013) and, thus, to identify where SSS can be successfully integrated.

SSS potentiality related to lead time and cargo concentration

Thus, according to the potentialities of SSS from both operative approach (Table 5-4) and strategic approach (Figure 5-6), it can be finally noted that SSS is a potential alternative, when competing with other modes for domestic traffic, for the following combinations:

Table 5-7 Ranking of supply chain characteristics according to SSS potential

Ranking*	Product value (lead time)	Product concentration	Demand uncertainty
1	Low (+)	High (+)	High
2	Low (+)	High (+)	Low
3	High (-)	High (+)	High
4	Low (+)	Low (-)	Low
5	Low (+)	Low (-)	High
6	High (-)	High(+)	Low
7	High (-)	Low (-)	High
8	High (-)	Low (-)	Low

The potentiality of SSS services is optimal when the cargo concentration is high and the product value is low (lead time is high). Thus when these two factors are combined the SSS competitiveness is the highest; when none of them is satisfied the potential of SSS is the lowest; and for the rest of cases the potentiality is medium and it depends on operative factors such as cost and time to become more competitive than the alternative (see colour regions in Figure 5-6 and Table 5-7).

For instance, the automobile company SEAT handles products with high value, higher concentration with some demand uncertainty (rank 3 and rank 6). It is placed in the upper-right sector characterized by push-pull and/or continuous supply stock policies. For such type of companies (products) SSS is beneficial because RoRo vessels can absorb the fluctuations in the outflow of the production and thus, be able to decide the quantity of vehicles which are to be carried in each vessel departing. The logistic operator TNT Express used to work with high value products with short lead time and small cargo concentration, where SSS transport is not seen as potential solution because of flexibility and quick solutions to customers.

As a conclusion, and referring to the potential of SSS it can be stated that:

- There are two strategic opportunities from using SSS:

  (1) Greater economies of scale than in road-haulage chains and more capacity to absorb demand variability derived either from its seasonality or from the uncertainty in its behaviour.

  (2) High concentration of supply chains, the shippers benefit from the economies of scale in SSS. The aggregation of flows implies a reduction in global variability, improving the performance of vessels.

Business models of the road carriers

From the second issue, when studying the competitiveness of SSS freight distribution competing with only-road transportation, three large kinds of distribution chain regarding road transportation, in general terms, can be defined:

- Road only (the cargo is accompanied during the whole trip).
  This option accepts two alternative options: driving with a single driver during the whole trip or combining two drivers and a tractor unit.

- Road combined with accompanied SSS (the truck driver travels inside the ship).

- Road combined with unaccompanied SSS (the cargo travels driverless on the sea link; therefore, there is a second carrier at the destination).

  In such context, different combinations can be formulated depending on how the logistics of the truck route are organized and on whether the truck tractor unit can have other uses or whether it is needed in exclusivity, i.e. travelling back and forth only between the port and the origin (or final) destination. Each sub-strategy will entail different final overall times (the time it takes the cargo to reach the final destination) since the semitrailer will have to wait for more or less time at the origin or destination port terminal in order to be shipped or/and picked up, respectively.

  Longer delays or waiting times at the terminal will occur when there is a single truck unit on each side of the maritime link that transports multiple semitrailers from/to the port terminal to the several origins/final destinations of the shipment. In turn, the minimum waiting time will be achieved when there is a truck available for each semitrailer (un)loaded per ship call at the port and the tractor unit can arrive at the terminal immediately before the access to the boarding area is closed. One last option would be to send a batch of semitrailers accompanied by a full truck, with the driver included.

Shippers and cargo carriers will adopt some of the previous strategies (business models) when using RoRo and RoPax shipping services in order to minimize the cost per shipment. In such context, according to Morales-Fusco et al. (2012), it was noted that previous strategies using SSS will be seen as potential when profit from economies of scale can be gained. However, to reach an optimal performance in the unaccompanied scenarios it is necessary to make a large investment in equipment and, therefore, to ensure a large demand in order to make the investment profitable.

Previous policy recommendations

Thus, to make the most of the SSS option it is necessary to promote policies to coordinate and consolidate the cargoes, to adapt the offer to the requirements, temporally and in terms of frequency, and to control the freight price of the maritime link. Moreover, measures facilitating cooperation between carriers are necessary.

5.4 Analysis of the factors affecting the growth of the sector

Threats of modal back shift

Threats of modal back shift will appear whenever one or more of the previous factors affecting the development of the sector suffer a negative impact by any of its drivers. An e-survey to the most relevant stakeholders involved has been conducted in order to identify the relations between the critical factors in SSS and its drivers and to detect the possibility of quantifying them. Table 5-8 shows major difficulties to provide an efficient SSS service in some EU ports.

Ports feedback

Table 5-8 Ports feedback as regards to the critical factors in providing SSS services

Port	Critical factors
ESPO	Type of vessels and delivery time (too long compared with alternatives modes of transport)
Port of Algeciras Bay	There is a need to harmonize port and maritime applicable laws, requirements and customs controls and procedures. This is an important limiting factor in those sea-basins related to third countries. Thus, cost and time are discouraging. They asked to harmonize port and maritime legislation and procedures and to establish speed-enhancing processes such as a priority pass for SSS.
Port of Amsterdam	Administrative burden (paperwork and inspections which differs per port) Handling costs (except for ferry services, SSS always requires additional handling of the cargo). Complex to organize (national and European lobbies of road, and especially rail, are stronger) The extension of the road network and the flexibility of road transport services are given a competitive edge that is difficult to beat; besides costs are very low, especially on the back-haul SSS requires coordination of the needs of multiple shippers (hard to keep everybody happy and always at risk of losing critical mass. Shippers are unwilling to give long term commitments and SSS lines often have trouble establishing sufficient trust in the service) Practically you will always need a second mode of transportation when the origin or destination of the cargo is not a terminal
Port of Antwerp	SSS lead time is too long compared to alternative modes of transport. Despite higher vessel frequencies, transit time at ports is too long compared to the road

Port	Critical factors
	(RoRo segment)
Port de Calais et Boulogne sur Mer	Rail services are very difficult to connect to maritime services. Problems of infrastructures, quality of service, culture, integration of "what comes after my service" Poor integration of modes of transport within ports means that all-road transport is practically impossible to beat In particular the RoRo segment is probably the most sensitive to the quality of service as it competes directly with road transport
Port of Turku (Finland)	Imbalance of traffic flows, especially in the Baltic Sea for the RoRo segment. They suggest a better allocation of fleet and sailing schedules, because cargo concentration will lead to cost savings.
Bulgarian Ports	Port infrastructure. Its development will be really important to improve the internal market and ensure a sustainable growth
Danish Ports	SECA rules, shipping administration (for non-internal market), lack of investment in rail cargo corridors, lack of public investment in access to ports from sea and land.

Shipowners feedback

Shipowner	Critical factors
Anonymous (Baltic, North sea)	Port infrastructure and hinterland links. Their impact is especially strong for RoRo and RoPax segment, which are time linked within the logistic chain.
Anonymous (Adriatic, Ionian, Atlantic, Baltic, Black, Med, North sea)	Regulations. Port dues should be based on trade, and not on GT values, and on dynamic regulations as per the actual circumstances of the area, type of vessel and vessel services. Current supervision of Member States. Lack of expertise (practice) of surveyors. Training needs.
Brittany Ferries (Atlantic ocean)	Road competition Environmental costs regulations for vessels. Low cost of airlines in EU (unfair and unlawful subsidies from regional airports)
UASC (container sector)	The local traffic (SSS) is not a strategic market for the shipping company. They use the local market to complement deep-sea cargo. They will operate a SSS line for local traffic (SSS) only in the case that a big customers requires a specific feeder service or for a market strategy for the company.
STENA Line (Atlantic, Baltic and North sea)	The increased costs, especially of bunker, are reducing the competitive advantage vs. land based transport. Port capacity Lack of financing sources for ferries

The ship-owners' answers about the expected modal back shift to road transportation due to the application of ship emissions regulations, the most common range of their estimates was a 10-15% loss for SSS.

Other stakeholders and real evidences of modal (back) shift

Another critical factor for SSS is related to the financial aids to shipping companies. Shippers' Associations argued that many shipping lines receive financial aids but when these aids are discontinued the shipping service disappears. This can be considered a big obstacle for the development of SSS in the EU because customers cannot rely on these services.

In summary, the most relevant threats and obstacles for the evolution of SSS are:

1. Too many regulations are affecting SSS. In fact, SSS is governed under the same regulations than DSS, which does not have market competition. SSS

competes with other modes of transport such as road and rail that are not regulated in the same way.

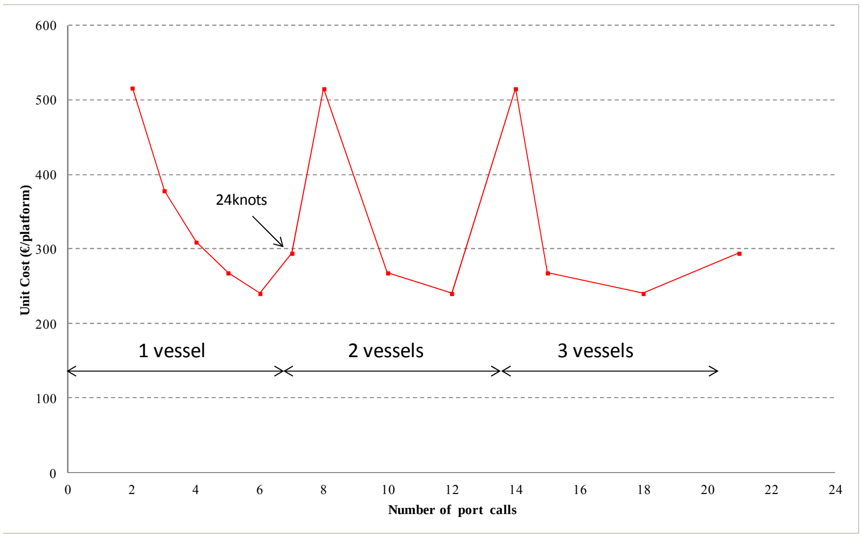
2. Complex and extensive bureaucratic procedures are affecting SSS, especially in those sea-basins that involve third countries.
3. Accessibility costs to/from ports are costly due to inefficient infrastructures, capacity problems or poor intermodal facilities.
4. The extension of the road network and the flexibility and low cost of road transport services reduce the competitiveness of SSS for most shipments
5. The increase of SSS capacity requires high demand rates. Shipping companies are mainly focused on running their business and thus their vessels' rotation.

One of the factors indicated by cargo-owners, forwarders and shippers is the need for high frequency, especially for the RoRo self-propeller, where the delays are more critical in terms of cost. Here, the business model of the shipping sector is key to understand how much this aspect can be improved.

In Figure 5-7 is shown the average cost of a RoPax vessels operation between two ports separated by 450miles (similar to Barcelona-Civitavecchia). Basic data of the vessel: 50,000GT (capacity for 205 platforms) and 20knots of speed. Assuming a 100% ship occupancy and that all the cost is assumed only by the platforms (to simplify the analysis), the Figure represent the average cost as a function of the number of calls (frequency). As shown in the Figure, once a first vessel is operating, there is an important risk in introducing a second vessel, since an important additional demand is needed to guarantee a competitive price. In the case that the road alternative is competitive this risk is even more critical.

The rigidity of the supply from the shipping side (which is not the case of road transportation) makes difficult to increase the capacity of a shipping line and its frequency (its basic transport quality). Some additional frequency can be added by increasing the speed, but leading a significant increase of the fuel cost (the fuel consumption is proportional to v^4). The scheduling of the services could also become less adequate, as it would be difficult to organise calls at the same time of the day.

Figure 5-7 Average cost for a RoPax shipping line for different frequencies. Source: own elaboration



6. Scale economies in the RoRo and RoPax segment are not decisive because vessels are multi-purpose and designed for quick operation. This puts low limits to their size and to the reduction of unit costs. The possibility of obtaining economies of scale with the fleet size are also modest and can be obtained mostly from the effects of standardisation and from cost reductions stemming from multiple purchases.

   Using the daily cost per several types of vessels shown in the COMPASS report (2009), Table 5-9 represents the average cost, in terms of €/day per tonne carried, for each type of vessel. In order to simplify the analysis, it has been assumed that all the cost for RoPax vessels is entirely supported by the trailers (in practice, it is shared also by the passengers and private vehicles). Regarding the container vessels and the RoPax, it has been assumed that each container and each trailer carries 20t of products. From the results, it can be clearly seen the strong differences in prices of RoPax compared to the rest of vessels, due essentially to their particular design. Pure RoRo ships are less costly but still require unit prices well above those possible for containers. No doubt that this is an important reason to explains why the SSS modal share is still low.

Table 5-9 Average daily cost, €/t-day, for several types of vessels. Source: own elaboration using data from COMPASS study.

Type of vessels	Capacity	€/day	€/day-t
RoRo	200 trailers	37807	9.45
RoPax small	40 trailers	21488	26.86
RoPax large	290 trailers	79417	13.69
Dry bulk	25000-45000 dwt	30953	0.88
	45000-80000 dwt	36636	0.56
	120000-200000 dwt	53838	0.33
	200000-320000 dwt	76134	0.29

Type of vessels	Capacity	€/day	€/day-t
Tanker	10000-40000 dwt	25519	1.02
	60000-80000 dwt	33927	0.48
	60000-110000 dwt	36387	0.42
	110000-200000 dwt	43406	0.28
Container	1000-2000 TEUs	31015	1.03
	5000-6000 TEUs	63370	0.57
	8000-9000 TEUs	82337	0.48
	10000-12000 TEUs	100547	0.45

7. Imbalance of traffic flows at origin/destination points.

   As already stated, in order to keep SSS competitive, there is a need to always have good levels of ship occupancy. This means that the cargo volume between the two connected ports should be both high and balanced. The other modes have the same problem of empty returns, but road transport in particular suffers from it with much less intensity, as their return routes can be adapted more easily and offer prices practically at the level of marginal costs.

8. Inter-modality in ports is poorly developed. The links between the land modes and SSS are not fully integrated within the supply-chain. There are no global operators supporting SSS development. Without powerful private integrators of the intermodal chain, it is really difficult to ensure a good synchronization of the transport chain from the origin and final destination and service reliability is, as a consequence, insufficient.

9. Moreover, complying with the low sulphur limits for marine fuels, particularly in SECAs, will produce a significant increase in the price of such fuels, at least in the short term, and can have a negative effect on the competitiveness of SSS as well as on the competitiveness of the industries in the countries bordering SECAs.

Supply vs. demand needs

According to the main criteria identified from the stakeholders and the literature review, Table 5-10 indicates how each type of cargo vessel deals with these criteria compared to road transportation (trucks).

Table 5-10 How the different SSS segments fix with the demand needs compared to the road transportation (trucks). (*) In fact, the rest of the criteria are included in quality

Demand criteria	RoRo non self-propelled	RoRo self propelled	Container	Bulk cargo
Unit prices	Competitive but less than the rest of cargo types		Very competitive prices because of economies of scale	
Frequency	Less than road. It is also more difficult to increase the current ones because of the high risks for the ship-owner.			
Reliability	Less than road (i.e.: weather conditions)			
Quality (*)	More rigid than road			Usually tramps services, where all conditions are under an ad hoc agreement

6 Analysis of the evolution of Short Sea Shipping

6.1 Market forecasts in the different European sea areas

6.1.1 Methodology

SSS calculation tool …

The market forecasts and scenario analyses presented in the following section are carried out by using a calculation tool that has been developed specially for the present study. It is called a "calculation tool" and not a "model" because it is not feasible to construct a fully-fledged forecasting/scenario model on the basis of the limited length of time series available. The methodology scheme used to forecast SSS demand, which is in principle a simple deterministic model, is synthesized as follows:

Model forecast. A brief description

Let's $\boldsymbol{q_{st}^{i}}$ be the annual (*t*) SSS traffic of *i*-type cargo and in the *s* sea basis. It's assumed that this traffic is function of the action of the ongoing tendency (started in the pass) and of the future drivers, that is:

$$\boldsymbol{q_{st}^{i}} = \left(\boldsymbol{q_{st-1}^{i}} + \Delta \boldsymbol{q_{s\tau}^{i}}\right)\boldsymbol{k(t)}$$

in which $\Delta \boldsymbol{q_{\tau}^{i}}$ is the average annual variation over the studied period, $\boldsymbol{\tau}$ (2005-2012), for *s* and *i*, and $\boldsymbol{k(t)}$ is the effects from the drivers. Regarding this last factor, it can be expressed as:

$$\boldsymbol{k(t)} = \prod_{l}\left(\boldsymbol{1} + \boldsymbol{f_{l}^{s}(t)}\right)$$

$\boldsymbol{f_{l}^{s}(t)}$ indicates the effect of the factor *I* over the demand in *t* and for the sea basis *s*. Two main types of drivers can be distinguished:

a) Drivers that affect the SSS cost, the $\boldsymbol{f_{l}^{s}(t)}$, are the multiplication of three elements: the variation of the cost component affected by the driver, like the fuel cost; the percentage of this cost over the total of the SSS cost; and the demand-price elasticity of SSS. Here some assumption has been made about which part of the variation of the SSS is passed on to the final client through the price. For instance, if the fuel cost goes down 50% and this cost represents the 50% of the SSS cost, finally there will be a 25% reduction of the SSS cost. Assuming that the ship-owner will pass on to the client only the 50% of this reduction, the final client will only experience a 12,5% reduction of the price. Applying the demand-price elasticity, the final effect in terms of demand will be quantified.

b) SSS demand is considered correlated with economic growth measured through GDP**.**

… with both explained and unexplained developments

While we cannot avoid the risk of biased results in the calculation tool, we have tried to overcome the problem of not being able to fully explain statistically the dependent variables by developments in the independent variable (drivers). This has been done by analysing each of the drivers – that can be quantified – one by one. Hence, we have made assessments of how the development in each driver may contribute to explaining SSS developments on the basis of results in the literature, of analysis of the available data, and from stakeholder views/validations.

However, since the inclusion of drivers is limited, only a part of the historical (i.e. for 2005 to 2012) SSS developments can be explained by the developments in the drivers. We have therefore analysed the unexplained part of the historical developments with respect to size and trend and used these findings for both the baseline forecast and for the alternative scenarios.

6.1.2 Baseline

Understanding baseline developments

A good understanding of the historical baseline developments for SSS transport is central for making reliable forecasts and scenarios. Actually, it has already been argued that such understanding is the main result of the present study. This comprises an understanding of how much of the baseline can be assessed qualitatively, how much can be assessed quantitatively, and also what cannot assessed. Hence, it is an essential background for the design of the calculation tool.

Baseline values for drivers

As presented in the previous sections we have identified and analysed a number of quantifiable drivers. From the estimate of how each of these drivers have caused the historical SSS developments the calculation tool produces forecasts on how much they will – based on assumptions about drivers future developments – influence the expected development of SSS.

Table 6-1 summarised the findings of the previous sections' analysis and Table 8-6 shows in detail the SSS response to each driver of change considered – for the different SSS transport types and for the different sea basins.

Table 6-1 Drivers – baseline values

Driver	Baseline values
Oil prices	According to EIA, the oil price has risen 78% in the period 2005-2014 but has fallen in 2014 until 89$/barrel. However, it is expected to increase 11% up to 2025 w.r.t. 2015 (baseline scenario). Figure 4-7 (left side) shows three different scenarios that were projected by the EIA (baseline, high and low scenario).
Economic growth	Economic growth (GDP) projections according to European Central Bank. • Period 2015-2017: GDP + 1.5 • Period 2017-2020: GDP + 1.7
Policy regarding sulphur regulation in ECA areas	It is assumed that the scenario "strong uptake of conventional fuels" is the more likely to take place in future years. HFO will hold 65% of the fuel share by 2025 because HFO with abatement technology is still considered the most cost-effective option for the majority of the fleet. Then, 30% for MGO/MDO and 5% remaining to LNG are expected. The relationship MGO/HFO is about 1.6
Consolidation	Increased co-operation, reduced competition. A decrease in supplied capacity of between 5% and 10% over a five year period is considered.

Driver	Baseline values
	RoPax and Container segments could be in the higher range It is assumed that the effect of consolidations only affect to multimodal costs (maritime link and port costs)
Directive on Reporting formalities Blue Belt (including e-Manifest)	Costs associated to administrative burden at ports and delays of vessels for customs clearance will be reduced. Thus, according to the EC, the consequence for shipping is significant in terms of extra administrative burden and costs. Companies said that the reduction of administrative burden would lead to savings up to €25 per container. It is assumed that cost savings will be translated to reduce operating speed during journeys and thus, a reduction of fuel consumption. On average (considering 450 miles and a reduction of 2knots due to cost savings at ports) it is expected a reduction of 3-5% of maritime cost per journey but the impact on the final price, due to power market, might be marginal.
Digitalisation initiatives (e-Maritime, e-Freight, e-Customs)	The impact of digitalisation initiatives is mainly related to improve the quality of service and flexibility for vessels and truckers. But, cost savings are also expected although the final impact on price would be marginal. • For the e-Freight initiative, savings of 10 minutes per truck ("to be converted to cost savings") and a 50% reduction of manual check-in activities (automated gate solution, changes of road to ports, cargo in bus lanes) were estimated. • The e-Maritime initiative will support the development of the Reporting Formalities Directive regarding communications between maritime transport and multimodal logistics Thus, it is assumed that digitialisation initiatives will help to reduce (on average) 2% of multimodal costs (port and maritime costs).
Technological developments - ships	In particular for the container and RoRo/RoPax segments, since bulk vessels are old It is expected that 10% to 20% efficiency improvement in fuel consumption for the following 10 years framework
Technological developments - ports	According to COMPASS study, it was expected 20% decrease in port costs. However, according to our interviews, surveys and suggestions from ESSF group the following statements were made: • This is potential for the container segment where automated handling can be a game change, but it should be considered that currently most terminals have already introduced improvements. Ports and terminals specialized in SSS are medium and small size, where labour and infrastructure account for the most part of the cost leaving little space for big savings from equipment and procedures benefiting from new technological advances/inventions. Cost savings within the range 5 to 10% are expected in following years • For RoRo/RoPax, the incidence is low/moderate because cargo handling is mainly related to the vessel. Cost savings about 5% are expected in following years • For solid and liquid bulk cargo this assumption is not applied
Ecobonus initiative	Ecobonus basis as a percentage of the ticked paid, which differs from 10 to 25% and from 20-30% discount according to the maritime route and the amount of journeys (>80 journeys completed) for EU and national routes, respectively. - 23 national maritime routes in Italy were incentivised - 12 EU maritime routes within West Mediterranean were incentivised by the Ministry of Infrastructures and Transports. In particular between Italy and Spain (Barcelona, Tarragona, Castellon, Algeciras

Driver	Baseline values
	and Valencia) and France (Tolone) The amount of tonnes transported in EU routes awarded by Ecobonus only represent only the 5% of total RoRo/RoPax cargo within the Mediterranean sea-basin Great incentive for national routes (increasing rates about 40% between 2007 and 2010) but low impact in EU routes because of decrease of Spain GDP and EU economic crisis. It is assumed that no additional effect will be produced in future years because of this initiative is already implemented since 2007.

Baseline forecast

From the previous assumptions on SSS responses we have generated baseline forecasts. Figure 6-1 and Figure 6-2 show that our preliminary baseline forecast assumes an overall increase of 19.4% in cargo transport by SSS over the next decade (2012-2025). In particular, it is foreseen that SSS cargo transport will reach 2,387 million tonnes.

Figure 6-1 Cargo transport by SSS, by sea basin, 2005-2012 and baseline forecast until 2025. Source: Eurostat, Maritime transport statistics, and CENIT/VITO/COWI. Note: The total transport volume is higher than in Figure 6-2 as there is double-counting in between sea basins.

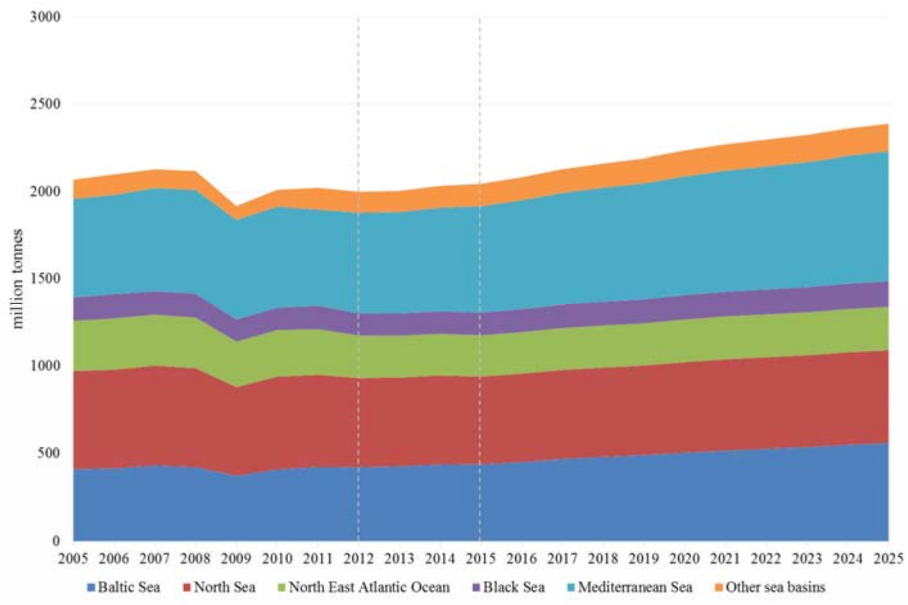
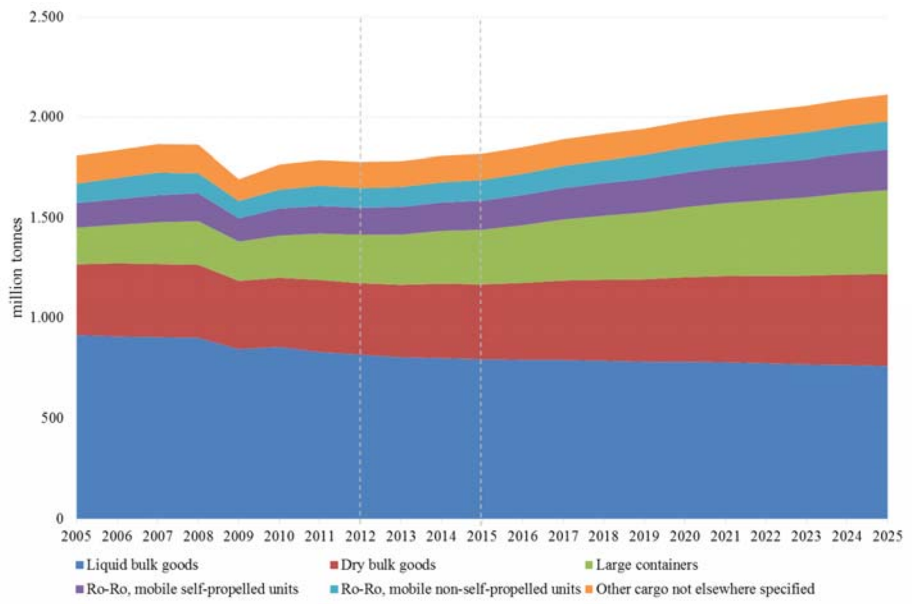


Figure 6-2 Cargo transport by SSS, by type of cargo, 2005-2012 and baseline forecast until 2025. Source: Eurostat, Maritime transport statistics, and CENIT/VITO/COWI. Note: The total transport volume is lower as in Figure 6-1 as there is no double-counting.



From the previous baseline forecast the following statements can be derived:

- The largest growth is expected in the Baltic Sea (annual average growth rate of 2.10%) and the Mediterranean Sea (average annual rate 1.95%). The North Sea and the Atlantic Ocean sea-basins show the lowest perspectives for traffic growth in future years.
- Regarding cargo types, the largest increases are expected for large containers (average annual rate of 4.4%) and Ro-Ro cargo (self and non-self propelled), which is expected to increase on average 3.0 % per year. On the other hand, the transport of liquid bulk goods is expected to see a decline (about -0.55%) which does not directly involve a reduction of modal shift since road transportation is also expected to decrease, in part due to pipelines.

6.1.3 Scenarios

Changes in the baseline assumptions for main drivers

The above baseline forecasts are of course uncertain, as there is considerable uncertainty regarding the future development of the driver values. To assess the possible impact of variations in these assumptions, we have considered two different scenarios (A and B) corresponding to low and high assumptions for each of the drivers. Table 6-2 shows most relevant hypothesis for each future scenario considered.

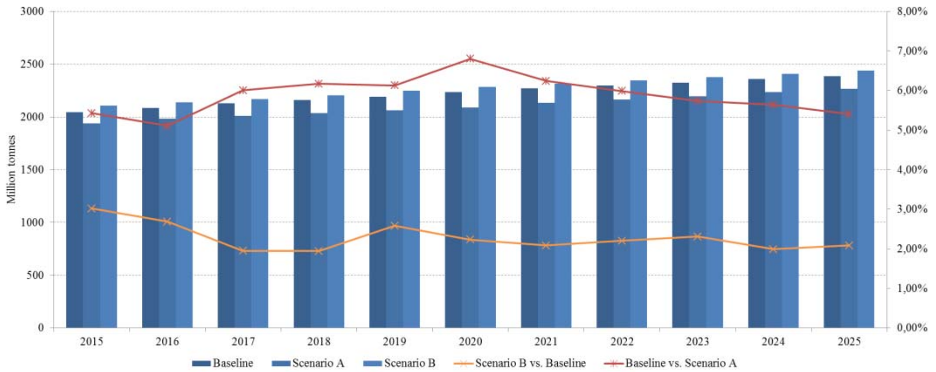
Table 6-2 Drivers changes for scenario A and B and SSS response assumptions

Driver	Scenario A	Scenario B
Transport costs		
Fuel prices	According to EIA forecast (Figure 4-7)	
Innovation and consolidation		
Consolidation	Additional consolidations are expected (up to 3%)	No additional consolidations expected

Driver	Scenario A	Scenario B
Reporting formalities and Blue Belt initiative	The impact on final price according to the baseline scenario has been reduced by 1%	The final price of the baseline scenario increased by 2%
Digitalisation initiatives (e-Maritime, e-Freight, e-Customs)	The impact on final price according to the baseline scenario has been reduced by 1%	The final price of the baseline scenario increased by 2%
Technological developments - ships	The impact on final price according to the baseline scenario has been reduced by 1%	The final price of the baseline scenario increased by 2%
Technological developments - ports	The impact on final price according to the baseline scenario has been reduced by 1%	The final price of the baseline scenario increased by 1%
Transport demand		
Economic growth	An increase of 10% with regards to the baseline scenario (GDP+1.65 until 2017 and GDP+1.87)	A 30% reduction of the growth in the baseline scenario (GDP+1.05 until 2017 and GDP+1.20)

Once the main hypotheses are defined, the next step is to evaluate their impact over the SSS cargo demand. Figure 6-3 shows the global SSS projections in Europe for both scenarios and the growth rates versus the baseline forecast.

Figure 6-3 Growth in SSS-cargo transport between 2015 and 2025: Baseline forecast and scenarios A and B. Source: CENIT/VITO/COWI.



According to the depicted results, the global SSS demand for the scenario "A" is expected to increase by 13.5%. For the scenario "B" it is expected that SSS cargo will increase by 22% in 2025 regarding the freight cargo volumes registered in 2012.

Economic growth, oil prices and EU policies effects on SSS

Nonetheless, since it was realized that fuel prices and economic growth has large impact on SSS demand, we considered three hypothetical cases in order to comprehend their individual effect.

The first case assumes that EU economy remains constant (non-increasing scenario) while for the second one, it is considered that oil prices are not going to increase in future years. Thirdly, the combination of non economic growth and constant oil prices is suggested (Table 6-3).

Table 6-3 Growth in SSS-cargo transport between 2012 and 2025: Baseline forecast and scenarios combining effects of main drivers.

Drivers			SSS demand increasing rate (%) 2025 w.r.t. 2012	SSS demand increasing annual rate (%) (average)
Economic growth	Oil prices	EU policies and consolidations		
Yes	Yes	Yes	19.45% (Baseline)	**1.40%**
No	Yes	Yes	13.10%	**0.95%**
Yes	**No**	Yes	21.95%	**1.55%**
No	**No**	Yes	15.40%	**1.10%**
Yes	Yes	**No**	17.35%	**1.35%**

Output values show that the economic growth has a large impact on future demand because the increasing percentage is 6 points lower than the Baseline scenario. Secondly, the effect of oil prices is contrary to the economic growth, without this driver the increasing rate would reach 21.95% in 2025 w.r.t. 2012 (average annual rate of 1.55%). Finally, if only EU policies and consolidations are considered, the increasing rate of SSS demand in 2025 will be about 15% (1.1% increasing annual rate).

It should be noted that the effect of main drivers on the Baseline scenario is not lineal, thus the aggregate effect of individual players will not be equal to the sum of individual effects.

6.2 Analysis of economic, social (safety) and environmental aspects of SSS in EU

Objective of the analysis

In this section we first present the evolution of the fuel costs and environmental impacts of SSS in the Baseline scenario. Next we calculate the wider economic, social, safety and environmental impacts of the scenarios "A" and "B" for SSS in comparison to the Baseline scenario.

In both cases the starting point for the calculations are the scenario results for the tonnes transported by SSS and for the fuel consumption by fuel type. These were presented in the previous sections. The methodology underlying the impact calculations is summarized in Appendix C.

6.2.1 The Baseline scenario

Table 6-4 presents the evolution of the fuel cost and environmental impacts in the baseline scenario. These can be calculated only for SSS as the study has not developed an outlook for road transport in the EU. The table gives the evolution w.r.t. 2010 (2010 = 100). The calculations are based on the fuel consumption scenario variant "Strong uptake of conventional fuels".

Fuel costs

As the baseline projects an increase in fuel consumption (because SSS demand is projected to increase), as well as an increase in oil prices (Figure 4-7), the SSS fuel costs are going to increase in the future in spite of the improvement in the efficiency of vessels in recent years through technology improvements. In 2025 they are estimated to be 105% higher than in 2010 (see Table 6-4).

The evolution by sea basin the division of the fuel consumption and fuel costs is approximated and uses historical information on the ratio between the fuel consumption and the number of tonnes shipped per sea basin. The fuel costs would increase more than average for the Baltic sea, the Mediterranean sea and the "other sea basins". The lowest increase is projected for the North East Atlantic sea basin.

Air pollution costs

The air pollution costs are reduced by slightly more than half in 2025 w.r.t. 2010, mainly thanks to the reduction in sulphur emissions which leads to a substantial reduction in the air pollution costs per tonne of fuel (see Table 8-11). The climate change costs are projected to increase as the Baseline scenario entails a rise in the fuel consumption. The increase is in line with the increase in fuel consumption, but is not completely equal to it as the fuel consumption scenario includes some shift between fuel types.

Table 6-4 The evolution of the fuel costs, air pollution and climate change costs of SSS in the Baseline scenario (2010 = 100)

	Fuel costs			**Air pollution costs**			**Climate change costs**		
	2015	***2020***	***2025***	***2015***	***2020***	***2025***	***2015***	***2020***	***2025***
All	162	163	205	80	47	49	114	114	122
Baltic sea	192	202	265	91	67	73	120	126	139
Black sea	154	153	190	80	48	50	113	112	118
Mediterranean sea	160	164	211	77	40	41	118	121	131
North East Atlantic Ocean	135	128	154	74	47	47	99	94	95
North sea	169	162	196	79	51	51	106	101	103
Other sea basins	203	211	272	112	78	83	150	155	169

Employment effects

Ecorys et al. (2012) estimate the employment in SSS to be approximately 823 000 persons. The study expects it to remain relatively stable even with an expected annual growth of 3% to 4% thanks to an improvement in efficiency. Taking into account an improvement in efficiency similar to the one posited by Ecorys (2012), the increase in SSS employment associated with the increase in tonnes transported in the baseline scenario would be about 0% in 2015, 7% in 2020 and 14% in 2025.

Evolution of SSS accidents

The following table gives a rough indication of the evolution of SSS accidents that are projected in the Baseline scenario. It is obtained by applying an accident risk per sea basin and goods type (calculated on the basis of EMSA and Eurostat statistics) to the projected evolution of SSS transport in the Baseline scenario. The table assumes that the accident risk per sea basin and ship type remains constant w.r.t. 2009-2010, but takes into account the change in the shares of the sea basins and the goods types in the Baseline scenario. Due to the changing composition of SSS transport, the number of accidents and the number of lives lost is projected to increase more than the number of tonnes transported. It should be noted that this is only a rough indication of the expected evolution.

Table 6-5 Projected evolution of SSS safety in the Baseline scenario (2010 = 100)

	2015	2020	2025
Accidents	106	119	130
Lives lost	103	114	122

6.2.2 The impacts of the scenarios “A” and “B” compared to the Baseline scenario

Modal shift assumptions

In calculating the impacts of the scenarios we take into account possible changes in other transport modes in order to estimate the impacts on the other modes using a simplified approach. For this only road transport is taken into account.

As the scenarios do not include only changes in costs for SSS, but also for road transport (via the change in crude oil prices) and as well as changes in overall transport demand (via different GDP growth paths), we cannot simply use cross-price elasticities for the change in road transport w.r.t. a change in SSS costs.

Therefore, we proceed as follows. The scenario results give the change in the number of tonnes transported by SSS compared to the baseline scenario. We make an assumption about the share of this change in tonnes that shifts to/comes from road transport. In these assumptions we take into account that in some sea basins and for some goods types the modal shifts is likely to be smaller than for others. For example, in the Baltic sea-basin, SSS might be considered as captive because road transportation is expensive with longer journeys. In the North Sea a higher impact can be expected. In particular, in those transportation journeys from continental European countries such as North France, Belgium, The Netherlands, Denmark, etc. By type of cargo, RoRo is taken to be most sensitive to changes and bulk cargo the least.

Modal shift uncertainty

As the modal shifts are highly uncertain, we have decided to include a sensitivity analysis with increasing degrees of modal shift. Case 1 represents a low modal shift and Case 2 a higher modal shift. Table 6-6 summarizes the aggregate impacts of these two scenarios on the tonnes shifted between SSS and road transport. The first part gives the share of the change in SSS tonnes that goes to/comes from road transport. For example in the scenario “A” the SSS tonnes are reduced by 100 million tonnes in 2015. Of these tonnes 16% is assumed to be shifted to road transport in Case 1 and 26% in Case 2. The second part of the table relates the tonnes shifted to/from road transport to the original number of SSS tonnes in the baseline. For example, in the scenario “A” 0.8% of the original SSS tonnes in the Baseline are assumed to be shifted to road transport in 2015.

Table 6-6: Assumed magnitude of modal shift to/from road transport in Case 1 and Case 2

	Case 1	Case 2
Share of extra/reduced SSS tonnes that comes from/goes to road transport		
Scenario A	15-16%	25-26%
Scenario B	12-17%	20-27%
Tonnes shifted to/from road transport as percentage of SSS tonnes in baseline scenario		
Scenario A	0.8-1%	1.3-1.7%
Scenario B	0.3-0.5%	0.4-0.8%

The average number of km over which the road tonnes are transported and the average load factors are taken from Eurostat statistics on road freight transport. We have used the data for road freight transport over distances of 300 km and more. A distinction is made between goods types.

Compared to 2013 the increase in road vehicle km (for freight transport over 300 km) would be 1% in Case 1 and 1.6% in Case 2 for scenario "A" in 2015. For scenario "B" in 2015 these figures would be respectively -0.6% and -1%.

Due to the international character of transport by SSS, it can be assumed that the road transport to be substituted by SSS mainly takes place on highways and is mainly executed by articulated trucks of more than 32 tonnes.

Once main assumptions regarding modal shift are defined, we proceed to evaluate the impact s related to SSS development.

Economic impacts

Table 6-7 gives the change in the fuel costs of short sea shipping with respect to the BAU scenario. This table also uses the fuel consumption scenario "Strong uptake of conventional fuels" which was introduced in section 4.3.1. Scenario "B" is characterized by a higher number of SSS tonnes and corresponding fuel consumption than the Baseline. However, the fuel costs fall because the fuel price is assumed to be lower in this scenario than in the Baseline. In scenario "A" the opposite occurs: transport and fuel consumption by SSS fall compared to the Baseline, but the fuel prices are higher, which results in higher fuel costs. The table also gives the percentage changes w.r.t. the Baseline scenario. The increase in total SSS fuel costs of scenario "A" ranges between 30% and 45%. For scenario "B" the reduction ranges between 21% and 34%.

Table 6-7 Absolute and percentage difference in fuel costs for short sea shipping w.r.t. the Baseline scenario (mio € and %)

Sea basin	Scenario A			Scenario B		
	2015	2020	2025	2015	2020	2025
All	8607 (30%)	13102 (45%)	14494 (39%)	-6058 (-21%)	-7280 (-25%)	-12350 (-34%)
Baltic sea	897 (31%)	1425 (48%)	1672 (43%)	-561 (-20%)	-720 (-24%)	-1291 (-33%)
Black sea	193 (31%)	290 (46%)	320 (41%)	-128 (-20%)	-152 (-24%)	-255 (-33%)
Mediterranean sea	3951 (28%)	6232 (43%)	6979 (38%)	-3030 (-22%)	-3683 (-26%)	-6283 (-34%)
North East Atlantic Ocean	1352 (31%)	1932 (47%)	2059 (41%)	-889 (-20%)	-1042 (-25%)	-1712 (-34%)
North sea	1739 (32%)	2460 (47%)	2620 (41%)	-1066 (-20%)	-1221 (-23%)	-2017 (-32%)
Other sea basins	475 (27%)	764 (42%)	845 (36%)	-384 (-22%)	-463 (-26%)	-791 (-34%)

The scenarios also include changes in the costs of SSS due to technical developments in ports, consolidation etc. However, as the calculation tool only considers percentage changes in the SSS costs, while including no information on the absolute cost levels, the difference in costs cannot be calculated. This entails that the actual costs for SSS will be overestimated in the calculations.

Table 6-8 presents the difference in fuel costs for road transport. For the road transport users the fuel costs change by the sum of the fuel costs without taxes and the fuel excises. However, the fuel excises are a transfer from the road transport users to the government. The change in the fuel excise payments should therefore not be seen as a cost to society. The table presents results for a relatively low (Case 1) to a higher (Case 2) modal shift, as it is introduced in Table 6-6). For road transport the relative differences w.r.t. Baseline scenario cannot be computed and are therefore not presented here.

Table 6-8 Difference in fuel costs for road transport w.r.t. Baseline scenario (mio €)

	Fuel cost no tax Case 1		Fuel excise Case 1		Fuel cost no tax Case 2		Fuel excise Case 2	
Year	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
2015	182	-64	85	-54	291	-102	136	-87
2020	259	-38	108	-34	415	-60	173	-54
2025	213	-26	83	-23	341	-43	133	-38

As can be expected, the scenario "A" is associated with an increase in the congestion costs of road transport because road transport increases, while the scenario "B" leads to a reduction in the congestion costs (Table 6-9). The differences between Case 1 and Case 2 reflect the difference in road vkm in these two cases, depending on the degree of modal shift assumed. Table 6-9 uses the upper value for the congestion costs per vehicle km. With the lower value of these marginal congestion costs (see Table 8-9) the values in Table 6-9 would be 60% lower.

Table 6-9 Difference in congestion costs for road transport w.r.t. Baseline scenario (mio €)

	Road congestion cost Case 1		Road congestion cost Case 2	
	Scenario A	**Scenario B**	**Scenario A**	**Scenario B**
2015	180	-114	288	-183
2020	243	-76	389	-121
2025	196	-55	313	-90

The employment effects of scenario A and B are computed based on the difference in tonnes transported in these scenarios compared to the Baseline scenario, assuming the same efficiency as in the Baseline scenario. As the tonnes transported by SSS fall in scenario A, SSS employment is expected to fall in this scenario compared to the Baseline. In scenario B a small increase is expected compared to the Baseline scenario.

Table 6-10 Difference in SSS employment w.r.t. Baseline scenario (%)

	SSS employment	
	Scenario A	**Scenario B**
2015	0%	0%
2020	-6%	+2%
2025	-6%	+1%

Environmental impacts

Table 6-11 and Table 6-12 present the impact of both scenarios on the air pollution and climate change costs of SSS, compared to the baseline scenario. As the scenario "A" is associated with lower fuel consumption (total amount of consumed fuel), the air pollution and climate change costs are reduced compared to the

Baseline scenario. The overall reduction of costs ranges between 6% and 7% in the different years for air pollution and climate change costs. In scenario "B" the environmental costs of SSS increase by 2% to 4% (climate change costs) and by 3% to 4% (air pollution costs).

Table 6-11 Absolute and percentage difference in air pollution costs of short sea shipping w.r.t. the Baseline scenario (mio € and %)

Sea basin	Scenario A			Scenario B		
	2015	2020	2025	2015	2020	2025
All	-1788 (-6%)	-1234 (-7%)	-1027 (-6%)	1174 (4%)	594 (3%)	557 (3%)
Baltic sea	-153 (-5%)	-128 (-6%)	-96 (-4%)	168 (5%)	96 (4%)	92 (4%)
Black sea	-51 (-5%)	-35 (-6%)	-28 (-5%)	41 (4%)	22 (4%)	22 (4%)
Mediterranean sea	-969 (-7%)	-569 (-8%)	-507 (-7%)	361 (3%)	136 (2%)	129 (2%)
North East Atlantic Ocean	-147 (-5%)	-113 (-6%)	-83 (-5%)	124 (4%)	49 (3%)	22 (1%)
North sea	-379 (-5%)	-317 (-6%)	-245 (-5%)	456 (6%)	276 (5%)	274 (5%)
Other sea basins	-90 (-8%)	-71 (-9%)	-69 (-8%)	25 (2%)	16 (2%)	17 (2%)

Table 6-12 Absolute and percentage impact on climate change costs of short sea shipping w.r.t. Baseline scenario (mio € and %)

Sea basin	Scenario A			Scenario B		
	2015	2020	2025	2015	2020	2025
All	-1010 (-6%)	-1192 (-7%)	-1043 (-6%)	591 (4%)	460 (3%)	425 (2%)
Baltic sea	-68 (-5%)	-82 (-6%)	-62 (-4%)	75 (5%)	62 (4%)	60 (4%)
Black sea	-20 (-5%)	-23 (-6%)	-19 (-5%)	16 (4%)	14 (4%)	15 (4%)
Mediterranean sea	-586 (-7%)	-690 (-8%)	-637 (-7%)	218 (3%)	164 (2%)	163 (2%)
North East Atlantic Ocean	-131 (-5%)	-149 (-6%)	-112 (-5%)	111 (4%)	64 (3%)	30 (1%)
North sea	-124 (-5%)	-154 (-6%)	-121 (-5%)	150 (6%)	134 (5%)	135 (5%)
Other sea basins	-80 (-8%)	-94 (-9%)	-93 (-8%)	22 (2%)	21 (2%)	22 (2%)

For road transport the climate change and air pollution costs increase in the scenario "A" while they fall in the scenario "B". This is explained by the change in road vehicle km in both scenarios (positive in the scenario "A" and negative in the scenario "B"). As before, we have included two variants with a relatively low and higher modal shift assumption.

Table 6-13 Difference in air pollution and climate change costs of road transport w.r.t. Baseline scenario (mio €)

	Road air pollution costs Case 1		Road air pollution costs Case 2		Road climate change costs Case 1		Road climate change costs Case 2	
Scenario	A	B	A	B	A	B	A	B
2015	34.52	-21.88	55.12	-35.12	45.11	-28.60	72.03	-45.90
2020	28.19	-8.83	45.21	-14.09	58.42	-18.31	93.70	-29.20
2025	19.52	-5.48	31.24	-9.01	46.79	-13.15	74.89	-21.59

Social impacts

Table 6-14 presents the change in the road accident and noise costs. These are proportional to the changes in road vehicle km. As the road vkm increase in the scenario "A", this scenario is associated with an increase in accident and noise costs of road transport. The opposite is the case for the scenario "B". The magnitude of the impacts is smaller in Case 1 than in Case 2, as Case 1 assumes a lower modal shift.

Table 6-14 Difference in road accident and noise costs w.r.t. the Baseline scenario (mio €)

	Road accident costs Case 1		Road accident costs Case 2		Road noise costs Case 1		Road noise costs Case 2	
Scenario	***A***	***B***	***A***	***B***	***A***	***B***	***A***	***B***
2015	7.67	-4.86	12.24	-7.80	0.93	-0.59	1.48	-0.94
2020	10.32	-3.24	16.56	-5.16	1.25	-0.39	2.00	-0.62
2025	8.32	-2.34	13.32	-3.84	1.01	-0.28	1.61	-0.46

Accident costs

Table 6-15 gives a rough indication of the impact on maritime safety of scenarios A and B compared to the Baseline scenario. The impact is computed by applying an accident risk per sea basin and goods type (calculated on the basis of EMSA and Eurostat) to the difference in SSS transport in the two scenarios w.r.t. the Baseline scenario. As before, the table assumes that the accident risk per sea basin and ship type remains constant w.r.t. 2009-2010, but takes into account the change in the shares of the sea basins and the goods types. Due to the change in the composition of SSS transport compared to the Baseline, there is a slight reduction in the average accident risk in Scenario A, while there is an increase in Scenario B. In Scenario A the number of accidents and lives lost are projected to fall, while they are expected to increase in Scenario B.

Table 6-15 Impact of Scenario A and B on SSS safety compared to Baseline scenario (%)

	Scenario A			Scenario B		
	2015	***2020***	***2025***	***2015***	***2020***	***2025***
Accidents	-5%	-6%	-5%	+4%	+3%	+3%
Lives lost	-5%	-6%	-5%	+4%	+3%	+3%

To sum up, the following conclusions are obtained from the impact analysis:

- The increase compared to the baseline scenario in total SSS fuel costs of scenario "A" ranges between 30 and 45% while for scenario "B" the reduction ranges between 21% and 34%.

- Road congestion costs will increase compared to the baseline scenario for scenario "A" while scenario "B" leads to a reduction.
- The overall reduction of environmental costs of SSS for scenario "A" (compared to the baseline scenario) ranges between 6% and 7% whereas for scenario "B" costs increase by 2%-4%.
- Road accident and noise costs are proportional to changes in road vehicle km. As the road vkm increase in scenario "A" compared to the baseline scenario, an increase in accident and noise costs of road transport is expected.

7 Development of policy actions and recommendations

7.1 Assessment of the promotion of SSS, development of MoS and the use of EU funding

Objectives

The objectives of this section are twofold: (1) to identify the main SSS initiatives launched by the EU Shortsea Network and, particularly, by the individual promotion centres and; (2) to analyse each initiative and evaluate its impact.

7.1.1 Assess the promotion of SSS and propose policy actions (notably regarding the European Shortsea Network)

Actions to develop SSS

The White Paper on European transport policy for 2010 highlighted the role that SSS can play in curbing the growth of heavy goods vehicle traffic, rebalancing the modal split and bypassing land bottlenecks. This followed a line of support for SSS. Already in 2003, the European Commission presented a Communication programme (COM (2003) 155 final) containing a set of 14 actions subdivided into legislative, technical and operational actions aimed at developing SSS at EU, national, regional and industry levels. It is an essential part of this study to analyse how they have been implemented and their effects.

Table 7-1 presents an evaluation of each particular measure according to the e-survey launched to SPCs and Focal Points.

Table 7-1 Analysis of the main promotion measures

Promotion measure	Comments and observations	Proposals
1.- Implementation of the Directive on reporting formalities for ships to arrive in and/or depart from ports in the Member States (IMO-FAL)	In general, the implementation was efficiently introduced but the time saving effects have been marginal because the reporting formalities and dematerialisation do not involve a real simplification.	Implement the “single window” with interoperability and coordinated at the European level. Final target: E-maritime, e-Freight, EU transport space without barriers, E-Manifest.
2.- Implementation of	Its implementation has been	Measures to support demand

Promotion measure	Comments and observations	Proposals
Marco Polo programme	effective since several SSS services have been launched inducing modal shift. However, there have been several competition distortion problems. Too much administrative procedures.	(users) avoiding distortion of competition: “Ecobonus”. Improve and simplify the administrative procedures for applicants.
3.- Standardisation and harmonisation of intermodal loading units	Recently, some countries (i.e.: Belgium, Netherlands and Luxemburg) reached an agreement on free cross-border movements of 45' units. This container is a valuable intermodal loading unit but needs "legal" status across Europe	Stimulate use of 45 ft through Ecobonus. 45'PW container standardisation: 45'PW fully considered in directive "weight and dimensions" as well in "Combined transport" directive.
4.- Development of Motorways of the sea	The implementation of this measure has not been effective. Insufficient accompanying measures. Very few MoS developed until now	Measures should focus on missing links, bottlenecks, infrastructure, etc. and Ecobonus Distortion of competition has to be avoided. Include MoS into the comprehensive network, and neighbouring countries
5.- Improving the environmental performance of Short Sea Shipping	SSS is environmentally friendly in itself, as far as modal shift to SSS could, for example, contribute to fulfilling the objectives of the Kyoto Protocol. Since January 2015, the EU Sulphur Directive entered into force. This measure involves a costly impact on SSS competitiveness within North Europe because alternative modes are not regulated in the same way.	To extend LNG bunkering facilities at ports in order to support LNG fuelled ships with low autonomy Supporting eco-friendly ships construction Internalisation of external costs for every mode of transport
6.- Guide to Customs Procedures for Short Sea Shipping in your country	It is considered as an efficient measure with different levels of implementation depending on the country. Very positive the “Authorized Regular Shipping services”. Steps taken in the right direction in some countries (i.e.: Belgium). In any case, there is a lot of work still ahead.	Move forward Common Maritime Space. Intra EU cargo should be moved/handled without obstructions (Safe Sea Net potential) e-Customs and efficiency procedures Harmonisation and wider dissemination of positives intra-EU rules and opportunities
7.- Identification and elimination of obstacles to making Short Sea Shipping more successful than it is today	Some of the identified obstacles are still kept: customs, port services, pilotage fees and efficiency. European Port Services Directive has not been developed	*See next section*
8.- Approximation of national applications and computerisation of	Some measures have been implemented (i.e. investment at national level in maturing and	Common Maritime Space in the EU Further simplification and avoid

Promotion measure	Comments and observations	Proposals
Community Customs procedures	enhancing the Customs IT systems) but countries should get more involved to improve it. Intra-EU trades and intra-EU SSS should be customs-free.	useless reporting. e-Customs and automation European transport space without barriers, Blue Belt, E-manifest, etc.
9.- Research and Technological Development (RTD)	This Action has been completed	
10.- One-Stop Administrative Shops	This Action has been completed	
11.- Ensuring the vital role of Short Sea Shipping Focal Points	Most of them are active in their role to promote SSS. In Spain for example, the West MoS project, or the PECs are speeding-up	-
12.- Ensuring good functioning of and guidance to Short Sea Promotion Centres	The functioning rate of SPCs is quite high in all countries, both at National and at European level jointly through the European Shortsea Network (ESN) The level of visibility is perceived as medium-high	-
13. Promote the image of SSS as a successful transport alternative	A lot of activities have been developed by most of SPCs: market approach, networking, communication activities in all means, workshops and event, reports, etc.	-
14.- Collection of statistical information	Most of the countries provide general SSS statistical information, but not specific SSS statistics per segment (bulk, container, Ro-Ro)	To develop a specific SSS statistics at national level and integrate them at European level. Coordination of EU statistics. Ports should provide detailed SSS statistics

Main bottlenecks

The following table shows the main problems about Short Sea Shipping identified throughout the years; all of them (14) are divided under 4 headings.

Table 7-2 Main issues identified by SPC.

	Identified problems	Comments	Proposed Policy Actions
IMAGE	Not all shippers perceive the SSS integrated into the intermodal chain as an efficient and cost effective way of moving cargo	Currently, SSS is seen as an efficient and attractive transport alternative for particular cargo segments	Intensify actions to demonstrate users that SSS is a flexible, reliable, cost and time efficient element of intermodality.
	Transportation time is perceived as too long	Depends on the service, the maritime transit improves the road transit time	Promote activities and studies to improve the perception of SSS and their potentialities.
	Expensive freight cost	Users know that SSS allows costs savings regarding road alternative	Development of training activities
ADMINISTRATIVE	Flow of information, as the time available for information dispatching is limited.	ICTs have improved the procedures	Equating European SSS procedures as Intra-EU flows by road: e-manifest, e-freight. E-manifest could solve the “infected vessels” problem. Regulation to standardize the collection of SSS data at national level, in order to be integrated in European Statistics.
	Infected vessels	Intensification of trade relationships with neighbouring countries becomes more necessary to solve this obstacle	
	Statistical data	It is necessary the generation and integration of the specific SSS statistics	
	Linguistic difficulties	This was solved by defining English as official language.	
	Custom procedures in intra-community trade	There have been clear advances in this area, but it is necessary to improve it	
SHORTSEA SYSTEM	Environmental requirements	Increased from 1^{st} January 2015 because of EU Sulphur Directive 2012/33/EU.	Actions to minimize the impact in SSS costs of the EU Sulphur Directive and to avoid the modal back shift. Regulation of the road transport of the 45'PW container
	Structure of cost, price and port dues	Currently, information on rates and charges is more transparent	
	Standardisation and harmonisation of intermodal loading units	45'PW fully needs to solve the present limitations for road transport	
PORTS	Inefficient port accessibility may cause delays and a reduction of competiveness.	Ports in general need to improve their accessibility in order to reduce the entry cost to SSS services	Directive “Port services competitiveness” Adjustment of local pilotage regulation Stevedoring: adaptation to SSS requirements as working hours, organization and costs. Include MoS into the comprehensive network in order to improve the infrastructure and accessibility at sea ports. Extend the MoS to third countries.
	Lack of flexibility in port terminals (timetables, etc.)	Inflexible working conditions of stevedores in many ports	
	Stevedores organization not adjusted to SSS requirements		
	Lack of port infrastructure suitable for SSS	Ports in general have to improve their infrastructures in order to allow SSS development	

7.1.2 Assess the development of Motorways of the Sea and the use of EU funding

Marco Polo programme

The second part of the Marco Polo Programme was mainly focused on modal shift and tried to introduce a SSS-based door-to-door service. Its target was to promote modal shift from road to a combination of SSS with other modes of transport.

In particular, the Marco Polo Programme funded 4 projects under the Motorways of the Sea (MoS) action which are mainly based on Spain and the Atlantic sea-basin. Table 7-4 shows the most important details of each MoS and its progress.

TEN-T programme 2007-2013

The Priority Project 21 on MoS builds on the EU's goal of achieving a clean, safe and efficient transport system by transforming shipping into a genuine alternative to overcrowded land transport. The concept aims at introducing new inter-modal maritime-based logistics chains to bring about a structural change to transport organisation: door-to-door integrated transport chains.

During the first years only a few project proposals were accepted. Table 7-3 presents the annual budget for MoS projects and the total project budget granted by the Commission.

Table 7-3 Annual budget for MoS projects

Year	Annual budget (Million €)	Number of Projects granted	Total project costs (Million €)	Contribution from TEN-T (Million €)
2004	-	1	2.4	1.2
2005	-	3	8.3	4.2
2006	-	3	4.6	2.0
2007	20	-	-	-
2008	30	3	63.3	12.8
2009	85	1	85.5	17.1
2010	100	8	363.1	73.6
2011	50	7	188.7	45.5
2012	25	13	557.5	169.3
2013	80	15	272.2	78.1
2004-2013 Total	***390***	***54***	***1545.64***	***403.75***

Table 7-4 Projects under the MoS action funded by the Marco Polo programme

Project Title	Member States	Maximum TEN- T Funding (€ million)	Main target	Evolution
Ro-Ro Past France (2007-2012)	BE, FI, NL, ES	6.80	This MoS initially offered three services per week (up to five in Sep.2009) in each direction between Bilbao (Spain) and Zeebrugge (Belgium). The vessel capacity was up to 200 un-accompanied trailers.	Funds were finished in 2012. Then, Transfennica continued operating the service increasing the capacity of the service line in 2012. However, the entry into force of the EU Sulphur Directive 2012/33/EU on 1st January 2015 and the consequent increase of the operation costs caused the **cancellation of the service** in Dec. 2014. In this case EC funds have demonstrated their success; the services have been operated for 7 years reaching high modal shift rates. The lack of adaptation of the Sulphur Directive to the particular situation of SSS has made the former EC action useless.
FRESMOS (2009-2014)	ES, FR	4.17	This project aimed at shifting trucks from the Atlantic coast roads between France and Spain. GLD Atlantique operated a modern Ro-Pax vessel between St Nazaire (France) and Gijon (Spain).	LD Lines operates a modern Ro-Pax vessel between St. Nazaire and Gijon. The service worked properly from Sep. 2010 and clients were satisfied. The occupation rate was very high especially in the North-South flow. Unfortunately, the shipowner **cancelled the service** in Sep. 2014 due to the finalization of the subsidy period, justifying that it was economically unviable.
Gulfstream.MOS (2010-2015)	ES, FR, UK	5.57	Ro-Ro service with high frequency connecting directly the north of Spain and the south of England, shifting the road transit of freight cargo via France to the new MoS via the Atlantic Arc. The calling ports are Portsmouth (UK) Bilbao (twice per week) and Santander (once per week), both in Spain.	The service is provided by Brittany Ferries and currently is working properly as a bridge between Spain and UK. This MoS receive State Aids from Spain and France.
Atlantica (2012-2019)	ES, FR	3.00	MoS between Vigo (Spain) and Nantes-St. Nazaire (France). This motorway tries to offer high frequencies for high volumes of cargo.	The service started in Jan. 2015 with 3 departures per week. It is planned to be extended to the Ports of Algeciras and Le Havre and to increase its frequency. This MoS has received TEN-T funding.

By categories, the TEN-T funds for MoS were classified as follows: 9 works, 24 studies and 12 mixed projects with a total budget of 3,678 million €.

The “works” are referred to infrastructure and facilities like Ro-Ro ramps, rail and road accessibility, LNG supply infrastructure, environmental upgrading of ships, waste management and shore-side electric, etc, related with an existing maritime link (MoS) to improve its performance. The “studies” consist mostly of the analysis of different aspects related to the improvement of maritime transport, like LNG bunkering, pilot actions to alternative propulsion, automatic systems to improve operational or/and administrative processes, ICT implementation, etc, but ultimately, they don’t address the establishment of new MoS services. Finally, mixed projects are focused on actions to improve infrastructure (ports facilities, accessibility, rail, ships, etc.) and complementary studies about Information and Communication Technologies, port procedures, bottlenecks reductions, supply chain integration, etc.

In general, the mixed projects support the improvement of existing services, combining “studies” and “works” in order to improve them, and support the modal shift from road to rail or maritime transport.

Baltic Sea is the sea-basin where more MoS services were awarded by TEN-T funds. Here as follows there are some examples of services:

- Zeebrugge – Esbjerg
- Klaipeda – Karlshamn
- Trelleborg – Sassnitz
- Gdynia – Karlskrona

To sum up, it should be mentioned that virtually no newly created MoS has been established in European sea-basins. That is, only existing maritime links have been supported through new infrastructures and additional services.

7.2 Policy actions and recommendations

Objective

The goal of this activity is to propose policy actions and recommendations based on past evidences, threats, bottlenecks and future trends as regards to the demand and supply sides of the SSS sector in order to support policy making for the EU’s maritime transport policy and, in particular, for Short Sea Shipping.

Background information

According to the Mid Term Review of the EU Maritime Transport Strategy, previous policy actions have mainly focused on: (1) removing administrative barriers or duplicated cross-border controls such as the Blue Belt initiative and Directive 2010/65/EU; (2) promote the creation of an integrated platform based on surveillance technologies to ensure the convergence of sea-land; (3) develop interfaces with eFreight, eMaritime, eCustoms, etc.; (4) allowing users to track cargo across transport modes; (5) reinforce EU funding programmes such as the TEN-T/MoS, Marco Polo (currently replaced by the Connecting Europe Facility - CEF) or the Regional Policy and other economic instruments; (6) promote better connectivity of islands and long-distance intra-EU passenger transport; (7) and ensure better port services in terms of fair competition, financial transparency, non-discrimination and cost-efficiency.

Previous achievements

As it has been observed alongside this assignment not all previous measures and initiatives had a large impact over SSS freight demand. For instance, the digitalisation initiatives may lead to a 2% reduction in multimodal costs (ports and maritime link) that involves a total vessel operating cost decrease varying between 0.2% and 0.4% according to the type of vessel. Thus, assuming that shipping companies translate the total reduction to final price to customers, price reduction will be within the range 0.2 and 0.4% which is not seen as a large incentive to SSS customers.

The weak overall success of Marco Polo indicates that direct subsidies to launch SSS lines are not an ideal solution for the long term maintenance of SSS services. In addition, the development of MoS was not fully achieved during last years, since shipping companies operating maritime services heavily depends on financial aids from EU funding programmes or State Members due to higher operating costs involves. Thus, for particular cases, services have been cancelled because of lack of economic feasibility.

On the other hand, most of policy measures are focused on improving port infrastructures and supporting economically stakeholders from the supply side (ports and shipping companies) but not of them focused on the demand side. The only promotion initiative on the demand side is the Italian Ecobonus, which aim is to move truckers off the roads and onto the MoS.

General approach of Policy actions

Thus, there is a need, however, to promote the sector and the modal shift for a more sustainable transport system. For that, two types of policies have to be considered: the supply side (the majority of EU SSS policy actions have been in this direction along the least years) and the demand side:

a) Supply policies. As indicated in the previous section, there are three main factors or steps affecting the efficiency of each supply policy measure: 1) how the possible cost saving, like, for instance, port efficiency, is translated to the SSS client, depending on the market power of the shipping sector; 2) the new demand from the SSS price reduction (price-demand elasticity); and 3) how this increase of the demand affects the modal shift (here the increase of the number of vessels for specific maritime connection is a risky business for the ship-owner and an additional vessel for specific service does not have an important effects in terms of modal shift).

b) Regarding the demand policies, despite that they impact directly on the demand, less tools are available for the Commission to influence on the final potential SSS clients.

In Table 7-5 the main strategies in terms of policy actions are described, indicating effectiveness and main problems.

Table 7-5 Main strategies for policy actions

Type of policy	Measure	Effectiveness in short and long term	Problems
Demand	Affecting directly the SSS price, like Italian Ecobonus	Direct and short term effects. Effectiveness directly related to price-demand elasticity	Limited capacity of action for the EC to act over the demand

Type of policy	Measure	Effectiveness in short and long term	Problems
			Difficult for the policymakers to differentiate the sectors in better conditions for using SSS (see Figure 5-6)
Demand	Affecting the taxes in the SSS price	Direct and short term effects. Effectiveness depending on how directly the tax reduction can be related to the use of SSS	Measure dependent on national tax regulation Difficult for the policymakers to differentiate the sectors in better conditions for using SSS (see Figure 5-6)
	Promote cooperation between carriers and consolidate cargoes	Medium/long term effects	Policy makers have few tools to act in that sense
	Promoting SSS	Long term effects	Identifying the potential SSS users.
Supply	Measures acting on the SSS cost (ship owners and/or ports)	Short term effects. Indirect effect. Depending on how the shipowners and/or port move the cost reduction to their final clients	Results depending on national markets, regulation and the market power of the SSS sector.
	Efficiency of the infrastructures (port access, terminals and technology of information)	Medium terms effects Effectiveness depending on the effect of these factors on the SSS cost	Results depending on national markets, regulation and the market power of the SSS sector.

The majority of EU SSS policy measures have been oriented in the supply side, and more attention the demand policies may be received in the future. This last statement is base on the following considerations:

- The success of the majority of the supply policies is based on how the cost reduction of the SSS service is translated to the final client, which the national regulations and port and SSS markets make this difficult in practise.
- From the shipping sector perspective, in the container and bulk sector the maritime sector is competitive against the road, which is not the case of the RoPax vessels, due to the less strong economies of scale of these vessels and the risky nature of the shipping sector. Any policy measure for reducing the SSS cost in the RoPax sector will require an important results in order to make possible an effective modal shift. For instance, measure to reduce the pilot cost in ports will require a powerful implementation to be

effective, because the national regulations, but the final results in terms of reduction of SSS cost will not be more than the 0,15%.

- Policies affecting directly the demand can have a self-enforcing effect: aside from improve the vessel occupancy, more demand makes possible a reduction of the average cost of the SSS, increasing then the SSS competitiveness (see the loop diagram in Figure 3-1).

The main target of policies

According to the diagnosis of the demand (see Chapter 5), the main stakeholders for whom the policy actions should be addressed are:

- Shipping sector. RoPax and RoRo vessels. Still there is a market for increasing the modal shift in this type of cargo. The container and the bulk maritime sectors are very competitive against the road.
- Regarding the demand, the target is:

a) Shippers companies operating with platforms.

b) Shippers companies with several trucks.

c) Shippers with one/few trucks and/or few platforms still worthwhile, but they will get less advantage from using SSS than a) and b).

d) Ideally cargo-owners with high economy of scale in distribution, low value of the product (low lead time) and high uncertainty of the demand. The first two factors are key for the use of SSS.

Note that the demand approach is only based on the strategic side. At the end, the use of the SSS will depend on the operative level: the cost of the specific SSS service compared (that is, distance, number of port calls, road cost, etc.).

Policy measures

According to all of these considerations, in Table 7-6 and Table 7-7 the proposed policy actions and initiatives are briefly introduced. In addition, a better explanation of each one is included in Appendix D.

Table 7-6 Policy actions and initiatives proposed for the ***demand side***

	Bottleneck, threat or obstacle affected	Stakeholder directly affected	Main SSS factor improved
1. Promotion of SSS advantages among international forwarders	Lack of awareness of the competitiveness of SSS services among non-specialised major forwarders	Major international shippers, cargo-owners, freight forwarders and logistic operators	Market knowledge
2. Adaptation of road transport directives to facilitate intermodal transport	Reduced hinterland for RoRo and RoPax due to the limitations imposed directive	Shippers, cargo-owners, freight forwarders, logistic operators,	-Transport time -Road transport cost -Reliability -Safety and security effects to be evaluated -Service flexibility
3. Implementation of a demand incentive: ECOBONUS	User's reluctance to change their usual way of operation (road)	Road hauliers, freight forwarders, shippers and cargo-owners	-Transportation cost -SSS attractiveness

4. Standardization of Intermodal Transport Unit 45 foot pallet wide (45' PW)	Lack of harmonization of intermodal loading units.	Road hauliers, freight forwarders, shippers and cargo-owners	-Transportation cost -Efficiency

Table 7-7 Policy actions and initiatives proposed for the ***supply*** *side*

	Bottleneck, threat or obstacle affected	Stakeholder directly affected	Main SSS factor improved
5. Design and implementation of maritime electronic manifest (eManifest)	Tough administrative burdens by the shipping industry by facilitating administrative formalities for seaborne EU goods	Shipowners	-Transportation time -Reliability
6. Directive "Port services competitiveness"	Port services cost and time	Shipowners, ports	-Transportation cost -Reliability -Efficiency
7. Improvement of road accesses to RoRo and RoPax terminals	Congestion in roads in pre-departure periods to ensure schedule and reliability	Port authorities, terminal operators	-Transport time (and cost) -Reliability
8. Create a standard reservation system for all RoRo and RoPax services	A shipper must have confidence on having a place in the scheduled vessel and the possibility of adapting to unforeseen circumstances without excessive penalties	Shipowners	-Transport time -Transport cost -Reliability -Service flexibility
9. Financial mechanism to extend over time the cost of adaptation of SSS vessels to the sulphur directive	Lack of funding to invest in the required adaptation measures	Shipowners	-Transport cost
10.Support research in to the design of more performing (and standardized) vessels for the various types of cargoes and services of SSS	Problems related to vessels costs due to excessive customisation	Shipowners and SSS specialists	-Transport time -Transport cost (including vessel's operating cost, port cost, etc.) -Safety and security
11. Promotion of the maritime profession (at all levels) in the EU	Lack of staff at all levels from EU countries, which creates dependency on foreign manpower in a strategic sector	Seafarers and shipowners	-Security -EU economy
12. Implementation of specific regulation to collect SSS statistical data	Lack of detailed statistical data about SSS market	Promotion Centres Policy makers	-Reliability
13.To extend Connecting Europe Facility coverage as MoS development support	Weak development of the MoS despite the fact that they are included in the TEN-T network	Shipowners	-Transport time and cost -Reliability

8 Conclusions

Objectives

The objectives of the assignment is to analyse the current trends of the EU Short Sea Shipping sector; identify the main factors affecting the growth of the sector; analyse the evolution of SSS market regarding main drivers, supply developments and demand requirements; and propose policy actions and recommendations to reinforce the position of SSS in EU meeting the objectives of the White Paper.

Thus, from the analysis carried out the following conclusions can be made:

Current status of SSS market: still work to be done

It seems that cargo transport by SSS has lost some momentum in recent years partly as a result of the economic crisis and partly via lost market shares to non-SSS, above all in the North Sea, North East Atlantic Ocean and Black Sea.

Cargo transport by SSS has decreased by 1.6% between 2005 and 2012, and the liquid bulk sector was mostly affected (all sea-basins except Baltic Sea registered traffic loss, however road transportation also did). The number of RoRo mobile self-propelled units, such as trucks, increased but since there here has been an increase within the non-SSS sector, the SSS market share has remained rather stable of about 37% of modal split in EU whilst road transport increase up to 45%.

The current scenario of SSS could be divided in three main kinds of freight movements in relation to different degrees of sensitiveness to external and internal changes and to the geographical location. That is:

- Captive traffic. Whenever no alternative mean of transportation exists (islands or land masses separated with a big water body) and for bulk cargo (importance of scale economies).
- Port originated traffic or DSS feeder traffic. SSS lines serving the first/last leg of intercontinental shipments using DSS lines calling in large transshipment ports. This kind of traffic usually corresponds to container SSS and its evolution is highly correlated to international container trends.
- Domestic traffic. Intra-EU maritime transport. Most Ro-Ro/Ro-Pax services belong to this kind of traffic which is directly competing with road transportation. RoRo services are successful when the road transport alternative is really unfavourable due to longer distances, tolls, driving time constraints, etc).

Which are the main decision factors from the demand side?

SSS customers (cargo-owners, shippers and freight forwarders) stated that they will usually select the lowest cost alternative. The second important factor to consider is service reliability for the supply chain. As shortsea transportation involves at least two different transportation modes for door-to-door services and the full integration of the chain is not currently well addressed, SSS clients are particularly concerned about this aspect of service quality.

The concept of reliability can also be related to the sustainability of shipping lines. Some shipping companies receive financial aid when offering SSS services but, once it is discontinued, the service disappears. This fact occurred with the MoS operated by LD Lines between St. Nazaire (FR) and Gijon (ES). It stopped operating in September 2014 because the ship-owner argued that it was economically non feasible (funding aids were over). Thus, SSS customers cannot rely on the persistence of the chain and are weary to invest in it and stabilise the demand for the long term.

Potentialities of SSS according to supply chain characteristics

As an alternative to operative factors (in terms of time and cost), the most convenient supply chain characteristics and conditions for SSS have been characterized through desk review and interviews. From the strategic approach, it can be noted that SSS offers great conditions when the product value is low, the cargo concentration and demand uncertainty are high.

SSS offers greater economies of scale than in road-haulage chains and more capacity to absorb demand variability derived either from its seasonality or from the uncertainty in its behaviour.

Factors affecting the growth of the SSS sector

In order to understand why SSS is not seen as a potential alternative in certain sea-basins and for certain cargo segments, a survey was launched to get the opinion from stakeholders. The feedback reflected the most relevant threats and bottlenecks affecting the development of SSS, which can be summarized as follows:

- Regulations affecting SSS. Rigid bureaucracy and heavy administrative procedures are affecting SSS, especially in those sea-basins that involve third countries.
- Accessibility costs to/from ports due to inefficient access and port infrastructures, capacity problems or poor intermodal facilities.
- The extension of the road network and the flexibility of road transport services are given a competitive edge that is difficult to beat; besides costs are very low, especially on the back-haul.
- The increase of SSS capacity requires high demand rates. Shipping companies are mainly focused on running their business and thus their vessels' rotation.
- Scale economies in the RoRo and RoPax segment are not decisive because vessels are multi-purpose and designed for quick operation.
- Imbalance of traffic flows (export and import) at origin/destination points.
- Inter-modality in ports is poorly developed. The links between the land modes and SSS are not fully integrated within the supply-chain.

The effects of the new sulphur regulation

Generally, three different compliance methods can be considered and their feasibility will depend on the type of vessel, newly build or retrofit and economical trade-off.

- Using alternative low sulphur content fuels, LNG fuel, methanol, liquefied petroleum gas (LPG) or biofuels;
- Introducing exhaust gas cleaning technologies to remove SOx from emissions. Two effective and mature technologies could be widely used (wet and dry scrubbing).
- Converting to Dual Fuel engines and install LNG Tanks.

In any case, the recent enforcement of sulphur regulation in ECAs in North Europe can be seen as an obstacle to SSS competitiveness. Even in the North and Baltic sea-basins, where SSS demand can be considered as captive, the introduction of sulphur regulation, according to ship-owners operating in the North EU basins, could represent a modal back shift of about 12-15%.

Main drivers and current trends of SSS market. What is expected for the future?

Regarding the effect of the drivers of change of the EU maritime sector, we found that:

- The demographic and population developments are aligned with the interest of SSS but acting in the long term. No important changes are expected in the next coming years.
- The energy cost and environmental issues (policy measures) can play an important role regarding a SSS's competitiveness. Prices are expected to increase and modal share of SSS to decrease.
- The economic situation is creating in the short term an increase of the risk of the shipping business, increasing the investment cost and making then easier the consolidation of the sector, as a reaction.

  In fact, different trends for consolidation in the SSS sector have been created in the North and Baltic Sea in the container and ferry/RoPax segment with the aim of being more efficient and cost savings.

- Regarding the policy measures, the most important impacts are allocated in the efficiency of the transport system, reduction of the administrative burden and climate change.

The most important drivers to be considered in the baseline scenario can be divided in two groups: (1) drivers and factors that can be affected by policies (i.e.: consolidation of the sector, port security, e-Maritime, e-freight, Blue Belt, technological developments, etc.); (2) and those that are external factors to the SSS sector and cannot be affected by policies, such as fuel costs and economic growth.

Based on some assumptions regarding the abovementioned factors and drivers, we were able to quantify the response of the SSS market by defining the corresponding elasticities regarding price/cost.

SSS demand evolution for upcoming years

In order to quantify the expected SSS demand, a calculation tool has been designed particularly for this assignment. It forecasts future demand by considering the effect of drivers and trends to extrapolate from the historical SSS demand evolution (2005-2012), taking into account different future scenarios.

From this point, the output values corresponding to the baseline forecast give us the following conclusions:

- The largest growth is expected in the Baltic Sea (annual average growth rate of 2.1%) and the Mediterranean Sea (average annual rate 1.95%). The North Sea and the Atlantic Ocean sea-basins show the lowest perspectives for growth in future years.
- Regarding cargo types, the largest increases are expected for large containers (average annual rate of 4.4%) and RoRo cargo (self and non-self propelled), which is expected to increase on average by 3.0% per year. On the other hand, the transport of liquid bulk goods is expected to see a decline (about -0.55%).

Two additional scenarios (named A and B) were undertaken because the above baseline forecasts are associated with uncertainty regarding the future development of the driver values. The conclusions obtained from that side were:

- For the scenario “A” the global SSS demand is expected to increase by 13% and, for the scenario “B”, it is expected that SSS freight cargo will increase by 22% in 2015 regarding 2012 freight cargo volumes.

Impact analysis

Next, an evolution of fuel costs and environmental impacts of SSS in the Baseline scenario was estimated. According to the projections undertaken in the market forecast, the SSS fuel costs are to increase in the future. In particular, in 2025 they are estimated to be 88% higher than in 2010.

Regarding environmental impacts, the air pollution costs are projected to be reduced by more than half in 2025 (mainly thanks to the reduction in sulphur emissions). In the same time, climate change costs are expected to increases because of the total amount of fuel consumption is projected to increase as a consequence of higher demand.

Finally, the wider economic, social, safety and environmental impacts of the scenarios “A” and “B” for SSS in comparison to the Baseline scenario were calculated. The main conclusions are as follows:

- The increase in total SSS fuel costs of the scenario “A” ranges between 30 and 45% while for the scenario “B” the reduction ranges between 21% and 34%.
- The overall reduction of environmental costs for the scenario “A” ranges between 6% and 8% whereas for the scenario “B” costs increase by 2%-4%.
- Road accident and noise costs are proportional to changes in road vehicles per km. As the road vkm increase in the scenario “A”, an increase in accident and noise costs of road transport is expected.

Policy actions and measures

Finally, some policy actions and recommendations have been proposed according to past experiences of funding programmes and taking into account main problems, threats and obstacles affecting SSS competitiveness. In particular, 4 actions (1-4) focused on the demand side and 9 actions (5-13) from the supply side have been proposed. Those are introduced as follows:

1. Promotion of SSS advantages among international forwarders

2. Adaptation of road transport directives to facilitate intermodal transport
3. Implementation of a demand incentive around EU: ECOBONUS
4. Standardization of Intermodal Transport Unit 45 foot pallet wide (45' PW)
5. Design and implementation of maritime electronic manifest (e-Manifest)
6. Directive "Port services competitiveness"
7. Improvement of road accesses to RoRo and RoPax terminals
8. Create a standard reservation system for all RoRo and RoPax services
9. Financial mechanism to extend over time the cost of adaptation of SSS vessels to the sulphur directive
10. Support research in to the design of more performing (and standardized) vessels for the various types of cargoes and services of SSS
11. Promotion of the maritime profession (at all levels) in the EU
12. Implementation of specific regulation to collect SSS statistical data
13. To extend Connecting Europe Facility coverage as MoS development support

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Appendix B Extended explanations, figures and tables

Table 8-1 Main EU policy measures and regulations affecting maritime transport market

Policy measures to improve competitiveness	Policy measures to mitigate the impact of major drivers of change
[1] Maritime Transport Strategy until 2018 [COM(2009) 8] (*Institutional*)	[2] Maritime Policy Green paper [COM(2006) 275] (*Operational, regulatory and licensing*)
[3] White Paper on Transport 2011 [COM(2011) 0144] (*Institutional*)	[4] Annex VI to MARPOL: Regulations for the Prevention of Air Pollution from Ships (*Operational, regulatory and licensing*)
[5] Communication and action plan with a view to establishing a European maritime transport space without barriers [COM(2009) 11 final] (*Institutional*)	[6] Directive 2000/59/EC of the European Parliament and of the Council of 27 November 2000 on port reception facilities for ship-generated waste and cargo residues. (*Operational, regulatory and licensing*)
[7] Directive 2010/65/EU simplifying port reporting formalities (*Institutional*)	[8] Directive 2005/35/EC on ship-source pollution and on the introduction of penalties for infringements. (*Operational, regulatory and licensing*)
[9] EU e-Maritime Initiative (*Institutional*)	[10] EU Marine Fuel Directive 2012/33/EU as regards the sulphur content of marine fuels [11] Directive 2005/33/EC [12] EU Sulphur Directive (1999/32/EC) (*Operational, regulatory and licensing*)
[13] The e-Freight project (*Institutional*)	[14] Communication from the Commission to the European Parliament and the Council, of 20 November 2002, "A European Union strategy to reduce atmospheric emissions from seagoing ships" [COM(2002) 595 final] (*Operational, regulatory and licensing*)
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[21] Council Regulation (EC) No 3094/95 of 22 December 1995 on aid to shipbuilding (*Operational, regulatory and licensing*)	[27] European Sustainable Shipping Forum (ESSF) to assess compliance with the new sulphur limits (*Operational, regulatory and licensing*)
[22] Eco-bonus to improve synchro-modal transport (Pricing, cost recovery, taxation and subsidy)	[28] Agreement on a European Directive on the deployment of alternative fuels infrastructure (*Operational, regulatory and licensing*)
[23] Council Regulation No 3577/92/EEC of 7 December 1992 applying the principle of freedom to provide services to maritime	

Policy measures to improve competitiveness	Policy measures to mitigate the impact of major drivers of change
transport within Member States	
[24] Implementation of Regulation 3577/92 applying the principle of freedom to provide services to maritime transport within Member States	
[25] New TEN-T Regulation and Connecting Europe Facility (CEF) (*Institutional*)	

Table 8-2 Main EU policy measures linked to macro-regional strategy

Sea basin	Policy measures to improve competitiveness	Strategies for promoting SSS
Adriatic and Ionian Region	Communication from the Commission concerning the EU Strategy for the Adriatic and Ionian Region [COM(2014) 357 final]	Developing ports, optimising port interfaces, infrastructures and procedures/operations - Support port multimodal connectivity through the development of SSS and the improvement of raid and railway connections - Increase short-sea shipping capacity and cross-border ferry connectivity - Implementation of ICT and harmonisation of the port processes through a common ITS - Development of a system of berth allocation in Adriatic Ionian ports Developing motorways of the sea - Foster development of a MoS in the Adriatic-Ionian region by building on existing experiences - Improving the railway connections at the port terminals instead of Ro-Ro - Support the logistic chain with shared IT solutions
Atlantic sea region	Communication from the Commission [COM(2013) 279 final]. Action Plan for a Maritime Strategy in the Atlantic area. Delivering smart, sustainable and inclusive growth	Improve accessibility and connectivity (priority 3) - Promoting cooperation between ports. - Promoting networks, SSS routes between EU ports, within archipelagos and to the coast of Africa through initiatives such as MoS
Baltic sea region	Communication from the Commission [COM(2013) 279 final]. Action Plan concerning	Action: Increase the role of the Baltic Sea in the transport systems of the region - Baltic MoS network: improved road and

Sea basin	Policy measures to improve competitiveness	Strategies for promoting SSS
	the European Union Strategy for the Baltic Sea Region EU Strategy for the Baltic Sea Region	rail infrastructure that links the port with the hinterland, improved infrastructure within a port, ITS solutions, environmental measures and activities related to winter navigation. Flagship projects to become a model region for clean shipping -Conduct a feasibility study on LNG infrastructure for SSS
Black sea	Communication from the Commission [COM(2007) 160 final]. Black Sea Synergy – A new regional cooperation initiative	To exploit the advantages offered by short sea shipping and inland waterways, notably the Danube. To support regional transport cooperation with a view to improving the efficiency, safety and security of transport operations TRACECA programme to provide assistance covering road, rail, aviation and maritime transport connections from Central Asia to Europe

Table 8-3 Summary table of expected impacts of policy measures on the EU maritime market. See Table 8-1 to identify the policy action.

Policy	*Economic impacts*					Social impacts				*Environmental impacts*				
	Transport activity	*Modal shift*	*Unit cost*	*Efficiency of the transport system*	*Congestion*	Reduction of administrative burden	Accessibility	Safety	Employment level	*Climate change*	*Air pollution*	*Noise pollution*	*Energy use/ energy efficiency*	*Renewable energy use*
[1]	=	++	++	+++	+	+++	+	=	=	+	=	=	=	=
[2]	+	+	=	++	+	=	=	+	=	=	=	=	+	=
[3]	=	++	++	+++	+	+++	+	++	=	+	=	=	=	=
[4]	=	--	=	=	=	=	=	=	=	+++	+++	=	=	=
[5]	=	++	++	+++	+	+++	+	=	=	+	=	=	=	=
[6]	=	=	=	=	=	=	=	++	=	++	=	=	=	=
[7]	=	=	++	=	=	++	=	=	=	=	=	=	=	=
[8]	=	=	=	=	=	=	=	++	=	++	=	=	=	=
[9]	+	+	+	+++	+	+	+	+	=	=	=	=	=	=
[10]	=	--	--	=	=	=	=	=	=	++	++	=	+	=
[11]	=	--	--	=	=	=	=	=	=	++	++	=	+	=
[12]	=	--	--	=	=	=	=	=	=	++	++	=	+	=

Policy	*Economic impacts*					Social impacts				*Environmental impacts*				
	Transport activity	*Modal shift*	*Unit cost*	*Efficiency of the transport system*	*Congestion*	Reduction of administrative burden	Accessibility	Safety	Employment level	*Climate change*	*Air pollution*	*Noise pollution*	*Energy use/ energy efficiency*	*Renewable energy use*
[13]	+	+	+	++	=	+	+	=	=	=	=	=	=	=
[14]	=	=	=	=	=	=	=	=	=	++	++	=	=	=
[15]	=	++	++	+++	+	+++	+	++	=	+	=	=	=	=
[16]	++	=	++	++	=	=	=	=	=	=	=	=	=	=
[17]	+	+++	+	+	+	=	=	=	=	+	=	=	=	=
[18]	=	=	=	=	=	=	=	Security (+)	=	=	=	=	=	=
[19]	+	+	+	++	+	=	=	=	=	=	=	=	=	=
[20]	=	=	=	=	=	=	=	Security (+)	=	=	=	=	=	=
[21]	+	=	=	=	=	=	=	=	+	=	=	=	=	=
[22]	=	=	=	=	=	=	=	=	=	+	=	=	=	=
[23]	++	=	++	++	=	=	=	=	=	=	=	=	=	=
[24]	++	=	++	++	=	=	=	=	=	=	=	=	=	=
[25]	+	+	=	+	+	+	+	=	=	+	+	+	+	+

Policy	*Economic impacts*					Social impacts				*Environmental impacts*				
	Transport activity	*Modal shift*	*Unit cost*	*Efficiency of the transport system*	*Congestion*	Reduction of administrative burden	Accessibility	Safety	Employment level	*Climate change*	*Air pollution*	*Noise pollution*	*Energy use/ energy efficiency*	*Renewable energy use*
[26]	=	+	+	+	+	=	=	=	=	+	+	=	+	=
[27]	=	+	+	+	+	=	=	=	=	=	=	=	=	=

The legend used in

Table 8-3 *is:*

=	*baseline or equivalent when introducing the policy measure*
+ *to* +++	*low to high improvement when introducing the policy measure*
-*to* ---	*low to high worsening when introducing the policy measure*

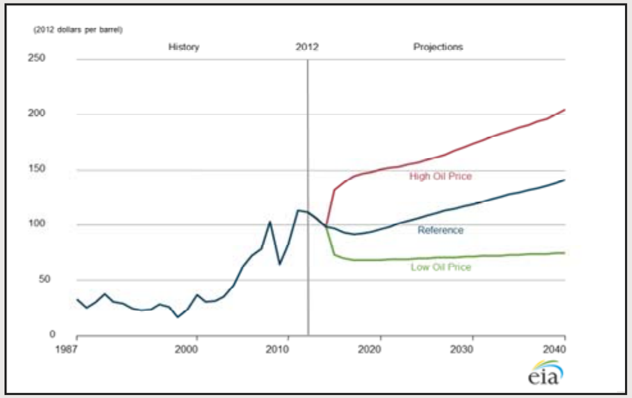
Table 8-4 Summary table of the impact of the remaining drivers of change on SSS competitiveness

Type of Driver	Driver	Main impact on SSS	Main affected variables of SSS's competiveness	Long/short term impact	Qualitative impact assessment on SSS
Demography and social changes	Population growth	Growth in transport demand	More frequency, reduction of ship cost (economies of scale) and less incentive for consolidation	Long term	++
	Population ageing	Demand, but not clear the direction Changes in mobility	Frequency and ship cost. Not clear the direction	Long term	?
	Urbanization prospects	Higher transport demand, longer distances and optimization of transport chains	Changes in transportation chains since longer distances are expected. Better port connections and efficiency of infrastructures are required	Long term	+
	Changing of work patterns	More international trade and movements of freight	More frequency, reduction of ship cost (economies of scale) and less incentives for consolidation	Long term	+
Energy and environment	Energy prices and fuel cost	Increase of the transportation cost, but with higher effect on the ship sector	Increase of ship cost and incentives for consolidation	Short and Long	---
	Climate change	Policy support for environmental transportation modes	Increase of public support for SSS	Short and Long	++
	Role of biofuels	Environmental advantages and cost-effective	Cost-effective	Medium term	+
Technology	Information and Communication Technologies (ICT)	Application to improve operations at port terminal and vessel operations, and to reduce administrative procedures	Improving reliability, time turnaround and flexibility	Short and Long	++
	Marine equipment/new propulsion systems	Improve energy efficiency and reduce fuel consumption		Medium	++
Economy	Economic growth	Increase of the transportation demand, including SSS	More frequency, reduction of cost (economies of scale) and less incentive for consolidation	Medium and Long	+
	Globalization of production and consumption	Increase transportation demand and distances (where maritime transportation is more competitive)	More frequency, reduction of ship cost (economies of scale) and less incentive for consolidation	Short and Long	+
	Uncertainty growth	Demand is more risky, then Increase the risk of the business and the investment	Incentive for consolidation and increase of the investment cost	Short and long	---
Finance	Financing instruments Access to liquidity/finance from banking/capital markets	Less financing possibilities and more expensive	Incentive for consolidation and increase of the investment cost	Short and medium term	---

Table 8-5 Promoting actions developed by SPCs

Promotion measure	Promotion measure
Communication	Communication skills are required to contribute to the visibility of SPCs and SSS, but the limited budget supposes a barrier.
Website	Despite all SPCs consider that website is really useful and that a calculation tool should be included, only 4 SPCs have an online tool for calculating emissions available in their website.
Workshops	The ESN organizes annually a conference with a rotation system.
Networking	Most SPCs (83%) are involved in activities related to networking with representative organizations such as shippers, freight -forwarders, services operators and national administrations.
Promotion	Promotion activities used to be the main aim of the SPCs. The most relevant activities are related to the use of the website and updating information (news, papers, journals, etc.). In this case, significant information about innovations and investments in the SSS sector are disseminated by each SPC.
Training education	Most of SPCs are giving special attention to the future generation of logistic and maritime by organizing conferences and workshops with the aim of disseminating material and supporting thesis related to SSS. Just few of them (4 SPCs) are regularly participating in the 2e3s. Training activities and the use of communication skills are important tasks to provide visibility to SPCs and the maritime transport using Short Sea Shipping
Statistics	The 70% of the SPC are collecting regularly (each 6months or yearly) detailed statistics. But just 4 SPCs distribute statistics to the press.
Innovations	The great majority of SPCs is following innovations on new vessels and is involved in energy and fuel developments. All of them are active in discussions about emissions and environmental measures of SSS.
European projects	The "ESN, the way forward" is a project funded by the Program Marco Polo 2011, in which 19 SPCs were involved (Sep. 2012 to Dec. 2013). In general, most SPCs are involved in European Projects.
Policy	It´s very usual that SPCs were asked for their opinion by administrations and authorities concerning maritime transport. The level of this collaboration depends on the network established by the SPC. In many cases, the relationship between both are very narrow, and the SPC collaborates with the administration about maritime transport policies.

Table 8-6 Drivers- baseline values and SSS response assumptions (extended version)

Driver	Baseline values	SSS response assumptions
Oil prices	According to EIA projections, the oil price has risen 78% in the period 2005-2014 but has fallen in 2014 until 89$/barrel. However, it is expected to increase 11% up to 2025 w.r.t. 2015 (Baseline scenario). Next figure show the different scenarios that were projected by the EIA (Baseline, high and low scenario). 	According to COMPASS report (2009), bunker costs represents on average 47% of the daily operating costs for a container vessel, 32% for a RoRo vessel and 22% and 12% for large and small RoPax vessels, respectively. These values were referenced in 2005. But, according to a Finnish study on the impact of the new regulations in 2015, the bunker costs share is about 75% for container vessels, 65% for conventional dry cargo vessels and dry bulk vessels, 60% for tanker vessels and 50% for RoRo vessels. Thus, in such context, the effect of an increase (for example of 20%) will generate an increase in vessel operating costs about 15% for container vessels, 13% for dry cargo and bulk vessels, 10% for RoRo vessels and 11% for car and passenger ferries. Then it was assumed the following elasticities price/demand per type of cargo: • Liquid bulk: -0.1 • Solid bulk: -0.2 • Containers: -0.2 • RoRo (self-propelled): -0.1 • RoRo (non self-propelled): -0.1 • Other cargo: -0.1 Finally, it is assumed that cost increasing will be directly reflected in the price.
Economic growth	Economic growth (GDP) projections according to European Central Bank. • Period 2015-2017: GDP + 1.5 • Period 2017-2020: GDP + 1.7	First we aggregate the GDP per sea-basin. Second, a correlation between aggregated GDP evolution and SSS demand traffic for each sea-basin was done, but correcting those values affected by the economical crisis. The output value corresponds to the elasticity GDP/SSS traffic that represents how much economic growth have/will affect SSS transport by type of transport. Then assuming that GDP will increase 1,5 points until 2017 and 1,7 until 2020, the SSS cargo can be estimated for each sea-basin and type of cargo.
Policy regarding sulphur regulation in	It is assumed that the scenario titled as “strong uptake of conventional fuels” is the more likely to take place in future years.	The increase of fuel cost due to sulphur regulation is reflected in operating costs according to previous assumptions. Then, it is

Driver	Baseline values	SSS response assumptions
SECA areas	HFO will hold 65% of the fuel share by 2025 because HFO with abatement technology is still considered the most cost-effective option for the majority of the fleet. Then, 30% for MGO/MDO and 5% remaining to LNG are expected. The relationship MGO/HFO is about 1.6	assumed that cost increasing will be directly reflected in the price. North and Baltic sea-basins
Port security	Port security measured by an index 2005=100, has been improved due to Directive 2005/65/EC	It is assumed that no relevant impact is expected on SSS demand according to stakeholders feedback
Consolidation	Increased co-operation, reduced competition. A decrease in supplied capacity of between 5% and 10% over a five year period is considered. RoPax and container segments could be in the higher range	Consolidation trends has been translated to vessel occupancy and then translated to average cost. As a reference value the occupancy was estimated about 70%. However, in Norway (Baltic Sea) vessel utilization is already high. As an example, Unifeeder to Oslo it is 93%. They also have vessel share agreements with others the helps them reduce their cost (SPC Norway). It has been assumed as the number of shipping companies is reduced (due to mergers) the vessel occupancy will increase. As a consequence, the average operating cost per day will be reduced (assuming that there is competition) and thus, final price to customers. It is expected that average operating costs will be reduced about 10% for RoRo/RoPax and Container sector.
Directive on Reporting formalities **Blue Belt initiative**	Shipping transport will face less administrative hurdles and therefore be able to be used to its full potential in the EU internal market and beyond. Costs associated to administrative burden at ports and delays of vessels for customs clearance will be reduced. Thus, according to the EC, the consequence for shipping is significant in terms of extra administrative burden and costs. Companies said that the reduction of administrative burden would lead to savings up to €25 per container.	It is assumed that cost savings will be translated to reduce operating speed during journeys and thus, a reduction of fuel consumption. On average (considering 450 miles and a reduction of 2knots due to cost savings at ports) it is expected a reduction of 3-5% of maritime cost per journey but the impact on the final price, due to power market, might be marginal.
Digitalisation initiatives **(e-Maritime, e-Freight, e-Customs)**	The impact of digitalisation initiatives is mainly related to improve the quality of service and flexibility for vessels and truckers. But, cost savings are also expected although the final impact on price would be marginal. • For the e-Freight initiative, savings of 10 minutes per truck ("to be converted to cost savings") and a 50% reduction of manual check-in activities (automated gate solution, changes of road to ports, cargo in bus lanes) were estimated. • The e-Maritime initiative will support the development of the Reporting formalities	It is assumed that digitialisation initiatives will help to reduce (on average) 1.5-2.0% of multimodal costs (port and maritime costs). No differentiation per sea-basin It has assumed that cost savings will not involve a big impact on SSS demand because operating cost reductions in ports are low. Then, SSS demand response would be low according to

Driver	Baseline values	SSS response assumptions
	Directive regarding communications between maritime transport and multimodal logistics	stakeholders feedback
Technological developments - ships	In particular for the container and RoRo/RoPax segments, since bulk vessels are old 10% to 20% efficiency improvement in fuel consumption according to surveys and interviews	First, assuming that bunker cost share on operating costs are: 75% for container vessels, 65% for conventional dry cargo vessels and dry bulk vessels, 60% for tanker vessels and 50% for RoRo vessels. Secondly, assuming reductions between 10% to 20% in fuel consumptions, the assumed direct reductions are: container vessel (7.5-15.0%); Ro-Ro vessel (3.2-6.4%).
Technological developments - ports	According to COMPASS study, it was expected 20% decrease in port costs. However, according to our interviews, surveys and suggestions from ESSF group the following statements were made: • This is potential for the container segment where automated handling can be a game change, but it should be considered that currently most terminals have already introduced improvements. Ports and terminals specialized in SSS are medium and small size, where labour and infrastructure account for the most part of the cost leaving little space for big savings from equipment and procedures benefiting from new technological advances/inventions. • For RoRo/RoPax, the incidence is low/moderate because cargo handling is mainly related to the vessel. • For solid and liquid bulk cargo this assumption is not applied	Cost savings within the range 5 to 10% are expected in following years for container segment and 5% for RoRo/RoPax segment. First, the port costs represent the following percentages on total vessel operating costs per type of vessel: 8.5% for container vessels, 6.3% for dry bulk vessels, 6.5% for liquid bulk vessels, 7.9% for RoRo vessels (COMPASS report). Secondly, assuming reductions the corresponding reductions as regards to cargo segments, the impact on final prices would be: container vessel (0.50%) and RoRo/RoPax vessel (0.40%)
Ecobonus initiative (Italian)	Ecobonus basis as a percentage of the ticked paid, which differs from 10 to 25% and from 20-30% discount according to the maritime route and the amount of journeys (>80 journeys completed) for EU and national routes, respectively. - 23 national maritime routes in Italy were incentivised - 12 EU maritime routes within West Mediterranean were incentivised by the Ministry of Infrastructures and Transports. In particular between Italy and Spain (Barcelona, Tarragona, Castellon, Algeciras and Valencia) and France (Tolone) The amount of tonnes transported in EU routes awarded by Ecobonus only represent only the 5% of total RoRo/RoPax cargo within the Mediterranean sea-basin	Great incentive for national routes (increasing rates about 40% between 2007 and 2010) but low impact in EU routes because of decrease of Spain GDP and EU economic crisis. It is assumed that no additional effect will be produced in future years because of this initiative is already implemented since 2007.

Appendix C Methodology and assumptions for the calculation of the economic, social, safety and environmental aspects

For the current study, economic, social, safety and environmental aspects were considered to evaluate the effect of the key drivers. Table 8-7 shows the impact indicators that were initially taken into account in order to evaluate the scenarios.

Table 8-7: Overview of impact indicators

Category	Indicator	Description
Economic	Direct operating costs and benefits	Direct operating costs and benefits (monetary and time costs).
	Congestion	Marginal congestion costs reflect the willingness to pay for avoiding utility losses due to speed reductions resulting from inefficient use of scarce capacity of the transport network. (Ricardo-AEA, 2014)
	Reliability	The indicator reliability combines an estimation of the predictability of transport times (measured by the standard deviation of the travel time) per transport mode and the value of time.
Social & safety	Employment	Employment effects cover direct employment due to the forecasted modal shift, e.g. truckers, mariners.
	Noise	Noise costs occur through health impairments and loss of productivity and leisure as noise causes annoyance and stress. (Ricardo-AEA, 2014)
	Accidents	External accident costs comprise the social costs of traffic accidents which are not included in the insurance system. External accident costs quantify medical costs, production losses, material damages, administrative costs and risk values valuing pain, grief and suffering as a result of traffic accidents. (Ricardo-AEA, 2014)
Environmental	Air pollution	Air pollution costs estimate the impact of emissions mainly on human health, but also on environment, economic activity, etc. (Ricardo-AEA, 2014) In this context NMVOC, NOx, PM2.5 and SO2 are covered.
	Water pollution	Water pollution costs evaluate the costs due to oil or motor fuel leakages, pollution from slop, antifouling paints, waste dumping. (JRC, 2008)
	Climate change	Dependent on the method used, climate change costs value the damage of greenhouse gas emissions to the sea level, landscape, fresh water availability, vegetation, etc. (i.e. damage cost approach) or the cost of reducing the greenhouse gas emissions in order to decrease the pace of climate change. (Ricardo-AEA, 2014)

We have attempted to limit the sources for the quantification of these impacts to a selection of established reports, complemented with own calculations and additional literature if required. In the next paragraphs we summarize the main assumptions made for the impact calculations.

1.1 Economic impacts

Direct operating costs and benefits

The impact of the scenarios on the direct operating costs and benefits will be estimated based on direct fuel prices. For road transport we take into account the fuel excises, which are a transfer from the road transport sector to the government. The fuel prices for SSS are taken based on the fuel price information in the second interim report (Sections 3.3.2, 3.6.2 and 3.6.3). For road transport the historical fuel price and excise are EU averages, based on the Oil Bulletin of the European Commission (https://ec.europa.eu/energy/en/statistics/weekly-oil-bulletin). In future years the price before taxes is assumed to change in line with the crude oil prices as projected by EIA, similar to the assumptions for SSS.

The scenarios also include changes in the costs of SSS due to technical developments in ports, consolidation etc. However, as the calculation tool only considers percentage changes in the SSS costs, while including no information on the absolute cost levels, the difference in costs cannot be calculated. This entails that the actual costs for short sea shipping will be overestimated in the calculations.

Congestion

The marginal congestion costs for road transport are taken from Ricardo-AEA (2014). This report distinguishes these costs based on vehicle type, region, road type and congestion level. For heavy duty articulated trucks, the average European marginal congestion cost on highways in rural areas (as opposed to metropolitan and urban areas) are summarized in Table 8-8.

Table 8-8: EU average marginal congestion costs for articulated heavy duty trucks on motorways in rural areas. Source: Ricardo-AEA, 2014

Congestion level	c€/vehicle km
Free flow	0.0
Near capacity	38.8
Over capacity	89.2

TREMOVE 3.3.2 (2010) indicates that 31.61% of the vehicle km by 32+ tonnes heavy duty trucks in Europe are driven in peak periods. The remaining 68.39 of the vehicle km take place during off-peak periods. As no accurate data are available on the share of vehicle km according to the congestion levels defined in Ricardo-AEA (2014), we will here define a bandwidth for the marginal congestion costs for road transport. Assuming that off-peak corresponds to free flow, the marginal road congestion costs range from 12.26 c€/vehicle km (= 31.61%*38.8) to 28.20 c€/vehicle km (=31.61%*89.2).

With regard to maritime transport, congestion costs include congestion caused by limited capacity at handling cargo and port logistics, next to waiting time. Currently, ports generally operate at overcapacity of existing infrastructure compared to the current demand and/or waiting times are not reported (Ricardo-AEA, 2014 and JRC, 2008). Therefore, maritime congestion costs are assumed to be negligible.

Reliability

Significance (2012) has determined value of reliability for freight transport according to mode. For road transport, values range from 2 €/hour per vehicle for container transport up to 6 €/hour per vehicle for non-container transport. For maritime transport, the value of reliability is estimated to 45 €/hour waiting time for a quay per ship for container transport and to 110 €/hour waiting time for a quay per ship for non-container transport.

These cost impacts will however not be estimated due to lack of information on the waiting time per transport mode in the scenarios.

1.2 Social and safety impacts

Employment

Ecorys et al. (2012) estimate the employment in SSS to be approximately 823 000 persons. It is expected to remain relatively stable even with an expected annual growth of 3% to 4%. In this study we assume similar efficiency increases as in the Ecorys report. Therefore, we estimate that the SSS employment effects in the scenarios are likely to be small and have decided not to include them. For employment in ports, PWC and Panteia report an increase by approximately 90 new cargo handling jobs with every additional million tonnes (adjusted41) of throughput in ports, based on Van Hooydonk (2013)42.

Noise

With regard to noise, only the marginal noise costs of road transport are taken into account, as the marginal noise costs due to short sea shipping are generally assumed to be no major issue. (Ricardo-AEA, 2014 & CE Delft, 2011). The first reason is that the main traffic related noise source in port areas are generated by road and rail traffic (NoMEPorts, 2008 and JRC, 2009). Secondly, shipping activities mostly occur outside densely populated areas (CE Delft, 2011).

European values for marginal noise costs, according to vehicle type, time of day and traffic type are published in Ricardo-AEA (2014).Table 8-9 presents the values for heavy duty vehicles in rural areas (as opposed to urban and suburban areas).

Table 8-9: Marginal noise costs for EU for heavy duty vehicles in rural areas (€/1000 vkm). Source: Ricarcdo-AEA, 2014

Time of day	Traffic type	€/1000 vehicle km
Day	Dense	0.7
	Thin	1.5
Night	Dense	1.3
	Thin	2.6

As discussed above, TREMOVE 3.3.2 (2010) assumes that 31.61% of the vehicle km for 32+ tonnes articulated heavy duty trucks can be allocated to the peak periods. Assuming that the peak periods correspond to dense day traffic and that the off-peak can be equally distributed over the remaining three categories, the average marginal noise cost amounts to 1.45 €/1000 vehicle km.

Accidents

Ricardo-AEA (2014) report a marginal accident cost of 1.2 c€/vehicle km for heavy duty trucks on highways across Europe. For maritime transport, little

[41] For the equivalence factors, see Commission Staff Working Document, Impact Assessment Accompanying the document Proposal for a Regulation of the European Parliament and of the Council establishing a framework on the market access to port services and the financial transparency of ports (SWD(2013) 181, Volume 2.
[42] Dr Eric Van Hooydonk, 2013, "Port Labour in the EU", a study commissioned by the European Commission.

literature exists on marginal accident costs. VTI (2014) suggests relatively low marginal accident costs, in terms of life and health. Including environmental costs and costs for the industry will probably lead to a considerable increase in the maritime accident costs. However, these factors have not yet been researched (VTI, 2014). Regarding the marginal accident costs linked to port activities, VTI (2014) suggests that these costs should be allocated to the transport chain as a whole, and not solely to maritime transport.

To give a rough indication of the potential impact of the SSS scenarios on maritime safety, we base ourselves on data from EMSA (2010, 2014). EMSA publishes data on maritime accidents and casualties. In this report we mainly use the data of the 2010 report as it provides data by region and by ship type. EWENT (2012) gives more background about why the accident risks differ between different sea basins.

Combining the EMSA data with Eurostat data on tonnes transported by the maritime sector, we have calculated an average accident risk per sea basin and ship type. These accident risks are calculated for the period 2009-2010. They have been applied to the projected SSS transport by sea basin and type of cargo in order to project the evolution of SSS accidents. The projections assume that the accident risk per ship type and sea basin remains constant over time. The average accident risk may however change over time as the share of the sea basins or goods types changes.

We know of no study that tries to determine the costs of SSS accidents. Moreover, the costs are also very case dependent. Therefore, we have chosen not to put a monetary value on the evolution of the accidents. Regarding the impacts on lives lost, Ricardo-AEA (2014) suggests a Value of Statistical Life of €1.7 million (2010 prices).

1.3 Environmental impacts

Air pollution

For road transport, Ricardo-AEA (2014) distinguish air pollution damage costs based on the vehicle type, tonne class, technology class (i.e. euro class) and road type (urban, suburban, rural and motorway). For heavy duty trucks of more than 32 tonnes, TREMOVE base case-projections show the following distribution of the vehicle km.

Table 8-10: Distribution of vehicle km of 32+ tonnes articulated heavy duty trucks according to Euro-class on motorways in non-urban areas. Source: TREMOVE 3.3.2

Euro-class	2010	2020
Conventional	5.94	0.22
EURO I	3.21	0.08
EURO II	14.99	1.07
EURO III	33.71	8.84
EURO IV	30.08	9.84
EURO V	12.07	79.95
Grand Total	100.00	100.00

The EU average air pollution costs on motorways for these 32+ tonnes articulated heavy duty trucks per Euro-class are summarized in the following table.

Table 8-11: Marginal air pollution costs on highways of 32+ tonnes articulated heavy duty trucks according to Euro-class. Source: Ricardo-AEA, 2014

Euro-class	c€/vehicle km
Conventional	14.8
EURO I	10.4
EURO II	10.4
EURO III	8.3
EURO IV	5.6
EURO V	2.3

Combining these data, the air pollution damage costs (EU average) of 32+ tonnes articulated heavy duty trucks on highways ranges from 7.53 c€/vehicle km in 2010 to 3.28 c€/vehicle km in 2020.

For maritime transport, the updated handbook on external cost of transport (Ricardo-AEA, 2014) distinguishes the damage costs for air pollution according to sea basin for NOx, SO2, PM2.5 and NMVOC as shown in this table.

Table 8-12: Air pollution damage costs for SSS per sea basin and pollutant. Source: Ricardo-AEA, 2014

Sea basin (€/tonne)	NMVOC	NO_x	PM2.5	SO2
Baltic Sea	1100	4700	13800	5250
Black Sea	500	4200	22550	7950
Mediterranean Sea	750	1850	18500	6700
North Sea	2100	5950	25800	7600
Remaining North-East Atlantic	700	2250	5550	2900

Based on emission calculations performed in LIMOBEL (De Vlieger et al., 2011) and SHIPFLUX (Bencs et al., 2012), average marginal air pollution costs for maritime transport are calculated per year, sea basin and fuel type. With regard to the latter dimension, a distinction is made between HFO, MDO/MGO and LNG. These calculations assume an autonomous evolution of the international fleet and take into account the changes in the sulphur content of HFO.

Table 8-13: Marginal air pollution costs for maritime transport according to sea region and fuel type (€/tonne of fuel) in 2010 and 2025. Source: own calculations based on De Vlieger et al. (2011) and Bencs et al. (2012)

Sea basin	2010			2025		
	HFO	MDO/MGO	LNG	HFO	MDO/MGO	LNG
Baltic Sea	914	472	44	450	472	41
Black Sea	1141	443	38	449	443	35
Mediterranean Sea	819	218	19	245	218	17

North East Atlantic Ocean	470	226	22	218	226	20
North Sea	1272	617	59	594	617	54
Other sea basins	470	226	22	218	226	20

Water pollution

Not much detailed information on the impact of emissions in water is available, as it is difficult to determine emission factors for water (JRC, 2009). Furthermore, the damage costs due to accidental oil spills range widely due to the diversity of local conditions. Therefore, costs caused by water pollution will not be included in the report.

Climate change

For road transport, Ricardo-AEA (2014) also reports marginal climate change costs for road and maritime transport. For heavy duty trucks of more than 32 tonnes, the marginal climate change costs are defined by Euro-class as follows.

Table 8-14: Marginal climate change costs for 32+ tonnes articulated heavy duty trucks according to Euro-class. Source: Ricardo-AEA, 2014

Euro-class	c€/vehicle km
Conventional	9.0
EURO I	8.2
EURO II	7.9
EURO III	7.5
EURO V	6.7
EURO IV	6.7

These data are combined with the distribution of the vehicle km according to Euro-class in Table 8-14. The resulting marginal climate change costs for road transport amount to 7.33 c€/vehicle km in 2010 and 6.79 c€/vehicle km in 2020.

For SSS, no distinction can be made according to sea region for the marginal climate change costs. The average climate change cost per fuel type is calculated based on the emission factors resulting from projections within LIMOBEL (De Vlieger et al, 2011) and SHIPFLUX (Bencs et al, 2012), and a climate change cost of 90€/tonne of CO2 equivalent (Ricardo-AEA, 2014). CO2, CH4 and N2O are weighted according to their respective global warming potential of 1, 25 and 298.

Appendix D Development of policy actions and recommendations

The following tables included the proposed measure or policy actions indicated in the core of the present report.

Policy measure	1. Promotion of SSS advantages among international forwarders
Goal of the policy action	Create awareness of the competitiveness of SSS and about their environmental benefits
Bottleneck, threat or obstacle affected	Lack of awareness of the competitiveness of SSS services among non-specialised major forwarders
Short description	A campaign directed to the main international forwarders showing concrete examples of competitive alternatives to their shipments using SSS
Who is going to implement it?	European Commission supported by specialized marketing firm with solid transport sector knowledge
Which is the SSS segment affected?	Containers RoRo (self or non-self propelled) RoPax
Which is the sea-basin involved?	All of them
Supply or Demand side target	Demand side
Main stakeholders affected/interested by the measure	Major international shippers, cargo-owners, freight forwarders, logistic operators
Main variable affected/improved	Market knowledge
Modal shift expected	Up to 5% of the relevant (SSS alternative exists) international traffic
Implementation cost and expected time	0.5 million campaign might be sufficient. Quick implementation.
Short/medium/long term effects	Short term
EU regulation (framework) related/involved	None
Risk and mitigation measures	The main risk is that services are not responding to expectations. SSS service providers should participate in the campaign to ensure service quality
Previous experiences in other sectors	Well-addressed marketing campaigns supported by the EU tend to be successful

Policy measure	2. Adaptation of road transport directives to facilitate intermodal transport
Goal of the policy action	Support intermodal, in particular SSS, transport with regards to pure road transport
Bottleneck, threat or obstacle affected	Reduced hinterland for RoRo and RoPax due to the limitations imposed directive
Short description	Allow a limited extension of driving hours conditions for trips to SSS terminals to extend the range of SSS ports' hinterland. It would essentially entail the consideration of the time spent inside the port as "availability time" and not working time.
Who is going to implement it?	European Commission should propose a revision of the Working Time Directive 2002/15/EC
Which is the SSS segment affected?	RoRo (self or non-self propelled) RoPax
Which is the sea-basin involved?	All of them
Supply or Demand side target	Demand side
Main stakeholders affected/interested by the measure	Shippers, cargo-owners, freight forwarders, logistic operators,

Policy measure	2. Adaptation of road transport directives to facilitate intermodal transport
Main variable affected/improved	Transport time Road transport cost Reliability Safety and security effects to be evaluated Service flexibility
Modal shift expected	Up to 5% for RoRo and RoPax
Implementation cost and expected time	Negligible cost (especially if the Directive has to be revised for other causes). Time for implementation subject to political decisions, impossible to foresee.
Short/medium/long term effects	Short term effects, as the hinterland extension would be perceived immediately by the shippers.
EU regulation (framework) related/involved	Working Time Directive 2002/15/EC
Risk and mitigation measures	The only risk stems from the safety risks of a small extension of working hours while the driver moves the truck inside the port and the vessel. A system to mark the arrival time in the tachograph could help avoiding fraud.
Previous experiences in other sectors	None

Policy measure	3. Implementation of a demand incentive: ECOBONUS
Goal of the policy action	To increase the attractiveness of SSS for current and potential users
Bottleneck, threat or obstacle affected	User´s reluctance to change their usual way of operation (road)
Short description	Design and implementation of a financing model to provide subsidies to road haulage companies or other kind of users which make use of existing or new maritime routes instead of road transport, promoting the modal shift.
Who is going to implement it?	European Commission: DG MOVE / INEA Member States
Which is the SSS segment affected?	Containers RoRo (self or non-self propelled) RoPax (depending on the MoS definition)
Which is the sea-basin involved?	All of them
Supply or Demand side target	Demand
Main stakeholders affected/interested by the measure	Directly: Road hauliers, freight forwarders and all users Indirectly: Shipowners, shippers, ports
Main variable affected/improved	Transport cost
Modal shift expected	Depending on the Ecobonus characteristics and its scope. For example, between 2007 and 2010, Italian Government supported the Italian Ecobonus with the following results for EU routes: 510.000 journeys funded carrying 14.6 million of tons in 4 years.
Implementation cost and expected time	Depending on the Ecobonus scope and the budget assigned. In Italy, during 4 years, the total amount of Ecobonus for EU routes awarded was 67 million of euros (approximately).
Short/medium/long term effects	Short term, since effective implementation
EU regulation (framework) related/involved	Commission communication C(2004) 43 "Community guidelines on State aid to maritime transport" Regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010
Risk and mitigation measures	Agents from other maritime services (not MoS) could ask for similar incentives on their business.
Previous experiences in other sectors	Italian Ecobonus Basque Country (smaller scale)

Policy measure	4. Standardization of Intermodal Transport Unit 45 foot pallet Wide (45'PW)
Goal of the policy action	The objective of the action is to allow to the 45'PW container be competitiveness into intermodal transport since its volumetric capacity is the same as a trailer.
Bottleneck, threat or obstacle affected	Lack of harmonization of intermodal loading units. Road transport regulation not suitable to 45'PW container
Short description	Introduction requirements to 45'PW container standardization in directive "weight and dimensions" as well in directive "Combined transport" would be implemented.
Who is going to implement it?	European Institutions Member States
Which is the SSS segment affected?	Containers RoRo (self or non-self propelled) RoPax
Which is the sea-basin involved?	All of them
Supply or Demand side target	Supply
Main stakeholders affected/interested by the measure	Shipowners, shippers, cargo-owners and carriers.
Main variable affected/improved	Transport cost Efficiency
Modal shift expected	Expected increase on the Short Sea Shipping container traffic
Implementation cost and expected time	This implementation would not be an expensive action, and the time to deployment will be short
Short/medium/long term effects	Medium Term
EU regulation (framework) related/involved	Directive 96/53/EC on Weights & Dimensions of heavy-duty vehicles operating as international and national transport within the EU. Directive 92/106/EC on Combined Transport
Risk and mitigation measures	No Risk
Previous experiences in other sectors	Extra-large dimensions are already included for some specialized trucks as car trucks or reefer trucks

Policy measure	5. Design and implementation of maritime electronic manifest: E-MANIFEST
Goal of the policy action	To reduce administrative burdens incurred at present by the shipping industry by facilitating administrative formalities for seaborne EU goods or goods in free circulation carried between two EU ports as if they were carried by land transport means, taking into account the commercial reality of Short Sea Shipping. Specifically for services linking European Ports with at least one call in ports of non-European third countries.
Bottleneck, threat or obstacle affected	Too much bureaucracy and invested time with a negative impact in Short Sea Shipping. Single Market Act is not working as it should
Short description	The eManifest is a harmonised electronic customs cargo document, to be used to prove the status of the goods on board. It will be specifically useful for vessels calling also in 3rd country ports. The e-manifest would allow custom administration to control the freight from non-European third countries before calling at ports, and the Custom Services could operate with margin. This situation would be similar to "Regular Shipping Services" calling in European ports.
Who is going to implement it?	European Commission: DG TAXUD
Which is the SSS segment affected?	Containers RoRo (self or non-self propelled) RoPax
Which is the sea-basin involved?	All basins, but specifically those linked to non-European third countries, specially:

Policy measure	5. Design and implementation of maritime electronic manifest: E-MANIFEST
	• Baltic Sea • Mediterranean Sea • Black Sea
Supply or Demand side target	Supply
Main stakeholders affected/interested by the measure	Directly: Shipowner Indirectly: Road hauliers, freight forwarders, and users
Main variable affected/improved	Transport time Reliability
Modal shift expected	N/A
Implementation cost and expected time	Currently DG TAXUD is working on it.
Short/medium/long term effects	Medium Term
EU regulation (framework) related/involved	Union Customs Code (UCC) adopted as Regulation (EU) No 952/2013 of the European Parliament and of the Council.
Risk and mitigation measures	No risk, e-manifest will take into account any potential risk and the measure to cover it.
Previous experiences in other sectors	Efficiency demonstrated in "European Regular Shipping Services"

Policy measure	6. Directive "Port services competitiveness"
Goal of the policy action	Improving the port services competitiveness
Bottleneck, threat or obstacle affected	Port services costs and time
Short description	Development of a common legal framework that allows the liberalization and free competition in the supply of port services No competition in port interface has negative impact in maritime transport, especially in SSS services with many calls per year (high frequency).
Who is going to implement it?	European Institutions Member States
Which is the SSS segment affected?	Mainly: RoRo ,RoPax and container
Which is the sea-basin involved?	All of them
Supply or Demand side target	Supply
Main stakeholders affected/interested by the measure	Directly: Shipowners Indirectly: users and shippers
Main variable affected/improved	Transport time and cost Reliability Efficiency
Modal shift expected	N/A
Implementation cost and expected time	This implementation would not be an expensive action, but the time to be able to approve it could be long.
Short/medium/long term effects	Medium Term
EU regulation (framework) related/involved	
Risk and mitigation measures	Lack of political agreement
Previous experiences in other sectors	Other transport sectors, as airports' handling, or road freight transport

Policy measure	7. Improvement of road accesses to RoRo and RoPax terminals
Goal of the policy action	Speed and reliability of the SSS-based transport chain
Bottleneck, threat or obstacle affected	Congestion in roads in pre-departure periods to ensure schedule and reliability
Short description	From a proper analysis of the external and internal road links in the port area, improve capacity, if needed, and information (fixed, dynamic and through ITS) to drivers.
Who is going to implement it?	Road and traffic authorities; port authorities
Which is the SSS segment affected?	RoRo (self or non-self propelled) RoPax
Which is the sea-basin involved?	All of them
Supply or Demand side target	Supply side; but improve competitiveness and demand
Main stakeholders affected/interested by the measure	Port authorities, terminal operators Shippers, cargo-owners, freight forwarders, logistic operators,
Main variable affected/improved	Transport time (and cost) Reliability
Modal shift expected	Up to 3%
Implementation cost and expected time	A specific budget per port will have to be estimated. Modest investments in information panels and ITS, especially if standardized. Implementation of less than one year after decision is taken.
Short/medium/long term effects	Short term effects with continuity
EU regulation (framework) related/involved	No specific regulation. Potential inclusion in Structural funds and CEF
Risk and mitigation measures	No major risks envisaged
Previous experiences in other sectors	ITS applications in urban areas

Policy measure	8. Create a standard (centralized?) reservation system for all RoRo and RoPax services
Goal of the policy action	Facilitate on-the-road decisions of forwarders and/or drivers about the best services available
Bottleneck, threat or obstacle affected	A shipper must have confidence on having a place in the scheduled vessel and the possibility of adapting to unforeseen circumstances without excessive penalties
Short description	An application showing the SSS options for a specific trip and allowing reservations with the maximum amount of flexibility. The system should be able to manage reservations, redirections and penalties in order to reduce the risks for both the truck owner and the shipping line.
Who is going to implement it?	Ideally a private company with initial support from the European Commission. In the medium term the service should become profitable and should allow other operators to compete
Which is the SSS segment affected?	RoRo (self or non-self propelled) RoPax
Which is the sea-basin involved?	All of them
Supply or Demand side target	Supply side
Main stakeholders affected/interested by the measure	Shipowners. Shippers, cargo-owners, freight forwarders, logistic operators,
Main variable affected/improved	Transport time Transport cost Reliability Service flexibility
Modal shift expected	Up to 5%
Implementation cost and expected time	Some 3 million per basin; implementation time around 2 years
Short/medium/long term effects	Medium term effects
EU regulation	No specific regulation. Potential inclusion in Structural funds and CEF

Policy measure	8. Create a standard (centralized?) reservation system for all RoRo and RoPax services
(framework) related/involved	
Risk and mitigation measures	The risk is the performance of the application and its acceptability in the milieu as a decision making tool
Previous experiences in other sectors	None that is known, of general use, in the transport sector

Policy measure	9. Financial mechanism to extend over time the cost of adaptation of SSS vessels to the sulphur directive
Goal of the policy action	Maintain the competitiveness of SSS reducing the shock of compliance with the environmental regulations in certain bassins
Bottleneck, threat or obstacle affected	Lack of funding to invest in the required adaptation measures
Short description	A public financial institution such as the EIB could establish a line of credit for SSS shipowners that could provide loans according to the life expectancy of the vessel to be adapted. With the vessel as a guarantee, loans for the investment at very low rates for some 7 to 10 years, could be awarded through standardized procedures.
Who is going to implement it?	Could be the EIB or other international (or national) financial institutions. They might require some comfort from the EU budget.
Which is the SSS segment affected?	All of them
Which is the sea-basin involved?	Initially the North Sea Later all basins
Supply or Demand side target	Supply side
Main stakeholders affected/interested by the measure	Shipowners Financial institutions
Main variable affected/improved	Transport cost
Modal shift expected	Important to avoid back shifts
Implementation cost and expected time	Very modest implementation cost. The issue is to convince the IFIs and define the procedures, etc., which would take at least 6 months.
Short/medium/long term effects	Short and medium term effects
EU regulation (framework) related/involved	Directive 2012/33/EU
Risk and mitigation measures	The risk stems from the possibility that the shipowners or the IFIs are not interested in the operation. The co-lateral support from the European Commission could provide some leverage.
Previous experiences in other sectors	Some experiences of the type have been proposed in the EIB, such as the Cleanbus initiative to help buy cleaner bus fleets

Policy measure	10.Support research into the design of more performing (and standardized) vessels for the various types of cargoes and services of SSS
Goal of the policy action	Long-term reduction of port operations and shipping costs of SSS
Bottleneck, threat or obstacle affected	Problem with high vessels costs due to excessive customisation
Short description	A balance should be found between the adaptation of the vessel to the characteristics of the specific SSS service and the cost advantages of more standardised design and construction. Some research, associating naval engineers with SSS operators and system specialists could produce prototypes better adapted than existing vessels to the needs of the different types of SSS.
Who is going to implement it?	European Commission through its research programme
Which is the SSS segment affected?	All of them
Which is the sea-basin involved?	All of them

Policy measure	10.Support research into the design of more performing (and standardized) vessels for the various types of cargoes and services of SSS
Supply or Demand side target	Supply side
Main stakeholders affected/interested by the measure	Shipowners, SSS specialists
Main variable affected/improved	Transport time Transport cost (including vessel's operating cost, port costs, etc.) Safety and security
Modal shift expected	Not quantifiable at this stage
Implementation cost and expected time	From 1 to 4 million (for the research phase that could take up to four years). The shipyard construction phase of prototypes would be a commercial venture to be started later.
Short/medium/long term effects	Long term effects
EU regulation (framework) related/involved	EU research programme
Risk and mitigation measures	The risk that the research does not bring some improvements on present SSS vessels is very modest; adequate management should even lead to SSS prototypes for different cargo types
Previous experiences in other sectors	This research should not be very different than similar projects undertaken for road, rail or aviation innovations.

Policy measure	11. Promotion of the maritime profession, at all levels, in the EU
Goal of the policy action	Attract qualified EU staff, as officers and seafarers, to SSS
Bottleneck, threat or obstacle affected	Lack of staff at all levels from EU countries, which creates dependency on foreign manpower in a strategic sector
Short description	Campaign to show to the youngsters the interest of the maritime profession and, in particular SSS that does not require long leaves from home. Adaptation of the university careers and professional training to European certificates
Who is going to implement it?	European Commission with the support of Member States
Which is the SSS segment affected?	All of them
Which is the sea-basin involved?	All of them
Supply or Demand side target	Supply side
Main stakeholders affected/interested by the measure	Seafarers and shipowners
Main variable affected/improved	Security EU economy
Modal shift expected	Not relevant
Implementation cost and expected time	Promotion campaign across the EU could cost between 1 and 2 million. Implementation of more standardized education and training depends on the willingness of the member states to abide by the proposal.
Short/medium/long term effects	Long term
EU regulation (framework) related/involved	
Risk and mitigation measures	The success of campaigns is always difficult to measure, as there are other variables affecting the results. The main risk is that young people do not feel the attractiveness of the maritime profession.
Previous experiences in other sectors	Promotion campaigns are common. Standardisation of degrees has proved very difficult in other cases.

Policy measure	12. Implementation of specific regulation to collect SSS specific statistical data
Goal of the policy action	Monitoring the evolution of Short Sea Shipping industry with reasonable detail, that allows provide an efficient tool for decision making. Detail assessment of SSS industry
Bottleneck, threat or obstacle affected	Lack of detailed statistic information about SSS industry.
Short description	Design and implementation of a homogeneous methodology in all UE Member States to collect specific data from Short Sea Shipping.
Who is going to implement it?	European Institutions: Eurostat / DG MOVE Member States
Which is the SSS segment affected?	All of them
Which is the sea-basin involved?	All of them
Supply or Demand side target	Demand
Main stakeholders affected/interested by the measure	Shipowners, Shippers and decision makers: ports, users, etc.
Main variable affected/improved	Reliability
Modal shift expected	N/A
Implementation cost and expected time	This implementation would not be an expensive action, and the time to deployment will be short
Short/medium/long term effects	Medium Term
EU regulation (framework) related/involved	Directive 2009/42/EC, Statistical returns for carriage of goods and passengers by sea Amending act: Regulation (EU) No 1090/2010 of the European Parliament and of the Council of 24 November 2010 amending Directive 2009/42/EC on statistical returns in respect of carriage of goods and passengers by sea Text with EEA relevance
Risk and mitigation measures	No risk
Previous experiences in other sectors	Any sectorial Eurostat Statistic

Policy measure	13.To extend Connecting Europe Facility coverage as MoS development support
Goal of the policy action	To make Connecting Europe Facility program more effective to improve Motorways of the sea services development
Bottleneck, threat or obstacle affected	Weak development of the Mos despite the fact that they are included in TEN-T network
Short description	Extend the CEF coverage as the only source of MoS funding support: -To include ports from the Comprehensive Network as ports that can be able to link MoS services. - To include connections with third-country ports, on a selective basis - To improve and simplify the procedures to facilitate the accessibility to beneficiaries
Who is going to implement it?	European Institutions Member States
Which is the SSS segment affected?	Roro Ropax Container secondarily
Which is the sea-basin involved?	All of them
Supply or Demand side target	Supply
Main stakeholders affected/interested by the measure	Directly: Ship-owners Indirectly: users and shippers
Main variable affected/improved	Transport time and cost Reliability
Modal shift expected	Depending on the budget of the action

Policy measure	**13.To extend Connecting Europe Facility coverage as MoS development support**
	As an example, Marco Polo Program II between 2007 and 2011 had a budget of €450 million and 2.33 million of truck trips were avoided. http://ec.europa.eu/transport/marcopolo/files/infographics-marco-polo-results.pdf
Implementation cost and expected time	This implementation would not be an expensive action because it not changes the CEF Regulations, and the time to deployment will be short. It could be implemented in the next call of CEF
Short/medium/long term effects	Short Term (since effective implementation)
EU regulation (framework) related/involved	European funding programs Regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010
Risk and mitigation measures	No risk
Previous experiences in other sectors	Marco Polo Program