SUCCESS FACTORS FOR DEVELOPING VIABLE MOTORWAYS OF THE SEA PROJECTS IN EUROPE

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ABSTRACT

Establishing a European wide high quality shipping links and integrating them with the trans-European Transport networks has been the vision of the European Commission (EC) to reduce land transport congestion under the Motorways of the Sea (MoS) concept. However, in spite of strong political backing and favourable policy initiatives, MoS projects have met with limited success. Establishing Motorways of the Sea is complex because of its International scope and involvement of a number of public and private stakeholders with conflicting objectives and goals. The paper attempts to identify critical factors for establishing viable MoS projects. The paper reviews the development of the MoS concept to understand the expectations of the EC and the concerns of the important stakeholders. The present status of these policy actions is reviewed and their possible effect on the performance of MoS projects is estimated. Case studies of Short Sea Shipping initiatives in different parts of Europe and the world are reviewed to learn from their successes and failures. This knowledge is applied to find critical factors for the success of MoS projects in the European context.

Keywords: Short Sea Shipping, Freight Transport Policy, Motorways of the Sea concept,

INTRODUCTION

Freight transport in Europe has undergone major transformations in the past decade triggered by a number of selection pressures that have encouraged trends of smaller but frequent shipments with increased transport distances. These trends have favoured road transport by virtue of its flexibility to adapt to changing transport demand dynamics, compared to other transport modes particularly, Inland Waterways, rail or shipping. As a result, European Member States have witnessed a sharp increase in road freight transport for more than a decade. If nothing is done, total road freight transport in Europe is forecast to grow by about 60% until 2013 from the 2004 basis effectively adding an additional 20.5 billion tonne-kilometres per year across the EU 25 Member States (Baird 2007). In comparison, market shares of European rail freight has been declining since 1995 while Short Sea Shipping (SSS-CA 2000) has been able to keep pace with road transport for intra-European goods transport mainly due to feeder traffic of intercontinental container flows.

Coping with this growth in transport demand implies using alternative transport modes more intensively. One of the proposed measures is the desire to develop Motorways of the Sea as an alternative to long distance road transport. For modal shift, road transport is the yardstick against which any proposed alternative is measured. For SSS to penetrate this market segment the challenge will be to offer the same overall service quality as road transport (Baird). To realise this, the European Commission suggested the development of the Motorways of the Sea.

The starting point when considering EU Motorways of the Sea policy is an assessment of the potential barriers that Short Sea Shipping is facing in relation to land based transport modes. The analysis takes account of the way in which sea transport differs markedly from land-based transport in issues of legislation, technical, markets and environment that pose as potential barriers to the development of sustainable Motorways of the Sea.

Previous research in this area elaborates on five marine motorway research studies. The outcomes of all these research projects have implications and important lessons for future of MoS initiatives. From an academic perspective, the paper contributes towards the development of a framework of analysis to help analyse the potential barriers and

proposed policy options in order to identify policy gaps that have to be addressed to ensure the sustainability of the MoS projects.

DEVELOPMENT OF THE MOTORWAYS OF THE SEA CONCEPT

The MoS concept was introduced in the European Commission's 2001 White Paper as a policy instrument to rebalance usage of transport modes and focus on intermodal transport development. Motorways of the Sea were seen as a cross-border transport projects between Member States that required hinterland access and simplification of goods transit. The main markets targeted for these services were long distance, consolidated, unitised intra-European trade flows that suffered from severe congestion along the land transport corridors.

The MoS concept is not new but goes back to June 1992 when Viamare S.p.A. started to operate one of the first road-to-sea initiatives between Genoa and Immeresi in Sicily (Paixão and Casaca 2008). Similar private ventures witnessed the shift of goods from road to sea in the Mediterranean, Atlantic, North Sea, Baltic and Adriatic maritime corridors.

In the first workshop about the MoS in 2003, most participants advised EC to develop MoS concept on a commercial basis rather than on a public service concept philosophy. Accordingly, a High Level Group stressed the importance of cooperative relationships between public authorities and private sector for its realisation. Four maritime corridors (Baltic Sea, Western Europe, South-East Europe, South-West Europe) were identified for setting up these projects and a 2010 deadline was agreed (VanMiert 2003). According to the Group, MoS was conceptualised as floating infrastructures that move goods by sea from one Member State to the other which aim to avoid congested land corridors and better integrate all regions of the enlarged European Union.

In April 2004, the TEN-t guidelines were amended in which Article 12a bears particular relevance to MoS since it states the 3 main objectives of developing MoS projects.

- Freight flow concentration on sea based routes
- Increasing cohesion

- Reducing road congestion

To implement the MoS projects through Article 12a of the TEN-t guidelines, EC sought views from interested parties (e.g. Member States, Regional and local Authorities, European and National Associations, Ports, Consultants, carriers) (Ballis and Golias 2004; EC 2005). The response to EC's 1st Consultation on MoS showed that there was widespread interest in the concept but ambiguity in certain aspects of the selection guidelines caused concerns from the potential stakeholders (EC 2004). There was strong emphasis to avoid the distortion of competition from newly started MoS services with already established SSS service networks, which serve some regional markets in the European Union.

Regarding the guidelines on the selection criteria of MoS project proposals, a majority of the participants defended market freedom and flexibility in opposition to the concentration of traffic flows by policy intervention. The existing port selection process unfairly excluded smaller ports in the MoS project selection guidelines. Stakeholders cautioned the risk of port congestion in the Category A ports after commencing MoS operations as many of these ports were already operating to full capacity. All stakeholders stressed the importance of flexibility in the MoS concept in order to adapt to local market conditions (Paixão and Casaca 2008).

Regarding EC funding to selected MoS proposals, transparency in the selection process and maximum budget allowable for each project was expected. Some stakeholders sought public funds to support acquisition of ships as it was argued to be a part of infrastructure over the water.

The first Consultation document did not mention a framework for existing Short Sea Services to participate in the MoS projects. Therefore, the 2nd Consultation in 2007 sought opinions on the possibility of developing Key Performance Indicators (KPIs) to be applied for ships and ports (EC 2007), as well as to develop a benchmark scheme to compare the performance of different transport modes while it also built on the idea of recognition for MoS links.

Stakeholder opinion was mixed regarding the proposed application of benchmarking and KPI to ships and ports. Terminal Operators, carriers and intermediate organisations were not in favour of KPIs and benchmarking because of claims that such indicators were indirectly already in place as the markets penalise poor services. Moreover, such a

process would increase the burden of data collection on the service providers. However, shippers, public authorities and Short Sea Promotion Centres were generally in favour of KPIs and benchmarking because this would provide a tool to compare different transport solutions and different companies on a given transport corridor. To date there has been no decision taken by the EC about enforcing KPIs and the benchmarking scheme.

Within the four corridors proposed for developing Motorways of the Sea projects by the High Level Group, some projects developed studies on the viability of such projects. Examples of these are BaSIM – Baltic Sea Information Motorways1, the Baltic Gateway2, Northern Maritime Corridor3 and the North East Cargo Link4 (Paixão and Casaca 2008). Portugal was the first country to take initiative in research to explore opportunities for Portuguese ports to participate in MoS projects through the PORTMOS project (Integration of the Portuguese Ports and Maritime System in the Motorways of the Sea) (APP 2006). PORTMOS Phase 2 developed the design and development of the info-structure to support the motorways of the sea in Portugal. Phase 3 (Pilot Action) of the PORTMOS Project is underway.

The most advanced 'Motorways of the Sea corridors' in operation are seen in the east and west Mediterranean and they have been performed by Grimaldi Group, Superfast Ferries and UN RoRo, even though the Baltic offers examples of innovative logistics solutions, particularly developed by DFDS TorLine with Volvo and Stora Enso (Paixão and Casaca 2008). This environment is also promoting the emergence of the Black Sea MoS and the extension of the MoS to link non-Member States with the European Union in the Mediterranean through the MEDA project.

KEY BARRIERS FOR DEVELOPING MOTORWAYS OF THE SEA AND MAIN INSTRUMENTS TO ADDRESS THEM

There are multiple challenges in the production of a network of competitive Motorways of the Sea services as an alternative to long distance road haulage. MoS barriers can occur because of market structure (Commercial), Legal and Regulatory environment,

[1] http://www.basim.org/
[2] http://www.balticgateway.se/
[3] http://www.northernmaritimecorridor.no/
[4] http://www.necl.se/

incompatibility of equipment and resources (Technical) and environmental considerations. All these barriers are inter-related and can negatively affect the overall performance of MoS projects.

Legal and Regulatory barriers

Regulatory barriers originate from laws issued by Authorities primarily concerning direct interaction with governmental infrastructure but also concerning external effects such as pollution, safety and security considerations.

Realising the security threat to maritime trade, EC adopted Regulation 725/2004 to embed the ISPS Code provisions to address measures for the security of ships and port facilities. Additionally, the EC introduced Directive 2005/65, which expanded requirements for maritime security and required ports to carry out identity checks of seafarers, port officials, port workers, visitors and persons residing within the port. Further European legislation is proposed to enhance security of goods from their production site, through the transport chain until arrival at their final destination. However, the lack of uniformity in the methods, standards and effectiveness of inspection measures employed among ports and across the various facilities within a port has resulted in increased administrative burden and transaction costs on carriers and port facilities that reflect on the service time and price of the intermodal services. A crude estimate of 5% to 10% of transport costs increases of intermodal transport is estimated by industry experts (Psaraftis 2005).

In many Member States, there is duplication of ship and cargo reporting procedures which increases the burden of reporting on ship crew and ship agents. Although "Authorised Shipping Service licences" are issued to ships engaged in intra-European trade for exemption of port Customs inspections, the Authorities more than randomly check goods upon vessel's arrival (EC 2005). Similar security initiatives and Customs checks are not enforced in road transport in anything like a proportional scale, saving it from bureaucratic bottlenecks that ultimately improve the efficiency of services.

Environmental legislation has had a significant impact on the development and maintenance of seaport infrastructure. Public support for port improvement and expansion work is weakening dramatically in many of the larger European seaports. In some cases, new port expansion plans have stirred up opposition from residents and environmentalists

often leading to long and costly litigation procedures, ultimately delaying port expansion plans indefinitely and triggering port congestion.

Driver wages and fuel constitute the two highest cost factors in road transport operations averaging 33% and 21% of total operating costs (COMPETE 2006). Over the years, international road haulage has taken advantage of the lack of harmonisation in fuel prices and driver wages amongst Member States to gain a competitive price advantage over other transport modes. Although the European Commission set a minimum level for excise duties on fuel, almost all Member States introduced higher levels by means of National Legislation. Average truck driver wages in long haul truck operations differ remarkably from country to country with some CEEC Member States having up to 8 times lower wage scales than in Western European countries (COMPETE 2006).

Technical Barriers

The European freight distribution system is operated by a dual technology: Intra-European movements are carried in articulated trucks and swap bodies optimised for Euro-pallets and are not designed to be stacked or to be lifted from the top (Pedersen and Lindstad 2005), while maritime transport utilizes maritime containers conforming to ISO standards. Maritime containers have failed to penetrate the intra-European market because Euro-pallets do not optimally fit inside these containers.

To remedy the incompatibility of loading units, EC proposed the adoption of a new standard - European Intermodal Loading Unit (EILU) that combine the advantages of containers (optimised fitting of Euro-pallets) and swap bodies (stackable) (Seidelmann 2003). Though EILU has the benefits of interoperability, the European industry has not shown interest in adopting the new standard. One of the reasons is that the European Industry has already invested in loading units conforming to old standards and do not want to be forced into new standards overnight. On the other hand, for most Shipping Companies, the intra-European trade is a risky business to justify the investment in adapting container ships to the new standard (Desrentes, Viegas et al. 2006). Until a common standard is adopted by Industry and carriers, the more expensive RoRo vessels find favour as the swap bodies (accompanied and unaccompanied) can be easily accommodated onboard.

An alternative to RoRo and swap bodies that is slowly gaining acceptance is the pallet-wide 45 feet ISO containers for intra-European trade. In 2006-07. the total number of 45 feet ISO containers circulating globally was in the order of 440,000 TEU which constitute only around 2% of the total container fleet. It is estimated that around 80% of these 45 ft ISO containers are connected with transport to and from USA while the rest 20% i.e. 88,000 units are moved to and from European ports mainly on deck of container vessels. European short sea operators also operate a small but growing fleet of pallet wide 45 ft containers mainly in northern European waters such as on the UK-mainland short sea routes. The number is estimated at around 30,000 to 35,000 units. To accommodate 45 ft containers and promote non-road transport modes for intra-European trade, European Commission has made appropriate provisions in its legislation. With the amendments to article 4(3) and 4(4) of Directive 96/53/EC on rules of vehicle and loading unit dimensions, each EU Member State would be allowed to circulate 45 ft ISO pallet wide containers only in national road transport operations within EU Member States. Other modes of transport i.e. SSS, inland waterways or rail could be used for long distances for transport operations between EU Member States (UNECE 2007).

Commercial Barriers

A potential barrier of adopting RoRo ships for MoS is the low availability of new and fast RoRo ships in the market for such services. RoRo shipping market is relatively small and is mostly focussed in European regions. The pure RoRo fleet stands at 1.2 million Lane-metres in October 2007, spread on 1,660 ships. Fleet growth has been fairly stable in the last 20 years at around 1.5% per annum (Fairplay 2008). The investments on new RoRo ships are almost 30% higher than conventional container ships of the same size. Most of the RoRo ships in the shipping markets are owned and operated by large Shipping Lines on established RoRo markets. Further addition of new RoRo capacity seems unlikely in the prevailing economic conditions (BRS 2009).

The average age of RoRo ships in the spot market is around 20-25 years and Shipping Companies are willing to invest in new tonnage only if there is adequate and sustained demand (BRS 2006). Moreover, the spot market of RoRo vessels is small and volatile compared with other shipping markets. Therefore, lease rates in the RoRo spot market are high and available ships are generally sub-standard. In 2008, the economic crisis and slowdown of trading activity spurred scrapping of old RoRo tonnage, increasing 60% from

10 RoRo ships in 2007 to 16 in 2008 (BRS 2009). In addition, consolidation in the RoRo industry has increased with established Companies buying weaker players in the market.

The shortage of RoRo vessels in the spot market, volatility of transport demand and consolidation of RoRo shipping companies impose a challenge to start RoRo services in new routes and markets. The commercial risks and high investment costs for RoRo ships dissuade many Companies to enter the RoRo shipping market. These trends threaten to limit the expansion of MoS networks in the planned corridors without substantial public support.

International conventions for freight transport are largely aimed at unimodal transport and based on non-harmonised definitions, liability limits, time thresholds for filing complaints and so on (IM 2001), even though intermodal transport rules exist since 1975 and a UN Convention has been drafted but not approved by many States. This lack of harmonisation between Conventions across transport modes imposes additional costs for the shippers in case something goes wrong (IM 2001). Moreover, documentation for the various modes varies across modes creating higher costs and risk of error in all transfer operations.

Market liberalisation in road haulage has been achieved in the European Union. This has tended to increase the level of competition within and across the different transport services (road and intermodal) pushing the profitability lower. Questions related to fair competition in the road haulage sector have surfaced with great visibility. Issues concerning flouting of drivers' working hours, environmental standards of the trucks, fixed costs imposed on the hauliers registered in the various countries and even the road charges applied in competing corridors serving the same long distance connections have surfaced (Viegas 2003). In some cases, policies favouring a particular transport mode distort competition. For example, in some dense transport corridors, public subsidies to Railway Companies have been reported allowing railway undertakings to offer rates below cost prices in order to compete with other transport modes (EC 2005).

Balanced and large transport flow volumes on a transport corridor are a pre-requisite for establishing MoS projects. Many long distance trading corridors have unbalanced freight flows that impose a challenge to such intermodal services of finding return loads. Road transport enjoys a larger network road infrastructure. In corridors with trade imbalances,

road hauliers search for return cargoes in adjacent regions that increase their chances of getting return loads.

Present pricing policies in European seaports demonstrate that there is substantial diversity in port financing and charging practices (Notteboom and Winkelmans 2005). Port charges vary from port to port and the cost structures are not transparent. Ships are penalised by indirect costs (e.g. light dues) by seaports but similar charges do not exist for the use of motorways or railways in land transport modes. Many Port Authorities impose ancillary services (such as pilotage, towage and mooring.) on vessels calling their ports. In many Member States, port ancillary service providers are protected from competition by local regulations and ships calling such ports are obliged to employ these services. The lack of competition in port services has reflected in higher costs and lower efficiency of these services. In service ports such as in France, Greece and Italy, terminal management and operations are under direct Government control hence not operationally efficient compared to North European ports.

Environmental Barriers

No other surface transport mode is as dependent on weather and climate conditions as water transport. The strong linkage between shipping and nature is a significant barrier for guaranteeing reliable and timely shipping services. High speed vessels are more sensitive to meteorological conditions requiring them to select one of the options (reducing sailing speed, deviate from planned route to avoid or limit damage, cancel voyage or look for shelter in a port of refuge) when faced with adverse conditions. Ships on the Atlantic routes suffer the worst weather conditions compared to sailing routes in other European maritime corridors (de Oses and la Castells 2008). As intermodal operations are dependent on shipping for main haulage, it offers little flexibility to alter the schedules due to various connections between them.

Most in the maritime industry consider shipping to be "greener" transport option than competing transport modes. However, the image of "green" shipping does not hold true for large parts of the maritime transport industry. If no action is taken, Sulphur oxide and Nitrogen oxide emissions in 2020 from shipping around Europe are expected to equal or even surpass the total from all land-based sources in the EU-27 Member States combined (Swedish NGO 2008). On average, a ship emits 30-50 times more sulphur oxides per

tonne-km than trucks. Trucks will be emitting less SOx even if ships are run on marine fuels with 0.1% sulphur content. Ships release about twice as much Nitrogen oxides per tonne-km as the latest truck models today.

TRANSPORT POLICIES TO PROMOTE MOTORWAYS OF THE SEA

While all these barriers deserve good attention the transport policy instruments available to address them will force interactions between them, not always in synergy with each other. Improving performance in one dimension is better achieved with instruments that create barriers in another dimension. Two main families of transport policy instruments are used by the European Commission to address the identified barriers:

Regulatory instruments – These instruments, the use of laws and regulations define what is allowed and what is not. This is done at a technical and economic level. At the technical level, laws are made to force the introduction of technologies in new vehicles and limiting the remaining time for the use of old technologies (Viegas 2003). This family instruments are generally accepted to be equitable solutions, although the instruments are more expensive and resource intensive to implement irrespective of their ability to compensate.

Economic instruments – Economic instruments provide financial incentives to the economic agents to act in support of goals specified by public authorities, i.e. agents are free to act, as they want but there is a monetary incentive to act in accordance of the government goals (Viegas 2003). This facilitates the gradual transition/adaptation by economic agents towards the desired behaviour.

To improve safety of the road haulage sector and provide a level playing ground of road transport with alternate transport modes, the policy options are as indicated in Table 1.

Regulatory policy instruments are directed towards stricter implementation of speed limits and driver working hours with the effect of relative increase in delivery times and operational costs of road transport. There is a proposal for the harmonisation of excise duties on diesel in EU and harmonisation of road haulage contract clauses that presently create large disparity in the freight rates between carriers in the common European markets. The expected impacts of such harmonisation would be a smaller differential between average road transport prices throughout Europe.

Amongst the economic instruments, EC has been considering charging for external costs related to congestion, air pollution, climate change, accidents and noise. Internalisation of these costs are planned to be applied to road, rail, aviation, maritime and inland waterways. Even if the difficulty in identifying external costs at all time and places imposes a trade off between the level of differentiation and the costs and flexibility of its implementation, the amendment to the Eurovignette Directive 2006/38/EC has introduced the right to apply environmental mark-ups of the unit charge per kilometre, with a 15% limit over the base price. The increase in fuel taxes in order to cross subsidise MoS services is another instrument proposed. The presumed effect is the increase of road freight transport rates while providing a new source of funds for promoting MoS projects.

Table 1: Regulatory and Economic policy instruments to discourage/restrict European road freight Transport.

Policy	**Policy Name**	**Description**	**Effects of policy actions**
Regulatory	Maximum speed limits on inter-urban road highways	Increase or reduction of the maximum allowed speed on urban or interurban highways	Relative increase in Transport time and time related costs
	Driver Working Hour	Reduction of Driving hours throughout EU.	Road transport less competitive on delivery times with other transport modes
	Harmonisation of Fuel prices in EU	Proposal for uniform taxation for commercial fuel	Increase in road transport costs and time
	Harmonisation of road haulage contract clauses	To protect hauliers from consignors enabling them to revise tariffs with changing market conditions.	Smaller and steadier differential between average transport prices of road and intermodal transport
	Distance based road charging	To reduce short haul road charges and increase long haul road charges	Incentive to use alternative modes for long distance transport – encourages modal shift
	Lorry ban on weekends	To reduce congestion near urban areas	longer delivery times close to weekends of road transport
Economic	Internalisation of External Cost	Optimal pricing of transport for every mode, taking external cost into account: Congestion costs, Environmental costs emissions, noise, Safety costs	Reduction of market share of road transport modes
	Increase in the price of fuel (through fuel tax)	% increase in fuel price different for each mode. E.g. introduction of "professional gasoline", reduction of price differential between gasoline and diesel	Higher market share for transport modes that are more environmentally friendly
	Congestion pricing	Time-related and/or distance related tariff on congested links	Lower congestion, Lower market share of congested modes

Source: Author

Amongst the policy instruments to encourage MoS, "Common European Maritime Space" is a key area of Regulatory policy currently progressing to have a common Customs inspection procedure in all transport modes for cargoes starting and ending within the

European Union. The main challenge for establishing the Common Maritime Space is that it cannot be solely addressed by the transport sector per se, but necessarily involves other public authorities like customs, health and safety, Immigration etc. EC services specialised in the affected sectors have begun work to identify problems and bottlenecks and compare their experience and proposed solutions.

Table 2 shows policy instruments to mitigate barriers in MoS intermodal chains and encourage service providers to participate in the MoS concept. Economic instruments include the availability of public funds to selected seaports for improving infrastructure as well as subsidies in the form of start-up aid to cover feasibility studies and part of the initial operational costs of newly established MoS services.

By investing in seaports and improving hinterland connections to the selected seaports, Governments can directly influence the service quality of the planned MoS services.

Table 2: Transport policy instruments to encourage Motorways of the Sea

	Policy Name	**Description**	**Effects of policy actions**
Regulatory Instruments	Market liberalisation in the European port services sector	To go further in the liberalisation seaports	Improved intra-port competition Lower transport costs
	Common Maritime Space	To simplify the regulatory framework for maritime transport by creating one stop offices for port Administrative and Customs procedures.	Reduction in port dwell times Improved port efficiency
Economic Instruments	Interconnectivity	Developing of MoS Port and Hinterland Infrastructure	Reduction in transport costs for operators, time savings for users. Higher transport speeds for pre and post haulage
	Start-up aid for MoS operations	Financial inducements to operators for subsidizing operational costs during star-up phase of MoS project. port accessibility	Reduction in transport costs for operators. Better service quality time savings for users
	European funds for port infrastructure development	Financial aid for developing MoS port infrastructure, facilities and ship procurement to expand capacity at bottlenecks	Faster port throughput and higher intermodal efficiency leading to improved MoS service performance

Source: Authors

LESSONS FROM PAST RESEARCH ON MOS PROJECTS

A number of research projects and private initiatives in Short Sea Shipping identified critical factors that determine the success of maritime-based intermodal transport projects useful for implementing Motorways of the Sea concept. In this section, we shall identify the factors that were unique to the projects from these examples.

Between 1996-1998, the EC funded the "European Marine Motorways" project(EMMA 1998) investigated the commercial viability of 3 types of Ro-Ro ferry services (< 24 knots, 24-30 knots & >30 knots) as an alternative to long distance freight road transport in three routes selected on the basis of high traffic flows, presence of congested road connections and land transport traffic bottlenecks. Favourable factors for viability of marine motorway services on these routes were identified as follows:

- French lorry driving ban at weekends/public holidays;
- expensive road tolls;
- shippers interest in alternative coastal RoRo link;

In spite of the above favourable conditions, a 24 knot vessel offering a trip time of 16 hours was found to make a small loss. This was because of the depressed trucking rates on the route, high port related costs (port fees and handling charges) and intermodal costs (higher per km of local haulage) that tended to make short sea alternative unattractive. Other port related factors that seemed unaddressed were

- Traffic congestion in and around ports of Barcelona and Genoa due to inadequate terminal areas, parking space for trucks and hinterland connectivity;
- High port charges due to discriminatory cargo dues levied to by-sea imports through Spanish ports;
- Start-up losses in shipping services as shippers would gradually gain confidence over the system;

Nevertheless, GNV commenced a daily Ropax ferry service on the Genoa-Barcelona route in 1999 offering a competitive transit time to road transport and over the years have been successful to attract more than one third of the former road market.

The ZEELAND-SCOTLAND (ZEE-SCOT) pilot project investigated the feasibility of a direct RoRo service between Scotland and continental Europe (Baird 2005) as an

alternative to long-distance road transport via England. From the survey of logistics companies conducted in this project, it was realised that three markets (i.e. Benelux, Germany and France) accounted for 75% of total Scotland-continent unitised traffic of which accompanied trailer traffic comprising half the total Scotland-continent traffic volumes moved by Channel services while the rest (unaccompanied trailers) moved via North Sea ports. During interviews logistics companies expected daily ferry services in both directions at ship speeds of atleast 24 knots. Around, 33% of logistics companies stated that they were certain to use new RoRo services with further 33% stating that they were very likely to use it and 21% fairly likely to. Though the survey appeared positive, logistics companies stated that user loyalty would need to be built up over the first 2-3 years of operation, suggesting that only moderate traffic flows might be committed initially. The ferry service would therefore need to prove its reliability over the start-up period and particularly during the winter months, in order to attract greater share of traffic. When

SuperFast Ferries commenced a daily RoRo service between Rosyth-Zeebrugge, traffic gradually increased but faced stiff competition from road hauliers that forced the Company to reduce service frequency from daily to three sailings a week. Presently, road still carries a majority of the freight because of access to toll free usage of UK motorways, the hiring of low cost East European truck drivers and cheaper fuel purchased on the continent which create a significant market distortion in favour of road haulage.

The United Kingdom Marine Motorways Study (UKMM) project discovered that door-to-door costs per trailer for a UK service would be at least 20% more expensive than all-road transport without any State aid (Baird 2007). A breakdown of average RoRo cost per trailer showed that almost 42% of it related to local road haulage connections, 8% as port handling costs and 50% for port-port coastal shipping costs.

Another innovative RoRo ferry initiative was the state-owned Viamare S.p.A. service between Genoa Voltri and Termini Imeresi in Sicily with the objective of developing Sicilian economy and reduce pressure on the Italian road infrastructure. The key to success of Viamare operations was to offer service sailings timed for truckers. (Paixão and Casaca 2008). However, there were many requirements that were critical for truckers to use the service. The ships had to accommodate the drivers on board and service sailings needed to be timed for truckers i.e. to find the right time of arrival and departure at

the terminals. Although Viamare succeeded in moving freight from road to sea, the company was not financially viable because of

- strong competition from entry of Grimaldi services that offered faster higher quality ships on the same route and market segments
- substantial ship capital costs resulting from high interest rates and devaluation of the Lira
- lack of enforcement of driving regulations
- relatively slow (18 knots) ship speeds

Grandi Navi Veloci employed larger faster ships and was equipped to carry a larger number of passengers that added to the revenue stream (Baird 2005).

In 1995, SuperFast ferries successfully introduced a Ropax daily service in the 504 nm Patras-Ancona route between Greece and Italy in 1995 employing 2 ships (Baird 2005). Within one year of startup the service was carrying 1,000 trucks per week. The instant attractiveness was attributed partly to the Balkan conflict, numerous border crossings and poor condition of roadways that made the road journey problematic. Port efficiency was optimised by completing port administrative formalities such as Customs clearances in advance and allowing road hauliers themselves for loading and discharging the ships.

The International Association of Turkish road haulage companies developed a new combined transport concept in 1992 by leasing 2 vessels initially, to offer a weekly service between Istanbul and Trieste. The service was successful due to a 70% ship utilisation guarantee given by its truck owners partly because of a conflict in former Yugoslavia. This encouraged them to purchase new highly efficient RoRo vessels for providing daily services, develop three new shipping routes across the Black Sea and open new freight terminal at Pendik, Istanbul. Presently, almost 65% of all Turkey's road trailer activity destined for W. Europe is moved via the UN RoRo services.

The above mentioned case studies illustrate the complex challenges surrounding development of new Motorways of the Sea. Some critical factors identified from above case studies are summarised as follows:

- Barriers that obstruct the smooth flow of road traffic or increase the costs of road services as a consequence of either political conflicts, poor road conditions or

policy measures such as high road tolls, driving bans on weekends are contribute to the attractiveness of marine motorways;

- In all cases, a daily shipping service schedules at departure times convenient to truck operators and the utilisation of fast conventional (> 24 knots) RoRo/Ropax ships is critical;
- Problems noted in England and Scotland suggest that where roads are still provided free to truckers by the State, the private sector provided seaway is not a viable proposition.
- An important conclusion from UKMM case was that modal shift was unlikely to occur entirely due to market forces but required a series of supportive policy measures to improve door-to-door maritime based intermodal services. Therefore, policy goals of reducing pre/end haul costs and optimising port efficiency was necessary through appropriate policy instruments.
- User loyalties for Motorways of the Sea services may take a few years to build. As seen in the ZEE-SCOT case, the first 1-2 years of shipping services are generally loss making because of the combination of start-up costs and low traffic volumes on newly established shipping services. At this stage, public support for risk sharing of investment for appropriate type of ships and financial incentives to cover the startup losses will be desirable to attract private operators for Motorways of the Sea projects;
- UN RoRo case demonstrates that the involvement of road transport companies as investors, shareholders and primary clients of a RoRo Shipping Company services is a role model for Motorways of the Sea projects.
- According to (Torbianelli 2000), routes which begin and end in continental Europe would either require fiscal measures or economic stimuli to ensure viability of Short Sea Shipping links.

CONCLUSION

The concept of the Motorways of the Sea is a novel idea. However, there is still a lack of clarity from the side the European Union. The scope and definition of the project is under question. Many stakeholders are not clear whether a benchmarking exercise to select ports and ships will be carried out to differentiate MoS projects with Short Sea Services.

Clarity in the European Commission's communication regarding scope/definition would speed up the implementation process.

The approach to implementation of MoS projects has many loopholes. Unlike road and rail networks, seaport and shipping links planned to be developed within TEN-t programme are not clearly identified. In doing so, it is bound to cause problems of competition distortion between ports vying to be part of MoS projects in countries that have either a decentralised or liberalised port structure. Secondly, a concentration of shipping services (MoS and SSS) only in some routes and corridors is expected if market forces are left to decide without strategic planning of the routes and links.

Inconsistencies between European transport and environmental policies exist where on the one hand maritime transport is encouraged while environmental policies such as the Birds, Habitat and Water Directives constrain seaport activities. To avoid these situations, either ports that have extra capacity to accommodate MoS projects need to be identified and selected or European Legislation is harmonised such that conflict between economic development and environmental protection does not occur.

The inspection and monitoring of goods, vehicles and personnel in European short sea shipping sector is more stringent than European road transport. The terrorist threat of attacks on ships and port infrastructure culminated in more inspections measures in the shipping sector. The lack of uniformity in the methods, standards and inspection measures in the shipping sector has increased the administrative burden and transaction costs on carriers. Similar inspection regimes do not exist in a comparable scale on land transport networks for intra-European trade. Unless inspection procedures are harmonised within the shipping sector and inspection regimes are uniformly applied for all transport modes, the land transport will enjoy a competitive advantage.

Port charges are high and ships are obliged to hire ancillary port services like pilotage, towage, ship loading/discharging etc. in many of the seaports. Attempts by EC to liberalise European port services have failed twice already because of strong resistance from port labour interests. From case studies, (Japan and UND RoRo) business models demonstrate that self-handling of ships in the seaports improve efficiency and reduce port costs.

To solve the problem of incompatibility of European loading unit standards in land transport and maritime transport, EC proposed the use of RoRo ships for MoS projects in the short and medium term. RoRo ships are more expensive to build and operate. Secondly, RoRo shipping is a niche market and is relatively small compared to the container shipping market. Barring European Union and Japan, RoRo ships are not employed in other trading regions. Thirdly, RoRo ships are presently operated on well-established routes and few large Shipping Companies control the market. The average age of RoRo ships is high and the economic crisis has resulted in the scrapping of many old ships and consolidation in the RoRo market. In the present conditions, Shipping Companies will be reluctant to invest in new RoRo ships unless the MoS project provides long and guaranteed employment for the vessels. Unbalanced freight flows between European trading regions impose a challenge to viability of MoS projects due to the lack of flexibility for ships to deviate from planned shipping routes.

Another alternative is the use of 45 ft ISO containers and container ships for intra-European trade. Although the 45 ft containers can carry more Europallets per loading unit, it has not yet found wide acceptance in Europe except on some North European shipping routes. A primary reason is the resistance from industry that has already invested in technologies for conventional containers, equipment and vehicles.

The lack of harmonisation across Liability Conventions of the different transport modes imposes additional costs for the shippers in case something goes wrong. Moreover, documentation for the various modes varies between the modes creating higher costs and risk of error in all transfer operations. Without a framework for a fair and simple liability regime for intermodal transport, the prospect of MoS to attract medium and high value goods seems unlikely.

Strong competition in the road transport sector as well as the lack of oversight from Authorities has raised issues of flouting road safety and environmental norms. Differences in the fuel excise duties and driver wages have allowed Road Haulage companies to cut operating costs over other transport modes. Harmonisation of driver wages and fuel excise duties in the European Union shall provide a level playing ground for competition across transport modes.

The Shipping sector enjoys the image as an environmental friendly transport mode because emissions of CO2 per amount of transport work are low compared to other

modes. On the other hand, shipping is an important source of air pollutants (like SOx, NOx and Particulate Matter) in coastal areas and harbours with heavy traffic.

The approach selected by the EC is to combine regulation with market-based instruments that apply Community fair and efficient pricing principles to the marine sector. Regulatory measures proposed are establishing mandatory NOx emission standards, setting sulphur limits to marine fuels and expansion of emission control areas (ECAs) to include all water bodies surrounding the European continent. Market instruments proposed are making all Member States introduce charges related to amounts of emitted pollutants by ships entering their ports (Swedish NGO 2008). The impact of the proposed policy measures on the total costs of shipping and market rates are unclear.

Transport policies that reduce the attractiveness of road haulage such as lorry bans on weekends, expensive road tolls, distance based road charges, increase in driver wages are identified from case studies. While policies encouraging self-handling in seaports, simple and fast port clearances (customs and security) and financial aid for port infrastructure development will be effective in offering reliable and fast MoS services to its customers.

With full energy and cooperation from the private stakeholders, EC policies to reduce costs and improve efficiency in seaports while providing a level playing ground with road transport are important for the sustainable and viable deployment of MoS networks.

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