SEVENTH FRAMEWORK PROGRAMME

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SKEMA Coordination Action

"Sustainable Knowledge Platform for the European Maritime and Logistics Industry"

Deliverable: D2.2.2.1 European Short Sea Shipping developments

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Contents

1. Study objectives

The study is aimed at providing an overview of key Short Sea Shipping (SSS) developments together with their merits and limitations. Specific reference will be made to the Commission's 14 SSS Promotional Actions in the "Programme for the Promotion of Short Sea Shipping" COM (2003) 155.

1.1 Stakeholders

- SSS Promotional organisations
- SSS operators particularly those participating in Container shipping, RoRo and LoLo operations
- European Commission and State Agencies responsible for policy development affecting Short Sea Shipping and intermodality

1.2 Glossary terms

Short Sea Shipping: For the purposes of this study SSS refers to the movement of cargo and passengers by sea between ports situated in geographical Europe or between those ports and ports situated in non-European countries having a coastline on the enclosed seas bordering Europe. SSS includes domestic and international maritime transport, including feeder services, along the coast, to and from the islands, rivers and lakes.

MarAd: The US Department of Transportation Maritime Administration

Jones Act: Certain provisions of the US Merchant Marine Act of 1920, also known as Jones Act, require that any vessel operating between two US ports must be US-built, US-owned, and manned by US citizens, significantly increases the capital and the operating costs for any short sea operation.

TEN-T: Trans European Transport Network to support expansion of SSS services, reducing congestion and environmental impact.

Motorways of the Sea: Motorways of the Sea are defined in EC communications as 'existing or new sea-based transport services that are integrated in door-to-door logistic chains and concentrate flows of freight on viable, regular, frequent, high-quality and reliable Short Sea Shipping links. The deployment of the Motorways of the Sea network should absorb a significant part of the expected increase in road freight traffic, improve the accessibility of peripheral and island regions and states and reduce road congestion.'

Short Sea Promotions Centres (SPCs): SPCs promote Short Sea Shipping as part of the intermodal transport chain. They form connections with all major actors in the field of shortsea shipping and are a channel of influence between business and authorities.

Intermodal Loading Units: Intermodal Loading Units (ILU), as the name suggests, are units by which goods can be moved between the various transport modes. They include containers, swap bodies and other purpose-build units.

1.3 Approach

The study will address:

1. Short Sea Shipping characteristics, particularly in the context of EU transport
2. Bottlenecks and progress achieved in eliminating them
3. The measures to create better integration of SSS in the transport system
4. EU Policy and Projects to promote SSS

2. An introduction to Short Sea Shipping

2.1Main characteristics

Short Sea Shipping (SSS) refers to the movement of domestic and international cargos (wet or dry bulk cargos), containers and passengers by water along coastal routes and inland waterways. The European Commission defines short sea shipping as ' the movement of cargo and passengers by sea between ports situated in geographical Europe or between those ports and ports situated in non-European countries having a coastline on the enclosed seas bordering Europe[1]. SSS is also a term often used to describe feeder services; distribution of international cargos from large hub ports to the smaller ports closer to the cargo's final destination.

Ship sizes in SSS usually range from 1000 dwt (deadweight tonnes), i.e. the amount of cargo they carry to 15000 dwt with draughts ranging from around 3m to 6m. Most of cargoes include grain, fertilizers, steel, coal, salt, stone, scrap and minerals (all in bulk), oil products (such as diesel oil, kerosene, aviation spirit - all in bulk), containers and passengers (usually on ferries).

Short Sea Shipping supports the development of efficient, integrated transport systems in all continents around the world, and can help meet environmental and social goals for sustainable development. From an environmental perspective, shipping tends to have lower environmental and social impacts than land transport[2].

Potential economic advantages from using SSS to moderate surface traffic include reduced costs of maintaining road infrastructure and making the transport of goods more efficient by reducing traffic congestion or directly connecting coastal regions. The expansion of short sea trade could also encourage more attractive employment in the maritime sector and could help with the acute shortages of seafaring officers.

[1] European Commission, 1999, The Development of Short Sea Shipping in Europe:
A Dynamic Alternative in a Sustainable Transport Chain (COM (1999) 317 final)

[2] COM(2009) 10 – Communication and action plan with a view to establishing a European maritime transport space without barriers

Given the above advantages, modal shift from road to sea has been a major objective of the freight transport policies of the EU as well as the USA and Asian countries, with a focus on reducing environmental pollution, freeing up road capacity and supporting sustainable development. The following sections provide a brief overview of the distinct characteristics of SSS in different continents.

2.2 Comparing and contrasting SSS in Europe the United States, and Asia

In European, cities are generally located close to one another (particularly in comparison to the US) and often have easy access to water. Fuel taxes and other costs make overland trucking relatively expensive, promoting the search for alternative transportation methods. The European commission has a long standing policy to promote SSS and created the Marco Polo program as part of Trans European Transport Network (TEN-T) to support expansion of SSS services, reducing congestion and environmental impact.

The US Department of Transportation through the Maritime Administration (MarAd) has made SSS one of its six high-priority freight initiatives through the National Freight Action Agenda. The major water freight systems in the US operate on the Mississippi River, the Great Lakes, and the St. Lawrence Seaway, and typically transport bulk cargoes (such as grain, coal, petroleum, and lumber) for which delivery is not time-sensitive. According to MarAd:

'Domestic waterborne transportation is safe, reliable, efficient and an established mainstay of America's national transport system. This environmentally friendly form of surface transportation handles a combined total of over 1.1 billion short tons of cargo, which is about 23 percent of the ton-miles of all domestic surface transportation traffic. Domestic waterborne transportation contributes $7.7 billion to the gross domestic product annually in the form of freight revenue.'[3]

The key drivers of SSS in North America are the increasing road congestion, concerns about the environment (particularly the air pollution from trucking on congested roads), and

[3] http://www.marad.dot.gov/ships_shipping_landing_page/domestic_shipping/Domestic_Shipping.htm

continuing growth of cities[4]. MarAd sees promoting the use of waterways as one means of easing traffic congestion and reducing air pollution. It has supported the development and adoption of the 2003 Canada–US Memorandum[5]. Further, in December 2007, the US Senate passed the latest Energy Law (HR 6), which has a section dedicated to the promotion of SSS as a sustainable mode that can alleviate highway congestion[6].

More recently through 'America's Marine Highway Program', the US is actively looking to expand SSS operations. 'Expanding the Marine Highway can be cost effective and will require less new infrastructure than surface transportation alternatives, represents significant fuel savings, while offering a resilient and redundant means of transportation'[7].

Surveys among US shippers agree that on-time reliability and door-to-door capability are the leading factors in their choice of transportation mode. However, despite the wide acceptance of SSS among US transportation stakeholders as an environmentally friendly alternative, there are various administrative, legal, operational and financial obstacles that delay the expansion of short sea services. These obstacles are:

1. Additional handling costs. Instead of trucks carrying the cargo directly from origin to destination, short sea vessels take over the longer haulage, and trucks make only the local pick-up and final delivery. At the transfer points or intermodal terminals, there are additional handling costs for the loading and unloading of the cargo.
2. Image problem. Traditionally, SSS has the image of a slow, unreliable and obsolete mode of transport which affects the shipper's decision to use this mode. Short Sea operators need to alter that image by effectively promoting the advantages of SSS to the shippers and facilitating the c-operation among transportation modes.
3. Harbour Maintenance Tax (HMT). The HMT is assessed as a 0.015% 'ad valorem' fee on the value of the commercial cargo, which is transported on vessels using the US ports. It is applied on both domestic and international containers that are been transported by vessels, but not on the cargo that is transported by trucks or rail. This is a major obstacle to SSS, since it is applied on every transhipment point. Many

[4] Brooks M. R. and J. D. Frost , (2004), 'Short sea shipping: a Canadian perspective', Maritime Policy and Management, 31, 4, 393-407
[5] Memorandum of Cooperation on Sharing Short Sea Shipping Information and Experience Between the Transportation Authorities of the United States of America and Canada, 16 July 2003.
[6] US CONGRESS, 2007, Energy Independence and Security Act of 2007, 101st Congress, first session, HR. 6
[7] U.S. Army Corps of Engineers, ''Waterborne Commerce of the United States'' (2005).

transportation industry stakeholders are calling for the waiver of HMT for the domestic SSS transportation. The recent repeal of the HMT in the Great Lakes is a major support for SSS.

4. Jones Act. In the US, one of the major obstacles to the development of coastal shipping is the 'cabotage' system. Certain provisions of the Merchant Marine Act of 1920, also known as Jones Act, which requires that any vessel operating between two US ports must be US-built, US-owned, and manned by US citizens, significantly increases the capital and the operating costs for any short sea operation. Thus, it makes SSS more expensive and less competitive. [8]

Asia has a long history of freight movements on sea and river routes and hub and spoke feeder ship traffic are already used extensively. One of the reasons for this is that many locations have non-existent or underdeveloped road and rail alternatives. The shipping sector in the regions is therefore very competitive. For Asia the motivation to further utilise sea transport is therefore a function of the geography of the region. However, in order to increase maritime traffic, Asia needs to invest more in ports and infrastructure to provide effective hinterland connections from the ports as part of an integrated transport system. Research is needed to determine how best to achieve optimum operating efficiencies in all situations, including future trade pattern developments across the ASEAN region and globally. It has been suggested that a "common transport policy" for the ASEAN region is desirable[9]. This is likely to entail some discussion of competitive and co-operative behaviour between ports.

There is general consensus across the regions as to the desirability of SSS in order to alleviate congestion and environmental impacts. Some of the obstacles and problems are common to all, notably the image of shipping and the issue of additional handling costs from transhipment. Promotion of SSS is seen as an important policy issue in all regions, although European Policy in this area is at a slightly more advanced stage that that of the US and Asia. A factor here is perhaps the geography of Europe, its coastline and the density of industrial centres.

[8] Perakis, Anastassios N. and Denisis, Athanasios(2008)'A survey of short sea shipping and its prospects in the USA',Maritime Policy & Management,35:6,591 — 614

[9] Short Sea Shipping – A European and ASEAN Perspective, Peter Wybrow, PLW Associates (Marine) Ltd & PACOMES (South East Asia) Sdn Bhd, Malaysia (2002) by Sue Lewey, Alliance of Maritime Regional Interests in Europe (AMRIE), Belgium, PLW Associates (Marine) Ltd and PACOMES (South East Asia) Sdn Bhd, Malaysia, Michael Lloyd, Alliance of Maritime Regional Interests in Europe (AMRIE), Belgium.

3. European Short Sea Shipping

3.1 The role of SSS in European transport

The previous section suggested that the European geography is highly favourable to Short Sea Shipping, with more than 67,000 km of coastline and very few industrial centres being more than 400km from the coast. Additionally there are approximately 25,000km of navigable inland waterways. SSS provides 40% of internal freight transport and has been growing at a moderate rate during the past decade.[10]

SSS is of paramount importance if the EU wishes to establish a complete and integrated system of intermodal transportation which will be able to guarantee not only free competition but also internal economic and social cohesion. SSS can offer effective transportation services with low relative cost and with fewer externalities compared to road transport which is considered to be its main competitor. The full exploitation of the advantages of SSS demands a comprehensive EU promotion policy. To this end, the EU has adopted a number of initiatives, which represent an important step in this process. However, in order for Short Sea Shipping to meet the contemporary transportation requirements of door – to – door and just – in – time, it should be fully incorporated to the multimodal / intermodal integrated transportation system. SSS must overcome its organisational problems and improve its image as an old fashioned mode of transport.

The importance of SSS in Europe is demonstrated by the fact that in 2007, SSS represented 61% of the total EU-27 maritime transport of goods (expressed in tonnes). This split between SSS and other seaborne transport (namely 'deep sea shipping') was particularly pronounced in Finland, Malta and Sweden where SSS accounted for 90% of sea transport. Geographical considerations may partly explain such predominance. In contrast, in relatively small countries, such as the Netherlands and Belgium which are home to some big ports concentrated on inter-continental trade, the share of SSS is about 50%.

In terms of commodities moved by SSS, liquid bulk accounted for almost half of the total to/from the EU-27, with 896 million tonnes. At 364 million tonnes, dry bulk was the second largest type of cargo. Goods transported in Roll-on/Roll-off (RoRo) units were third (251

[10] European Commission Maritime Affairs http://ec.europa.eu/maritimeaffairs/

million tonnes), followed by containers (210 million tonnes). In contrast to bulk cargo, goods in both Ro-Ro units and containers recorded positive growth rates of +5.2% and +8.4%, respectively in 2007. Indeed RoRo ships are particularly suited to European SSS markets and have been technologically developed in recent years.

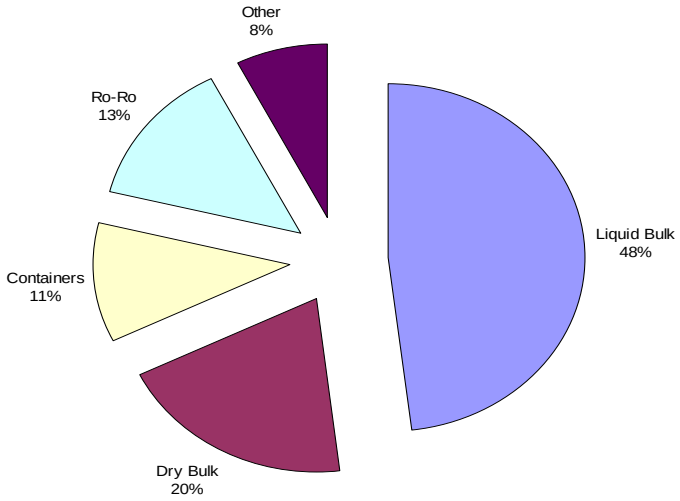

Figure 1: Commodities Moved by SSS in Europe 2007- *Source Eurostat*

Ports play a significant role in the development of SSS. With the exception of the main hub ports of Rotterdam, Antwerp, Hamburg, Amsterdam and Algeciras, all top 20 ports of Europe had shares of SSS above 50% of total seaborne transport. However, Rotterdam still handled the highest tonnage of short sea shipped goods in 2007. Despite these high percentages it is recognised that many ports in terms of their organisation and infrastructure are not always friendly to Short Sea Shipping in Europe. The EU has therefore included policy measures for the enhancement of Short Sea Shipping. Its programme includes describes legislative, technical and operational initiatives which are aimed at developing Short Sea Shipping at EU, national, regional and industry levels. In addition, the establishment of a "European maritime transport space without barriers" should help to boost short sea services in all maritime regions. This concept would ensure a reduction of the administrative formalities, in particular customs formalities that apply today to the intra-EU seaborne trades and that do not apply to similar road transport services.

3.2 The main advantages of Short Sea Shipping

Short Sea Shipping developments aim to make a significant contribution to EU transport policy[11] *by*:

- supporting the sustainable development of European transport;
- helping increase interregional trade by means of efficient and low cost transport services;
- contributing to regional development and prosperity in Europe through the facilitation of intra-European trade;
- making a distinct contribution to the reduction in CO_2 and other greenhouse gas emissions associated with transport;
- helping reduce road congestion and associated road damage in European states.

The most important benefits of Short Sea Shipping are:

1. avoidance of road congestion
2. less environmental damage, allowing companies to enhance their green credentials
3. government savings on road related costs
4. overall cost savings to the shippers for specific market segments
5. economies of scale - meeting future freight capacity demands
6. support for interregional trade and economic development

3.3 EU SSS promotion Actions

The Commission's 14 SSS Promotional Actions are specified and elaborated in its publications:

- "Programme for the Promotion of Short Sea Shipping" COM(2003) 155,
- "Mid-Term Review of the Programme for the Promotion of Short Sea Shipping" COM(2006) 380

[11] "European Transport Policy for 2010 – Time to Decide" and mid-term review

The 14 SSS Promotional Actions can be summarized as follows:

Legislative Actions	Technical Actions	Operational Actions
1. Implementation of the IMO-FAL directive on ship reporting. 2. Implementation of the Marco Polo programme. 3. Standardisation of intermodal loading units. 4. Motorways of the Sea. 5. Improving environmental performance of SSS.	6. Guide to customs procedures for SSS. 7. Identification & elimination of obstacles to SSS. 8. Computerisation of Community Customs procedures. 9. RTD measures	10. One-stop administrative shops. 11. Securing the role of SSS Focal Points. 12. Ensuring good functioning of SS Promotion Centres. 13. Promotion of SSS as a successful transport alternative. 14. Collection of statistical information.

Progress has been reported in the Mid-Term Review of the Programme for the Promotion of Short Sea Shipping (COM(2003) 155 final)

3.3.1 Motorways of the Sea

The Motorways of the Sea initiative introduced by the Commission's White Paper on European Transport Policy of 2001[12] sets out to make better use of the enormous capacity of Europe's seas and large river systems as floating infrastructure for transporting goods. This will contribute to a lasting restructuring of long distance freight transport in Europe, putting it on a more sustainable path.

Motorways of the Sea are defined in EC communications as 'existing or new sea-based transport services that are integrated in door-to-door logistic chains and concentrate flows of freight on viable, regular, frequent, high-quality and reliable Short Sea Shipping links. The deployment of the Motorways of the Sea network should absorb a significant part of the expected increase in road freight traffic, improve the accessibility of peripheral and island regions and states and reduce road congestion.'

[12] COMMISSION OF THE EUROPEAN COMMUNITIES, 2001, White Paper. European Transport Policy for 2010: Time to Decide. Brussels: COM(2001) 370, 12.09.2001

The concept of Motorways of the Sea[13] is seen these days within the wider development of high-quality Short Sea Shipping as a viable alternative to road transport. A wider range of private and public (e.g. Marco Polo II programme) sources of investment have been mobilised to develop Short Sea Shipping connections which offer services meeting "Motorways of the Sea benchmarks" on a number of key performance indicators. A summary of such indicators is given in Annex 1.

Implementing and promoting Motorways of the Sea as an alternative to building new or upgrading existing major road highways parallel to the coast can bring important benefits. An example given in COM 606 indicates that a Motorways of the Sea between the North of the Iberian Peninsula and the North Sea Member States with four vessels and six round trips per week would realise a modal shift of close to 5 billion tonne-kilometres over 3 years, saving the emission of 125000 tonnes of CO2[8] and taking every day a lane of more than 3 km of trucks in both directions away from the highways.

The Community can provide funding for the planning and implementation of Motorways of the Sea through TEN-T, Marco Polo II, structural funds, cohesion funds and research and development programmes.

However, awarding Motorways of the Sea (MoS) status to existing or new Short Sea Shipping links is not particularly welcomed by EU member states and industry led benchmarking initiatives for quality SSS could be a way forward in implementing the MoS concepts in the SSS sector.

3.3.2 European SSS Promotion Centres

Shortsea Promotion Centres are instrumental in promoting European Union transport policy in relations to SSS. An initiative was taken in Holland in the early 1990´s to assemble the involved parties and to see how best practices could be explored in order to promote short sea shipping. Shortsea Promotion Centre Holland was the first SPC in Europe. At the time focus was only at this single mode. Other SPCs were established in many of the States and there are now 21 Short Sea Promotion Centres (SPC's) in the EU and adjacent states. The general activities of the SPCs are:

[13] Report on the Motorways of the Sea COM(2007) 606 final

- Information dissemination - websites, newsletters, seminars and workshops
- Information on transport solutions
- Database on liner services
- Identification and solution of bottlenecks - information on best practices

The services of the SPCs are directed at industry. All the SPCs promote shortsea shipping as a viable transport mode as a part of intermodal transport chain. SPCs form a platform with connections to all major actors in the field of shortsea shipping. SPCs are a channel of influence between business and authorities. In addition there are country specific tasks.
SPCs work in collaboration with the Short Sea Shipping Focal Points in various member states. This concept has since been developed as it was imperative that these offices worked together.

The main advantage of the SPCs is neutrality and wide coverage both nationally and internationally via the European Shortsea Network (ESN). The ESN (http://www.shortsea.info) was formed in 2000 in order to:

- To strengthen the activities of the national SPCs
- To exchange concrete information
- To exchange ideas, best practices
- To support new SPCs

The European Commission has provided financial support to the ESN via grants to projects of the network. New SPCs have received a grant to their start-up projects. The SPCs and the ESN have contributed to increase the awareness of shortsea shipping as a mode of transport. This has been done via a web sites, conferences, fairs and information dissemination to shippers and forwarders. The ESN has also contributed to highlight bottlenecks and worked with Short Sea Shipping Focal Points to eliminate these obstacles.

3.3.3 Promotional Platform for Short Sea Shipping and Intermodality (PROPS)

The PROPS Coordination Action builds on previous EU and national activities undertaken to promote and develop short sea shipping. PROPS aims to work closely with all the promotion centres in Europe and the European Short Sea Network to develop practical tools to enhance their activities – in the fields of legislative, technical and operational.

The project aims to develop and utilise a business networking approach to enhance the current practical work of the promotional centres in Europe. The planned media campaign will establish and test the role of existing promotional bodies as well as the business perceptions about the short sea shipping and its importance in the supply chain.

3.3.4 Standardisation of cargo units

The lack of harmonisation and standardisation of loading units prompted the European Commission to propose a Directive[14] that focuses on enhancing the efficiency of the intermodal transport chain. Currently, the handling characteristics of intermodal loading units (ILU) differ considerably from containers to swap bodies to purpose-build units, leading to increased costs from adjustments of handling equipment. The scope of the European Commission Directive has been to achieve a degree of uniformity in the intermodal loading units by the harmonization of key characteristics. Those characteristics include:

- Dimensions of the loading units,
- Location and design of accessories and fittings of the loading units that relate to handling and transportation,
- Stack-ability, suitability for top lifting and seaworthiness,
- Maximum allowable space for transporting pallets, and it should also offer simple and fast charging and discharging of pallets to decrease friction costs and delays.

The harmonisation of these characteristics aims at facilitating frictionless movement in all land and waterborne modes of transport. Harmonisation will decrease transfer friction costs, decrease transportation related risks, and speed up handling with consequential time savings.

[14] Directive Of The European Parliament And Of The Council on Intermodal Loading Units, COM(2003) 155 final 2003/0056 (COD)

Concerns raised for standardising a European Intermodal Loading Unit (EILU) include the adaptation costs and fears that the new EILU would lead to a discrepancy between intra-European and international standards. This could affect the efficiency in ports.
The standardisation issue is now in the hands of the industry and is being pursued in association with the International Organisation for Standardisation (ISO).

4. Integration of SSS in logistics chains

4.1 Overall requirements

Intermodal commodity flows are simply a sequence of separate stages. Intermodal freight transport could be managed more effectively by means of systems that enable smooth transfer of good between modes and information between all parties (i.e. the senders of goods, the companies moving the goods and the receivers). With such systems, the transport chain could be scheduled and managed as a single process over a range of modes and with different providers.

Integration of SSS in logistics chains can therefore be viewed as a process integration problem addressing the interests of the stakeholders involved:

1. *Transport users*: Businesses that buy transportation services, who are shippers (including exporters & importers) and freight forwarders acting on behalf of shippers wishing to identify and use SSS or combined transport services most suited for their purpose;
2. *Ship operators*: Businesses that provide transportation services wishing to exchange information electronically with all relevant actors through planning, executing and completing transport operations including hauliers, operators of trains, inland waterway vessels, terminals and other logistics operators;
3. *Port services providers* responsible for managing the transport infrastructure able to facilitate the best possible use with efficient links to hinterland connections and to support transport users by providing relevant information about the available transport infrastructure and how to use it;
4. *Transport Regulators:* the EU and National Administrations (regulatory authorities, specifically customs, safety & security agencies, police (immigration), animal welfare and associated organisations such as EMSA (European Maritime Safety Agency)

responsible for SafeSeaNET[15] wishing to obtain, in the simplest possible way, the required information for monitoring compliance with applicable regulations, and to exchange information with other authorities for collaboration in security and environmental risk management.

The crucial issues for integrating SSS in logistic chains as outlined above are addressed by the EU e-Freight and e-Maritime initiatives.

4.2 e-Maritime and e-Freight

The objective of European e-Maritime initiative is to promote "coherent, transparent, efficient and simplified solutions in support of cooperation, interoperability and consistency between member States, sectors, business and systems involved in the European Transport System"[16]. This objective is fully compatible with the Lisbon Agenda, the mid-term review of the Transport White Paper, the Blue Book on an integrated maritime policy, the information society and a range of other policies inspired from electronic means of communication.

The EU e-Maritime initiative is intended as a broad and embracing initiative in the maritime transport sector aimed at facilitating and supporting the development and take-up of the latest enabling ICT technologies for the improvement of maritime transportation services as part of the integrated EU Transport System.

e-Maritime is also closely related to:

1. the "e-freight" action of the EU Freight Logistics Action Plan which denotes the vision of a paper-free, electronic flow of information associating the physical flow of goods with a paperless trail built by ICT;
2. the e-Customs developments[17] aimed at providing a paperless environment for customs and trade by making Member States' electronic customs systems compatible with each other and creating *a* single, shared computer portal
3. European Border Surveillance System / EUROSUR related developments.

[15] SafeSeaNet aims at establishing, within the Community a vessel traffic monitoring and information system with a view to enhancing the safety of efficiency of maritime traffic, improving the response of authorities to incidents, accidents or potentially dangerous situations at sea, including search and rescue operations, and contributing to a better prevention and detection of pollution by ships.

[16] European Commission (EC) Green Paper "Towards a future Maritime Policy for the Union"

[17] communication COM/2003/452 of 24/07/2003

5 European maritime transport space without barriers

The European maritime transport space without barriers initiative seeks to improve the overall effectiveness of intra-EU maritime transport by removing major administrative obstacles to the development of SSS. The Commission recognises that this mode has an important role to play in helping the EU to meet its environmental commitments and address its energy challenge, through better competition conditions with road transport.

The Communication on a European maritime transport space without barriers[18] has identified a number of actions required in both the short- and medium term, dealing primarily with the simplification and easing of administrative formalities and burdens in European SSS.

These actions include:

1. Simplification of customs formalities for vessels only sailing between EU ports including guidelines for speeding up documentary checks related to animal and plant products carried between EU ports, rationalisation of documents requested under different bodies of legislations.

2. Simplification of administrative formalities for vessels sailing between EU ports, but having a call in a third country or a free zone including enhanced electronic data transmission.

3. An administrative single window. The Commission is preparing measures for "National Single Windows". A Single Window is a system that allows traders to lodge information with a single body to meet all import or export-related regulatory requirements.

4. Simplification of rules on carriage of dangerous goods by sea

5. Co-ordination of administrative inspections with a view to shortening turnaround times

6. Facilitation of administrative communication

[18] COM(2009) 10 – Communication and action plan with a view to establishing a European maritime transport space without barriers

7. Issuing of Pilot Exemption Certificates (PEC). Member States are invited to create a regulatory framework which would permit easier pilotage exemptions.

8. Physical separation in ports of areas reserved for SSS for Container traffic and RoRo traffic. The benefit of this measure would be more rational management of port traffic and faster vessel turnaround times in ports.

6. Review of EU Projects

FP4 - TRANSPORT RTD - Transport Research and Technological Development (RTD)

The Transport RTD programme formed part of the first activity of the Fourth Framework Programme (FP4) within the sub-area 'Transport'. It supported the development and implementation of the common transport policy. The main objectives of the programme were:

- to develop an efficient, safe and environmentally friendly transport system
- to facilitate the interconnection of the separate transport networks
- to increase the efficiency of each individual mode and improve cooperation between them
- to promote the design and management of infrastructure with a view to reducing the damage to the environment and improving the quality/price ratio; and
- to provide industry, transport operators and users, and authorities with the appropriate decision-making instruments based on better knowledge and understanding of mobility, traffic flows, their interactions and interdependencies.

INSPIRE: Innovative Ship Pilot Research (01/1998 - 12/1999)

The main objective of INSPIRE was to demonstrate how SSS can be made more competitive as part of an intermodal transport chain. Specific objectives were to:

- develop determining strategies that would increase the effectiveness and competitiveness of EU SSS on key corridors;

- demonstrate that EU SSS can extend its competitiveness through the application of vessels that are optimally matched to trading corridors and to ports;
- provide policy recommendations to improve the overall effectiveness of EU SSS.

The main INSPIRE result was a methodology for corridor studies. The methodology integrated economic, logistic and design issues and was a valuable tool to decide ship type and speed and to analyse effects of infrastructure investments on a corridor. The methodology included formats for data collection on ports, ships and cargo flows, and a simulation tool enabling comparison of multi-modal transport solutions, for example use of alternative routings, different vessels and land transport vehicles, and different fuel charges.

IPSI: Improved Port/Ship Interface (04/1996 - 04/1999)

The objective of the IPSI project was to develop new concepts for efficient port/ship interfaces in order to make SSS the best choice for as large a share as possible of the total transport distance. The project focused on the cargo handling system, but new vessel designs were developed to improve cargo loading and unloading operations.

The main outcome of the IPSI project was the development of new concepts for intermodal Short Sea Shipping terminals and vessels. For terminals, IPSI focused on the cargo handling system. As for vessels**,** the project distinguished IPSI ships and IPSI barges.

PROSIT: Promotion of Short Sea Shipping and Inland Waterway Transport by the Use of Modern Telematics (01/1998 - 03/2000)

The PROSIT project had two main objectives:

- the application and installation of the Interconnectivity Manager (IM), to support automated Electronic Data Interchange (EDI) between several internal and external partners and
- the development and demonstration of a set of tools enabling the electronic, dynamic and interactive support of business decisions.

The main results of PROSIT were the installation of the IM and the development and testing of a new tool, named ProShip, which uses the IM for information exchange with customers or transport industry. The ProShip tool was able to support:

- the brokerage between the demand and the supply side,
- the comparison of the agreed and planned transport with reality.

SSS-CA: Short Sea Shipping Concerted Action (04/1996 - 03/2000)

The objectives of SSS-CA were:

- to assess the state of the art of SSS,
- to synthesize all relevant research and other related work,
- to monitor related projects,
- to define pilot projects and demonstrators,
- to define criteria for interoperability and **SSS** logistical efficiency,
- to identify the key focal points for future development in **SSS**,
- to perform a comprehensive analysis of **SSS** statistical data.

SSS-CA produced three main results: i) a comprehensive database about the state of the art on SSS, ii) the formulation of the terms of reference for pilot projects in the area of SSS, and iii) an extensive statistical analysis of SSS flows in Europe.

The INTERREG III programme

Interreg III was a Community initiative which aimed to stimulate interregional cooperation in the EU. It was financed under the European Regional Development Fund (ERDF). The guidelines were approved by the Commission on 28th April 2000.

The Interreg objective was to strengthen economic and social cohesion throughout the EU, by fostering the balanced development of the continent through cross-border, transnational and interregional cooperation. Special emphasis had been placed on integrating remote regions and those which share external borders with the candidate countries.

REMARCC II: Network of Regional Maritime Competence Centers (06/2002 - 06/2005)

The purpose of the project was the promotion of SSS and inland waterway as a main component of intermodal transport and examine its contribution to the future maritime development of the North Sea Region. More specifically it considered greater efficiency of transport corridors and networks in the North Sea Region, strengthening of port's position in

intermodal transport and logistics chains, better integration and improved interaction and communication between public and private stakeholders in the logistic sector.

The project focused on the following three areas for regional strategies:

- Logistics competence
- Logistics optimisation and
- Logistics marketing

The objective of the project was to promote competitive and sustainable intermodal transport systems in the North Sea Region (NSR) including waterborne transport (SSS and inland navigation) as the main transport leg through:

- Creation of regional and interregional waterborne transport and logistics collaboration clusters
- Improvement of the competence of the waterborne transport and logistics networks organisations and individuals
- Optimisation of waterborne transport and logistic processes
- Development of strategies and mechanism for the promotion of the use of waterborne transport and logistics
- Creation of a quality assurance framework for implementing measures and continuous quality improvement.

The project aim contributed to the strategy NORVISION which examined co-operation for the promotion of SSS and inland navigation involving stakeholders from port operators, shipping companies, shippers, forwarders, logistic providers and hinterland infrastructure.

The main results of this project were**:**

- Recommendations to improve North Sea Logistic Clusters.
- Demonstration and take-up measures to implement Knowledge Management processes.
- Enterprises and administrations participating in Knowledge Management processes.
- Informing shippers about possibilities to shift cargo from road to waterborne transport.

- Coaching and training courses/seminars.
- Staff development via coaching and training.
- An internet based platform for promoting sustainable waterborne intermodal transport and logistics in the North Sea Region.
- Increased awareness of waterborne transport alternatives.
- Production and distribution of publications.
- Certification measures carried out by the North Sea Quality Circle as an interregional quality management instrument which were welcomed by enterprises and administrations participating in Knowledge Management processes.
- Investigation of the characteristics of maritime regions.
- Promotion of waterborne transport, having a strong impact on future planning and demand for transport infrastructure within and between the regions in the North Sea Region.

FP5 - GROWTH - KA3 - Land transport and marine technologies

The key challenge for FP5 was how to reconcile the increased demand for transport with the need to reduce its impact on the physical, social and human environment, and how to reduce the transport intensity of economic growth.

The stakeholders included EU DG TREN, transport industry, SME, national and regional governments and corresponding organisations, research centres, universities, consultants, transport service providers and operators, transport experts.

ADVANCES: Thematic Network on an Operational Platform for Quality Shipping (04/2000 - 03/2003)

ADVANCES was concerned with quality in maritime transport. Its objective was to respond to the European initiatives of Quality Shipping and SSS by considering improved technology within an attractive commercial framework. Quality Shipping is most commonly related to achieving better safety at sea and, as a result, much activity was focused on eliminating sub-standard shipping. The Advances Thematic Network was, however, intended to be a broader arena in which all the relevant players in the transport chain would contribute to an

understanding of how to combine the industrial concept of total quality with the IMO and European desire for improved safety at sea.

The objective of ADVANCES was to establish a network for:

- Establishing a common understanding of 'quality maritime transport'
- Identifying the missing elements needed for a wider adoption of a quality approach
- Evaluating previous and ongoing research to clarify the availability of required elements
- Suggesting new activities to close the gap between the status quo and future requirements
- Validating the practicality and viability of a 'quality' approach
- Disseminating results to industry

Quality in maritime operations was taken to mean:

- Better safety at sea
- Better protection of the environment
- Added value to the contribution played by shipping in the overall transport chain
- Improvement of operational, tactical and strategic decisions to allow waterborne transport activities to be optimised with improved commercial viability and better quality freight services to customers.

REALISE: Regional Action for Logistical Integration of Shipping across Europe (10/2002 - 10/2005)

REALISE investigated technological strategies, methodologies, and tools for the European business community and decision-makers to encourage the use of short sea shipping**.** The project objective was to assist European business actors and policy-makers to secure the key maritime transport objective of the European Commission White Paper ‘A European Transport Policy’. This was to achieve a substantial modal shift of incremental freight from road to sea and a development of intermodality during the next decade. REALISE set out to provide methodologies and tools for the development of short sea shipping via its integration in the complete logistics supply chain.

In the context of the above mentioned objectives the work programme of REALISE focused on three integrative studies:

- Statistics
- Environmental impact
- Multi-modal pricing and cost structures**.**

INTEGRATION: Integration of Sea Land Technologies for an Efficient Intermodal Door to Door Transport (08/2002 - 07/2005)

In its ongoing attempt to manage predicted increases in freight transport, the European Commission was taking steps to encourage the use of intermodal systems, especially containers. Integration of the different modes within the transport chain meant improved flexibility, quality, and cost effectiveness and stimulated competition between transporters instead of between transport modes.

The objective of INTEGRATION was to develop demonstrable optimised concepts, integrate new technologies, and to reinforce intermodal links with special emphasis on easing, improving and facilitating cargo flows between inland and sea (loading / unloading cargo operations). INTEGRATION aimed at producing systems and services for moving freight from origin to destination by intermodal chain, where water transport was enhanced. INTEGRATION systems contributed to the competitiveness of the maritime transport through:

- Short Sea Shipping freight transport increase
- Terminal/Ports operations volumes increase
- Enlargement of the maritime network

The INTEGRATION project did not set out to invent completely new solutions but to study existing technologies and adapt them or their application to improve the land-sea connection. The rationale was that adapting established technologies would speed up their take-up by the industry. It also built on the results of another European project, such as IPSI. The early stages of the project identified two key technologies in current use. First, most short-sea

vessels are roll-on-roll-off ships, loaded 'horizontally' by driving containers on to the ship. Second, large ports such as Hamburg and Rotterdam have automated guided vehicles that move containers from a port's marshalling area to the quay cranes that normally load the ships. The second major activity of INTEGRATION was the rational design of new ro-ros, optimised for SSS.

PRIN

The Ministry of Education in Italy co-finances research programmes of national relevance proposed by the universities. In the past the Ministry funded 40% of the costs of projects proposed by universities. Today the '40%' instrument has been superseded by PRIN with similar objectives and funding arrangements. The basic objective of it is to part finance research projects of University departments in Italy in different disciplinary areas.

The funded projects fall mainly under the area of Civil Engineering and Architecture, Industrial and Information Engineering (including one on SSS : *Environmental compatibility and structure and plant reliability of vessels for competitive and sustainable short-sea shipping*), Economic and Statistical Sciences (including : *Outlook of short-sea shipping in the Mediterranean Sea (2004-2005).*

Outlook of Short Sea Shipping in the Mediterranean Sea (2004-2005)

The objectives of the project were:

1. The identification of a methodology which was able to highlight the variables affecting competitiveness of SSS and the development of a model summarising its operation.
2. The application of a theoretical model to the reference market and to the user categories of major interest.
3. The analysis of freight traffic flows and potential demand by collecting statistical data and direct surveys among operators.
4. The economic analysis of services offered on the routes of major interest with a focus on fare and service conditions. This examined simultaneous opportunities offered by the infrastructure and organisation systems and by the socio-economic evaluation of the production of RoRo services on the routes of interest, with particular reference to

the distribution among categories and areas of costs and benefits (internal and external).

5. The identification of possible inefficiencies in the current service organisation together with proposals to improve them.
6. The identification of links that can be activated by evaluation of the feasibility and main critical elements relating to the market, infrastructure, organisation and legislation, and their potential effects in terms of traffic flows.
7. The analysis of dedicated port terminals and potential routes in the Mediterranean, from the point of view of encouraging productive integration of distant regions and improving the logistics of the links between origin zones and zones where production is located.

InMare: Technologies and Methodologies for Safe, Environmentally Friendly and Efficient Shipping Operations of the Future (04/2004 - 03/2006)

InMare created the basis for further enhancing European SSS by improving freight service capacity and reliability and passenger well-being on the one side, and by minimising the risk of life losses, damage to the environment and accidents on the other.

In particular, the project's objective focused on coordinating activities within five areas, identified as important topics:

- enhanced efficiencies on board and ashore
- human resources
- communication and decision-support system (DSS)
- regulatory matters
- environmentally sustainable ship operations

The basic idea of the InMare was, therefore, to integrate expertise and experience with a substantial contribution from European ship-owners' representatives. This was an important tool for stimulating a common research strategy in maintaining the competiveness of European shipping industry.

CREATE 3S: Production to improve total efficiency of new generation short-sea shipping (12/2006 - 11/2009)

Traditionally ship concepts contain two physically inseparable main function groups: platform functions (buoyancy, power generation, propulsion, hotel, etc.), and cargo functions (cargo containment/treatment/handling). The purpose of CREATE3S is to develop a ship concept consisting of two basic modules: a ship-platform module and ancillary interchangeable cargo-containing modules.

At sea, ship-platform and cargo-containing modules are linked together. At the destination the entire cargo-containing module is discharged and replaced by a new cargo-containing module, much the same as a truck chassis/container combination. The shorter the time spent in ports for loading and unloading will allow for more voyages while reducing port fees per voyage. The risk is the eventual higher cost of implementing this new concept.

To address this risk, CREATE 3S is developing standardization and modularization concepts in ship-platform design that will enable the use of advanced manufacturing techniques, thereby reducing lead-time and labour costs. Introducing low-mass hull structures will enhance payload capacity, thus obtain additional economic gain.

CREATE 3S will make advances with respect to the state of the art in:

1. ship concepts (cargo unit containing the entire ship cargo carrying capacity; cargo unit with no buoyant capability, loaded/unloaded directly to/from land-side; and interface between ship hull and cargo modules and the loading/unloading system)
2. hydro-mechanic performance (ship hull forms for a number of ship families, offering better hydro-mechanic performance)
3. ship structures (lighter and cheaper ship hull-structure families, industrialised production manner; large cargo modules fitting the ship-platform modules);
4. shipping operations (less time spent in ports; more flexibility in short-sea shipping operations)
5. ship production (reduced man-hours in the entire process chain; reduced lead time and more flexibility to cope with customer requirements; improved working conditions;

improved product quality through pre-tested standard components; modular products which can easily be adopted to short-term changes in the market).

Marco Polo Programme

In order to achieve the European White Paper's objectives about maintaining the traffic share between the various transport modes for the year 2010 at its 1998 level, Europe established the Marco Polo Programme. Marco Polo was adopted in 22 July 2003 and set quantified and verifiable objectives. It aimed not only to relieve congestion of road infrastructures but also to improve the environmental performance of the whole transport system by shifting part of road freight to short sea shipping, rail and inland waterway and to enhance intermodality, thereby contributing to an efficient and sustainable transport system.

The actions of Marco polo I (2003-2007) were three:

- Modal shift actions to shift road traffic to other modes of transport by providing start-up aid for new non-road freight transport services.
- Catalyst actions involving innovative measures to overcome structural barriers in the market.
- Common learning actions to improve cooperation for optimizing working methods and procedures in the freight transport chain,

The financing of the original programme was 30 million Euros per year for 4 years. The renewed Marco Polo programme, Marco Polo II, covered the period from 2007 to 2013 and has the same aims with Marco Polo I but includes two new terms:

- Motorways of the sea to directly shift a proportion of freight from road to Short Sea Shipping or a combination of Short Sea Shipping and other modes of transport in which road journeys are as short as possible.
- Traffic avoidance actions to integrate transport into the production logistics of businesses to avoid a large percentage of freight transport by road without affecting production output or workforce capability.

Thus the Marco Polo II Programme has a wider scope than its predecessor and a larger budget, at 400 million Euros.

The **stakeholders** eligible for funding for both, I and II, are only:

- private trade and
- commercial undertakings.

Public authorities are not eligible to participate. However, administrations may be up to 100% owners of a participating commercial undertaking.

The Modal Shift Actions and the Motorways of the Sea are specifically about SSS.

Modal Shift Actions

Modal Shift Actions focus on shifting as much freight as economically meaningful under current market conditions from road to SSS, rail and inland waterways. They may be concerned with the start-up of new services or significantly enhance existing services.

Motorways of the Sea MOSES

MOSES' main goal is to develop a blueprint establishing the detailed criteria and conditions for developing an innovative European network of Motorways of the Sea (MoS) as part of the Trans-European Transport Network (TEN-T).

The four specific **objectives** of MOSES are:

- to develop all the research actions necessary for underpinning a marketing strategy which makes MoS the obvious mode for freight transport by user and key decision makers;
- to produce a comprehensive and validated methodology for developing quality MoS services with seamless junctions at modal transfer nodes through integration of technology with organisational, economic and regulatory aspects;
- to assess the impacts of the MOSES innovations and resulting policy recommendations, and of their deployment at European Union-side scale and to develop tools to assess and certify MoS services;
- to produce a blueprint for designing and implementing at European Union scale efficient, safe and secure Motorways of the Sea that achieve a massive modal shift from road freight transport, verified and validated through business case demonstrators.

Four corridors have been designated for the setting up of projects of European interest:

- ***Motorway of the Baltic Sea*** (linking the Baltic Sea Member States with Member States in Central and Western Europe, including the route through the North Sea/Baltic Sea canal) (by 2010);
- ***Motorway of the Sea of Western Europe*** (leading from Portugal and Spain via the Atlantic Arc to the North Sea and the Irish Sea) (by 2010);
- ***Motorway of the Sea of South-East Europe*** (connecting the Adriatic Sea to the Ionian Sea and the Eastern Mediterranean, including Cyprus) (by 2010);
- ***Motorway of the Sea of South-West Europe*** (western Mediterranean, connecting Spain, France, Italy and including Malta and linking with the Motorway of the Sea of south-east Europe and including links to the Black Sea) (by 2010).

The results and recommendations of the MOSES project are expected to contribute to the achievement of the following aspects of the European intermodal transport network:

- increase the interregional cargo volumes carried by sea by means of specific recommendations
- address the operational deficiencies of current intra-European LoLo services

- design RoRo services that will unlock the values that are contained within appropriate combinations of ships, terminals, and infrastructures
- disaggregate the unnecessary separation of LoLo and RoRo at port terminals
- incorporate inter-continental LoLo services into European Motorways of the Sea
- ensure that Motorways of the Sea will be adequately supported by ICT structures and capabilities
- develop the conditions that are required to establish efficient and sustainable regional hinterland transfers of goods from sea to landside goods destinations
- set up a marketing strategy for intermodal and sea transport integration into the European sea motorway network(s)
- examine the pricing and financing considerations that will enable public and private institutions to provide the necessary support for market based solutions to the provision of European the sea motorway network(s)
- deliver recommendations on the establishment of "intelligent standards and regulations" that assist and do not hinder the efficient commercial development and operation of the Motorways of the Seas
- advance European policies on sustainable mobility through the promotion of the Sea Motorways concept as a valuable alternative.

7 Conclusions

Short Sea shipping undoubtedly has a key role in the development of a European sustainable transport system. The goals and concepts developed in EU policy and projects point to a clear agenda for the development of European Short Sea Shipping. The key elements of this agenda are:

1. Simplification of administrative procedures
2. Enhanced promotion and marketing,
3. Seizing the benefits from container traffic and opportunities from changing international and interregional trade
4. Improved port capacity, accessibility and efficiency
5. Development of effective, non-congested hinterland connections
6. Ensuring availability of suitable vessels
7. Co-operation between all the players in the chain, including administrations responsible for safety, security and environmental issues
8. Establishing integrated information systems (utilising the e-Freight, e-Customs and e-Maritime initiatives) to facilitate integration of short sea shipping in the logistic chains including planning and implementation
9. Co-ordinating the funding instruments
10. Balancing incentives for various modes of transport
11. Dealing with any distortion of competition
12. Providing adequate training and attracting young people to the maritime profession,
13. Improving energy efficiency and reducing (air) pollution.

Even though Short Sea Shipping faces intensive competition from road transport and various development challenges, prospects for SSS growth are realistic. However, it is important that ship-owners, port operators and logistics providers can adapt quickly to the contemporary transportation environment and realise the potential for this transport mode.

Annex 1 Motorways of the Sea -MoS

Survey of MoS related indicators

The aviation industry (SESAR) has agreed on 11 performance areas for benchmarking freight services as shown in the following table. The World Bank has defined 7 performance areas for measuring Logistics performance country by country worldwide. The Shipping KPI project and MOSES have also defined similar performance areas.

For each performance area KPI have been specified but not as yet used widely by the industry.

SESAR	World Bank	Shipping KPI	MOSES
Environment		Environmental Performance	Environmental Sustainability
Security	Efficiency of Border crossings	Security Performance	Security
Safety		Safety Performance	Safety
Predictability	Quality of transport and ICT infrastructure		Commercial Reliability
Efficiency	Lead times	Operational Performance	Time(lead time, turnaround, shelf life, frequency)
Cost effectiveness	Domestic Logistics cost		Cost effectiveness
Interoperability	International Shipments	Technical Performance	Intermodality (Interoperability)
Access/Equity			Access-No Monopoly
Participation	Logistics competence	HR Performance	
Capacity			Capacity-Infrastructure
Flexibility			
		Navigational Performance	

Measuring Performance

The MOSES approach for measuring performance is described in the following diagram. Actual measurements are weighed and grouped in a hierarchical way for a given transport leg or terminal. For MoS the whole chain has to be taken into consideration. This can be done through a so called 'MoS filter' that enables the correct composition of various Performance Areas (PAs) for different MoS services, projects and initiatives. Figure 3 shows the complexity of measuring performance along the logistic chain.

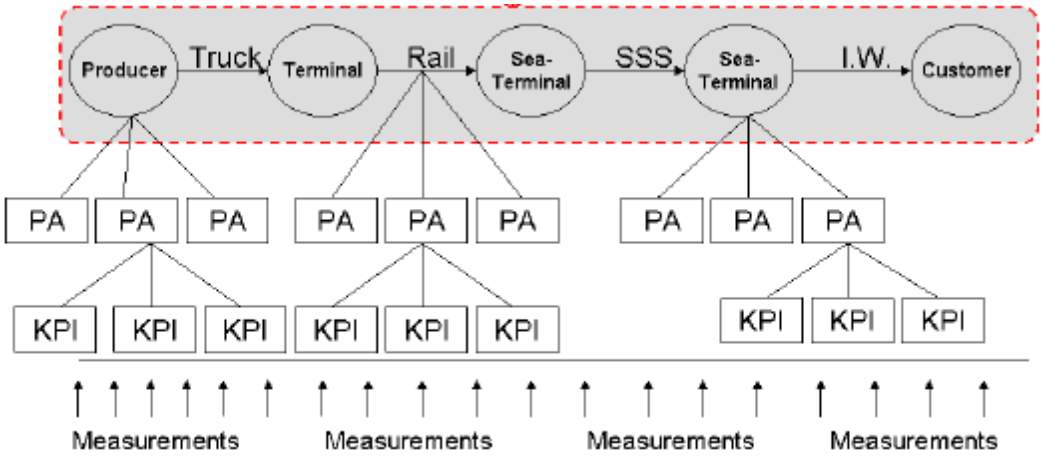

Figure 3: Measuring Performance along the MoS chain

An example of KPI measurements for transportation times is shown in the following table

Transportation Time			
KPI Name	**KPI Description**	**Objective**	**KPI Measurement**
Service Accessibility (SA)	Minimum time between booking and start of transport	elapse time from booking to start of transport	=no of Hours/Days per Trip
Transport Time Precarriage (TTPr)	Lead Time from Origin to Port of Departure	Measures the Time for Precarriage	=in Days per Trip
Transport Time Oncarriage (TTOn)	Lead Time from Port of Arrival to Destination	Measure the Time for Oncarriage	=in Days per Trip
Berth Dwell Times in Port of Departure (BDTPoD)	Time spent for Loading/Unloading in PoD	Measures the Time spent for Handling Procedures	=in Days per Trip
Berth Dwell Times in Port of Arrival (BDTPoA)	Time spent for Loading/Unloading in PoA	Measures the Time spent for Handling Procedures	=in Days per Trip
Vessel Queeing in Port of Departure (VQPoD)	Waiting Time in PoD because of Berth Occupancy	Measures the Time spent in PoD before Berthing	=in Days per Trip
Vessel Queuing in Port of Arrival (VQPoD)	Waiting Time in PoA because of Berth Occupancy	Measures the Time spent in PoA before Berthing	=in Days per Trip
Vessel Transport Time (VTT)	Transport Time from PoD to PoA	Measures the pure Sea Transport Time	=in Days per Trip

MoS scenario

To exemplify how integration of SSS and land based infrastructure represents a MoS network a scenario has been developed for demonstration purposes. The various combinations of transport modes within the scenario are not to be considered as the only viable alternatives.

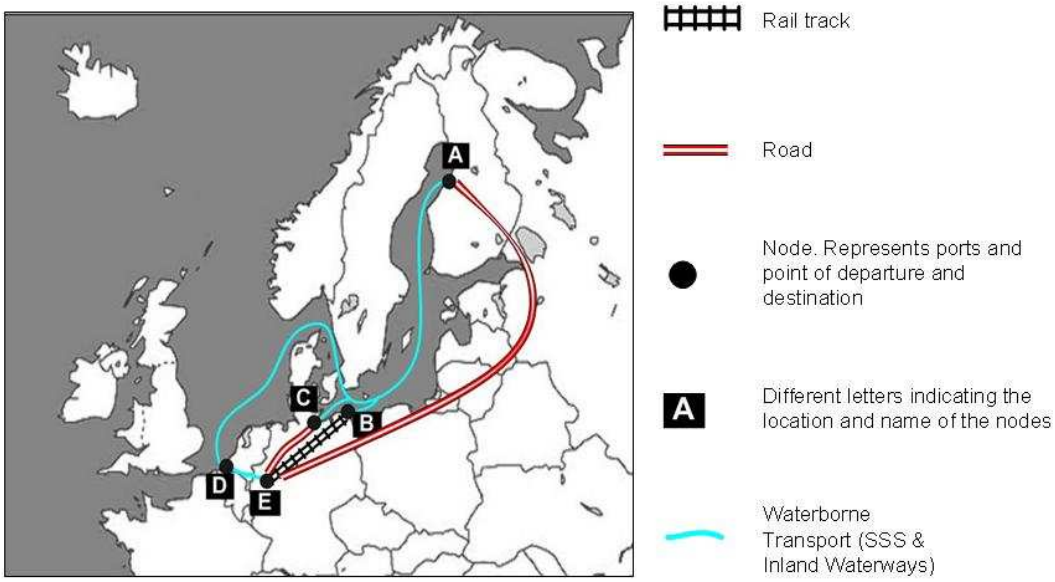

Figure 1: The Motorway of the Baltic Sea, transport from Northern Finland to Ruhrgebiet, Germany

This scenario visualises how the Baltic Motorway of the Sea can be operated when transporting an industrial product from a producer in northern Finland, shipped from the port of Raahe, with Ruhrgebiet (Germany) as a destination. The following transport options are available using different modes:

- A- E, ship the product directly by using truck from the port of Raahe (A) to the manufacturer in the Ruhrgebiet (E) area.
- A- D- E, ship the product from Raahe (A) to Rotterdam (D) by SSS service, and from the latter node to Ruhrgebiet (E) by inland waterways.
- A- C- E, transport the product from Raahe (A) by SSS to Lübeck (C) and to Ruhrgebiet (E) by truck.
- A- B- E, transport the product from Raahe (A) to Satsnitz (B) by SSS service, and from the latter node to Ruhrgebiet (E) by rail.

From the scenario above it is quite clear that developing KPIs for the extended transport chain becomes far more complex than for a single mode or transport leg.