IBERIAN MOTORWAYS OF THE SEA. AN OVERVIEW AFTER 15 YEARS OF VAN MIERT REPORT

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Abstract: After 15 years of the Van Miert report proposing to include the Motorways of the Sea in the TEN-T schema, an overview wants to be done in the Iberian Peninsula scenario. In 2015 the Intra European trade (Eurostat, 2017) supposed around 11,263.4 millions of tons, being through Short Sea Shipping (SSS) up to 1.808,5 millions of tons and only the 13.6 % on Ro/Ro trades (246.04 millions of tons or the 2.2 % over the total volumes). In the case of Spanish Short Sea Shipping traffics raised to 196.668 millions of tons (234.7 millions of tons in 2016 from www.spc-spain.es) being only 15.33 millions of tonnes or 7.8 % under Ro/Ro schema. Keeping in mind these figures, it is asked which rate of success should be acquired with the maritime transport promotion policies in European Union. The proposed paper wants to analyse in deep, which reasons could explain the low volumes that still Intra European Short Sea Shipping gets. The analysis will begin with a review of the SSS and Motor Ways of the Sea official definition and after having a complete overview of traffic figures, to propose a model to analyse the best mode to connect different Iberian destinations offered to Consignors, in an attempt to transfer part of the cargo from road to sea option.

Keywords: motor ways of the sea, short sea shipping, Western Mediterranean.

1. Introduction

Motorways of the Sea (MoS) concept was officially mentioned for first time in the White Paper of Transport (EC, 2001) with the main objective to reduce the existing and future bottlenecks in Trans European transport Networks (TEN-T) and additionally to improve the logistic integration of short sea shipping (ANAVE, 2004). From the beginning there was the thought that the building of links under 500 km. of distance, would require initial support to be developed like a quality stamp or distinctive or specifically financial aid from European funds like (in fact has been) FEDER or Marco Polo programs inter alia.
Coming back, among first initiatives to shift road transport to the sea representing the concept of MoS, was the action known as *Autostrade del Mare* carried out by Viamare S.p.A. in 1992 (Beškovnik, 2013). Further attempts to draw a definition or operational frame to the MoS concept are identified from the year 2002 (Ministry of Transport of Finland 2002, Gijón declaration 2002, Van Miert report 2003). A tentative definition suggested them as any multimodal service that includes a maritime leg with minima standards of quality that elevates them over the general concept of services understood as Short Sea Shipping (ANAVE 2004) that supposed a real alternative to road transport and contributed to the reduction of congestion, the environment conservation and the economic growth.
From an academic point of view, different proposals of definition were provided (Baird, 2007; Paixão, 2008). However, some authors were of the opinion that never has given a precise definition of a MoS (nor SSS) (Douet & Capuccilli, 2011). MoS can be deducted that are door to door regular services, serving with high frequency, including a short sea leg allowing a significant modal shift. Also they are called floating infrastructures, that move goods by sea from one member to another and aims to substitute land motorways to avoid congestion and give access to countries separated from the mainland and enable better integration of waterborne with surface, modes. (Paixao 2008). From these last definitions it seems that MoS should be limited to short sea services using Ro/Ro ships among member states so few potential for modal shift seems to be as most of them are operating in captive markets.
More recent information from EU web site established as main objectives of MoS, the concentration of freight flows on sea based logistical routes to improve existing or new maritime links being viable, regular and frequent to reduce road congestion and/or improve access to peripheral and island regions and States. So as to provide more efficient, commercially viable and sustainable alternatives to road-only transport.
Even that SSS traffics increased 12% between 2001 and 2010 (Ng 2013). However, SSS in general has not improved as expected because seems that its definition not fit with potential impact Ro/Ro services that are mostly captive and only a few remove trucks from roads. Additionally, shore infrastructures are subsidized, being the opposite scenario in maritime sector.

2. Spanish Scenario

During the year 2017, SSS services reached 248 millions of tons, supposing an increase of 6% from 2016, being split in 19% national coastwise and 81% of external traffics. But due to a reduction in the number of ships, the overall connections increased mainly when referred to SSS as alternative to road around 42% in the Atlantic basin and 25% in the Mediterranean one. The number of MoS in the Atlantic side was 2 and in the Mediterranean were 3. The mean occupation with respect to offer was 73.1% decreasing from 2016 when reached 80.1%, in both basins the offer increased and demand didn't follow this tendency being the overall figure of occupancy lower. From a global perspective the SSS share in the rolling traffic passed from 10% in 2014, to 9.7% in 2015 and to 9.1% in 2016 (SPC Spain 2018).

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Table 1
Share of SSS on the overall rolling flows in different countries

Countries and year	Share
Italy, 2016	46.8%
Belgium, 2016	4.4%
United Kingdom, 2016	21.8%
France, 2016	0.8%
Spain, 2016	9.1%

Source: Own based on SSS Statistic Observatory. SPC Spain 2018

2.1. The Offer of MoS Lines in Spain

During the second semester of the year 2017, in the Atlantic basin operated 50 SSS services being up to 32 (64%) a real alternative to road, having 2 more than 3 calls per week and thus considered as MoS. During the same period in the Mediterranean up to 38 (28%) services were considered an alternative to road out of 135 lines and only 3 considered MoS (SPC Spain 2018).
As it has been mentioned before, the total number of MoS in Spain has been in 2017 of 5 lines operated by 2 shipping companies, linking 8 international ports and served by up to 12 ships. Considering the two basins, in the Atlantic case we find 2 shipping companies in 2 MoS with 4 Ro/Ro ships linking 2 ports. In the meanwhile, in the Mediterranean there were 3 MoS served by only 1 shipping company, linking 6 ports and using 8 Ro/Pax ships. Being the average frequencies of call of 3.1 and 5 times per week, respectively.

Table 2
Detail of motorways of the sea in the Mediterranean and Atlantic basin. Year 2017

Mediterranean MoS	Frequency	Atlantic MoS	Frequency
Barcelona Civitavecchia	Daily	Algeciras Vigo Saint Nazaire Le Havre	3 x week
Barcelona Livorno Barcelona Savona	4 x week Daily	Santander Le Havre	3 x week
Valencia Livorno Valencia Savona	Daily		

Source: Own based on SPC Spain web site http://www.shortsea.es/index.php/simulador/lineas and Grimaldi web site www.cargo.grimaldi-lines.com (consultation date June 2018)

2.1. Evolution of the SSS Traffics in Spain

In January 2004, Spanish government established in Algeciras a position in order to promote SSS services. In that year, the short sea services apart from feeder connections existing nowadays there were up to 24 services running.
During the year 2004, 12 companies were linking 8 Spanish ports with other European destinations (see Table 3).

Table 3
Detail of Spanish SSS services. Year 2004

Company	Frequency	Route	Type of ship
Med Seaways	2 x week	Tarragona and Savona	Ro/Ro
Cía. Trasatlántica Española	every 2 weeks	Valencia, Barcelona, Piraeus, Istanbul and Izmir	Containers
Cía. Trasmediterránea	2 per week	Vigo and Saint Nazaire	Ro/Ro
Geest North Sea Lina / Naviera del Odiel	weekly	Bilbao, Rotterdam and Tilbury	Containers
Grandi Navi Veloci	weekly	Barcelona and Genoa	Ro/Ro
Naviera Pinillos	weekly	Bilbao, Southampton, Felixstowe and Thamesport Bilbao, Dublin, Liverpool and Greemock	Containers
Transmed	2 x week	Tarragona, Genoa and Salerno	Containers
UECC	2 x week	Bilbao, Pasajes, Portbury Santander, Pasajes, Vlissingen, Sheerness and Zeebrugge Vigo, Le Havre, Zeebrugge, Sheerness and Bremerhaven	Ro/Ro
Xpress Container Lines	weekly	Vigo, Le Havre, Thamesport, Rotterdam and Vigo Barcelona, Genoa, Livorno and Fos Gijón, Rotterdam, Bilbao, Gijón Vigo, Leixoes, Rotterdam and Vigo	Containers

Company	Frequency	Route	Type of ship
Grimaldi Napoli	3 x week	Valencia, Livorno, Salerno, Tunis, Malta	Ro/Ro
	daily	Barcelona and Civitavecchia	
OPDR Hamburg	Every 2 weeks	Hamburg, Bremen, Antwerp, Le Havre, Felixstowe, Southampton, Rotterdam, Lisboa, Leixoes and Vigo	Containers
	weekly	Rotterdam, Bilbao and Le Havre	
Flota Suardíaz	weekly	Bilbao, Zeebrugge, Vlissingen, Southampton, Vlissingen, Zeebrugge and Santander. Gijón, Saint Nazaire, Southampton, Vigo and Setúbal. Setúbal, Vigo, Gijón and Vlissingen.	Ro/Ro
	2 per week	Tarragona and Livorno Tarragona, Civitavecchia and Salerno	

Source: Own based on SPC Spain web site http://www.shortsea.es (consultation date June 2018)

As it can be seen only two services in Mediterranean basin had 3 or more calls per week and then could be considered as MoS and the actual Atlantic services then had only two calls per week. Also during the year 2007, two new services were opened in each basin. One carried out between Bilbao and Zeebrugge with three sailings per week that definitely left the Spanish port in 2015. And a second service in the Mediterranean between Barcelona and Livorno, still in force.

3. Case Study

This section identifies main Spanish ports involved in Short Sea Shipping and proposes new Motorways of the Seas. Main Spanish cities are connected with the most important Spanish ports and, on the other hand, connected to most important European ports and cities. Up to 54165 links between Spain and European countries were studied, based on time and costs. Moreover, three different types of ships are considered, namely, conventional ships (23 knots); fast ships (23 to 30 knots) and High Speed Crafts. For time and cost calculation purposes representative ships are used (Table 4).

Table 4
Detail of main characteristics of the considered ships

Particulars	Conventional Eurocargo Istanbul	Fast ship Superfast Galicia	High Speed Craft Millenium 3
Length	195	160	96
Beam	25.2	23.2	26
Draught	7.8	6.8	3.3
Power (kW)	12510	34300	38501
Speed (knots)	20	23.2	42
Gross Tonnage (GT)	20775	14560	6360

Source: Own based on www.equasis.org. (consultation date june 2018)

Travelled distance and speed are factors closely related to engine consumption and then conditioned by the fuel costs. Capital costs, crew costs and RMIA (i.e. repairs, maintenance, insurance and administrative) costs are considered. These costs are limited to the navigation phase, considering only the ship in open seas. Port costs like taxes, fees, discharge operation or demurrages are not considered. The method used is based on Stopford (1997); however different authors have proposed alternative methods to calculate them (Anderson and Ivehammar, 2016; Tzannatos, 2005; Tzannatos *et al.,* 2014; Mulligan and Lombardo, 2006 or Martínez de Osés and Castells, 2009).
Capital costs dependent on an additional time unit at sea, are assessed based on Gross Tonnage (GT). The capital cost per day is based on the Compensated Gross Tonnage (CGT) factor. The formula used is taken from the Compensated Gross Ton (CGT) System, from OECD Directorate for Science Technology and Industry in its Council Working Party on Ship building (OECD 2007):

$$CGT = A \cdot GT^{B} \quad (1)$$

Being the factors A and B obtained from OECD (2007). From equation (1) applied to the price of all ships, the daily capital cost is obtained considering a credit at an interest of 5% and a useful and repayment life of 25 years (Tzannatos *et al.,* 2014).

$$\text{Capital cost} = 14.014 \cdot GT0.63 \text{ €/day} \quad (2)$$

Regarding the group of repairs, maintenance, insurance and administrative costs, Jansson & Shneerson (1987) suggest that this should be around 3.5% of the daily capital costs. General formula to calculate RMIA costs is shown below:

RMIA = 0.4905·GT0.63 €/day (3)

Crew cost, this unitary value is difficult to estimate due to the variability if passenger and non-passenger ships are considered. The resultant formula of the crew costs is given by:

Crew Costs = [2.1(Officers·Wage) + 1.5(Mates·Wage)/30]·Sailing time/24 (4)

Based on Anderson and Ivehammar (2016, 2017) and Larsson (2010), fuel consumption for a specific journey is calculated considering the hull resistance as:

$$C = \frac{R_{T.} D}{E_{MGO} \cdot \eta_T} \quad (5)$$

Where
C fuel consumption, in kilogram (kg)
R_T vessel resistance, in kilo newton (kN)
D sailed distance (meters)
EMGO the specific energy of Marine Gas Oil, 42700 MJ/kg is considered
η_T thermal engine efficiency

The total resistance of the vessel is calculated by a model for hull resistance (Larson and Raven, 2010):

$$R_T = \frac{1}{2} \cdot \rho \cdot V_S^2 \cdot (B + 2 \cdot d) \cdot L \cdot C_B \cdot C_{TS} \quad (6)$$

Where
ρ water density, in kg/m3
Vs speed, in m/s
B beam, in m
d draught of ship, in m
L length of ship, in m
C_B block coefficient, 0.67 is used
C_{TS} resistance constant, 0.0022 is used

4. Results

The main objective of this contribution is preselect the Spanish ports susceptible to belong to a Motorway of the Sea and find suitable routes in the European framework. Figures 5 and 6 show the most viable routes in terms of time and cost, respectively.

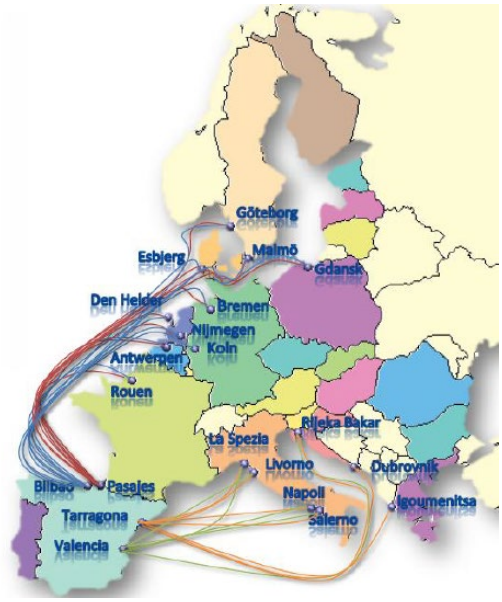

Fig. 1.
SSS Suitable routes in terms of time
Source: Own based on internet caught picture

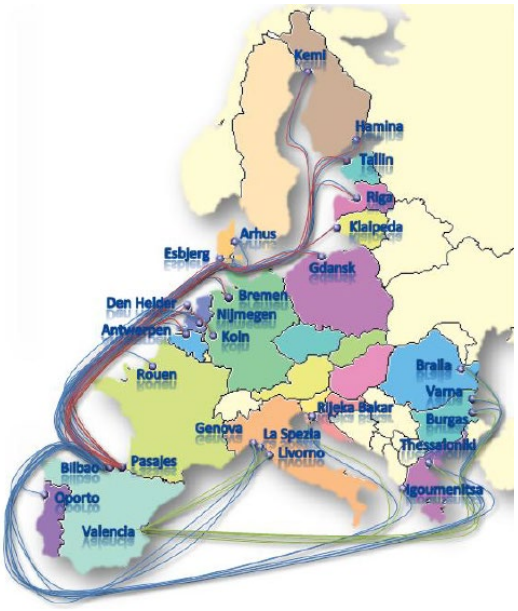

Fig. 2.
SSS Suitable routes in terms of cost
Source: Own based on internet caught picture

Finally, based on proposed model explained in the above section, table 5 shows the final suitable routes connecting different European destination (one of them is one Spanish port) considering time, cost and type of ship.

Table 5
Proposed routes in terms of time, cost and type of ship

Country	Route	Type of ship
Germany	Bilbao-Bremen	Fast
	Bilbao-Koln	Fast
	Pasajes-Bremen	Fast
Belgium	Bilbao-Antwerpen	Fast
	Pasajes-Antwerpen	Fast
Croatia	Valencia-Rijeka Bakar	Fast
Denmark	Bilbao-Esbjerg	Conventional
France	Bilbao-Rouen	Fast
Poland	Bilbao-Gdansk .	Fast
	Pasajes-Gdansk	Fast
Greece	Valencia-Igoumenitsa	Conventional
	Valencia-Thessaloniki	Conventional
The Netherlands	Bilbao- Nijmegen	Fast
	Bilbao-Den Helder	Conventional
	Pasajes-Nijmegen	Fast
	Pasajes-Den Helder	Fast
Italy	Valencia - Livorno	Conventional
	Valencia-La Spezia	Conventional

Source: Own based on detailed calculations

5. Conclusion

Final calculations have been carried out, considering different goals to be accomplished. Keeping in mind the results showed in the previous section, the first conclusion is that HSC ships due to the cost of consumption are skipped from the first assessment. The selection between fast or conventional Ro/Ro ships depends on the possible competence with only road transport chains. Time is a factor to be considered but for certain type of goods, frequency is another factor to be considered by final costumers and also reliability or consistency along the time or influence of the seasonality. It is

also considered that higher speeds supposes higher consumptions and then pollutant emissions; however there combinations of routes with faster speeds where time makes them competent against only road transport chains.
As a suggestion to shipping companies, and of course subjected to further checking we propose different short sea links that can be real alternatives to only road transport chains with different European countries. Existing MoS are not considered in the proposal as they are at least at this moment reliable and efficient transport alternatives. Some of them get the geographical advantage that some combinations have, like is the case among Italy and Spain. Some others are relying in an advantage on only time or cost and a few on both; but they are.
As a concluding idea, it is left still a proper definition of SSS and MoS for exactly define them and make a clear frame of what are the links susceptible to get consideration and funding from EU.

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