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D 8.a Consolidated Report

Project co-funded by the European Commission within the trans-European networks budget (TEN-T)		
Dissemination Level		
PU	Public	YES
PP	Confidential only coordinator and European Commission	
RE	Confidential only participant Member States and European Commission	
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Project co-funded by the European Commission within the trans-European networks budget (TEN-T)

WEST – MOS
INTEGRATED PLAN

TABLE OF CONTENTS

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1. Background

The process to develop Motorways of the Sea is being carried out within the framework of the Trans-European Transport Networks (TEN-T), and is in fact priority action nº 21 in the latest version of the TEN-T approved in April 2004 in a joint decision by the European Council and the European Parliament.

But the implementation of Motorways of the Sea is different from the other priority actions in that public resources must be assigned by invitations to tender organized among the Member States of the European Union due to the direct effect on the maritime transport services market.

Spain and France are currently in the midst of a selection and implementation process through an invitation to tender for the Motorways of the Sea on the Atlantic side, and Spain and Italy have reached an agreement to implement similar Motorways of the Sea selection actions.

This document summarizes the results obtained in the WEST-MOS project, including both "macro" and "micro" (practical case studies prepared by Port Authorities) results and structuring them to serve as an integrated “macro” plan when setting out the bases for actions from Member States with the goal of spurring development of motorways of the sea.

The government actions studied in this document are focused on the possibility of granting two types of subsidies, following the rules established by the European Commission in this regard:

- Subsidies aimed at the supply of sea lines that comply with the criteria of the motorways of the sea, through the corresponding calls for tenders between member states, such as the one developed between Spain and France (First Work Package for the WEST-MOS project).
- Subsidies aimed at demand for the Motorways of the Sea (road transport operators), similar to the ones applied by Italy (“Eco bonus”).

This type of subsidy would be combined with the ones covered as part of the Marco Polo programmes and the programmes of the TEN-T itself.

To estimate the quantity of the subsidies needed to provide an effective push for the Motorways of the Sea, the potential demand between sea facades was first estimated, and the subsidy required to put the necessary offer into service to cover that demand was then calculated based on the minimum profitability for the line. Finally, the effects of the implementation of the Motorways of the Sea, in terms of the reduction of greenhouse gases and external costs, were evaluated in order to ultimately establish the bases for States to make the initial decisions related to the implementation and section of Motorways of the Sea.

2. Diagnosis of the situation.

Spain's interest in the development of the Motorways of the Sea originated from its concern for the congestion of the motorways that cross the Pyrenees, not only at the border crossing itself, but also on the adjacent connecting arteries.

Based on the information from Customs and the Spanish-French Cross-Border Observatory, in 2003, trade between the Iberian Peninsula and the rest of the European Union (EU-15) to the north of the Pyrenees totalled 175 million tonnes (Mt), of which 75 Mt were handled by sea and 100 Mt by land. Of the land volume, a total of 96 Mt were handled by road, with just 4 Mt carried by rail.

The preponderance of road transport on the trans-Pyrenean routes is the product of its continuous expansion over the course of the last 20 years. Prior to the signing of the Accession Treaty with the European Economic Community at that time, cumulative road traffic increased 3% annually, increasing to 8% after signing of the treaty. At the rate of 8%, traffic doubles every 10 years, which is in fact what happened during the period 1986-2005.

Although there are signs indicating that this growth is slowing, trans-Pyrenean traffic (Irún-Biriatou and La Junquera-Le Perthus) ranges between 8,000 and 9,000 lorries per day. The limited capacity of these roads results in congestion, with the effects becoming more and more noticeable with each passing day. This is a very clear example of the generation of external costs that affect the principle of sustainable mobility that governs the Common Transport Policy.

The increasing difficulties involved in road transport, either due to congestion or to the measures to prevent it, in the form of traffic restrictions imposed by different areas of the Public Administration, have resulted in the creation of a series of maritime services aimed at attracting lorries away from the motorways. This is a reaction by the transport market itself, generated out of private initiatives, and it demonstrates that short sea shipping is viable, at least under certain conditions.

As a result, in the Western Mediterranean, and more specifically between Spain and Italy, a series of regular services have sprung up progressively between several Spanish ports (Barcelona, Valencia, Tarragona, etc.) and several Italian ports (Genoa, Livorno, Salerno, Civitaveccia, etc.). The trend points to the creation of a services network between different points on the Mediterranean, with a growing total frequency implicit in the network itself. This services network attracts mainly lorries travelling between Italy and Spain, and vice-versa, through the Mediterranean Arc, which is supported on France's Blue Coast, in either full-lorry mode (self-employed drivers) as well as semi-trailers shared by larger Spanish and Italian companies.

FIGURE 1. TRANS-PYRENEAN TRANSPORT BETWEEN SPAIN/PORTUGAL AND THE REST OF THE EUROPEAN UNION (EU-15). 2003.
Units: Millions of tonnes per year (Mt)
SOURCE: Spanish-French Cross-Border Observatory

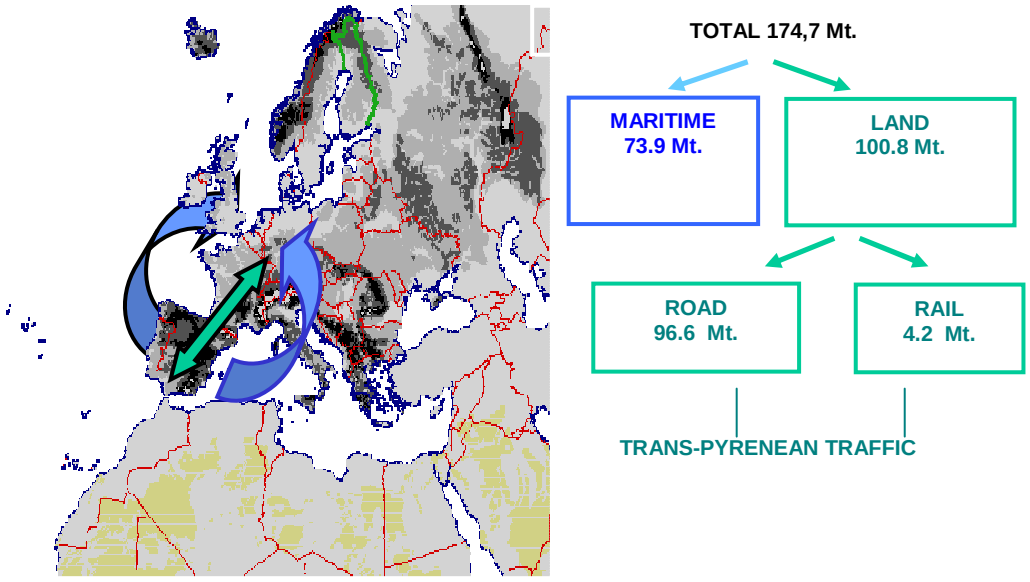
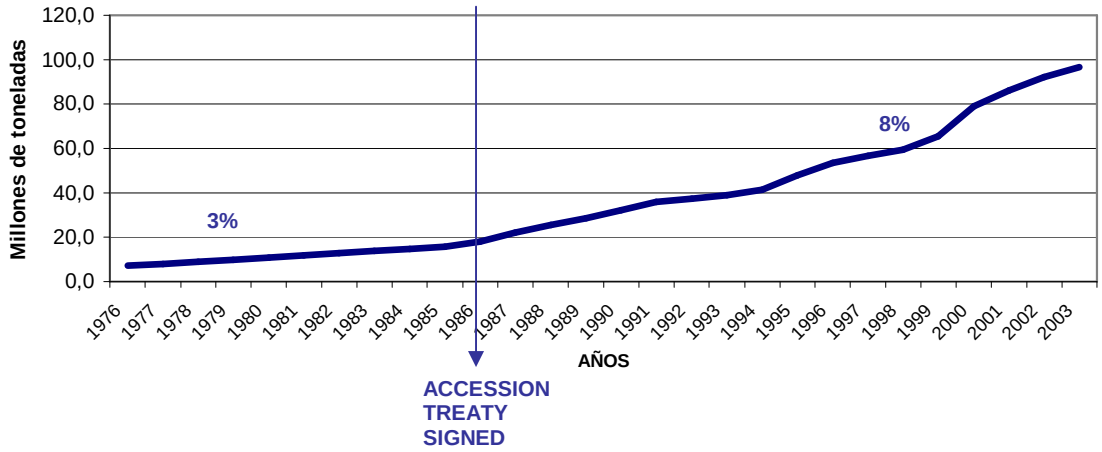


FIGURE 2.-. TRANS-PYRENEAN TRANSPORT BETWEEN SPAIN/PORTUGAL AND THE REST OF THE EUROPEAN UNION (EU-15). BOTH DIRECTIONS.
Units: Millions of tonnes per year
SOURCE: Spanish-French Cross-Border Observatory



The reaction of this type of demand, which customarily sees road routes as the basis for its business ("covering kilometres"), is being slowed by the historical inertia of the habitual usage of road transport and by the reticence generated by the new operation and maritime-port paperwork required.
In response to the reaction time of the demand, the strategy being applied by short-sea shipping companies, especially Grimaldi, to develop services is to pace the supply with

the demand to minimise risks and continuously optimise the capacity of their "ro-ro" ships. The initial idea was to take advantage of existing vehicle traffic and reserve hold space in car-carriers to progressively attract cargo, until a point was reached at which ships could be allocated exclusively for heavy vehicles (accompanied or unaccompanied), initially scheduled with low departure frequency (Monday, Wednesday, and Friday, for example).

The service has matured, and today the Barcelona and Valencia ports already have more than one departure per day to different Italian ports and are enjoying relatively high traffic growth. Other ports on the eastern coast of Spain, such as Tarragona, are also starting services of this type.

Short-sea shipping in the Spanish Atlantic is not as advanced as in the case of the Western Mediterranean. In the Mediterranean, the possibilities of transferring from lorry to sea are based on the appearance of new maritime services with significantly shorter net distances in comparison with road (a straight line instead of an arc), with this effect increasing as the points of origin and destination move further south on both the Iberian and Italian peninsulas. However, the Atlantic coast does offer a very different geographical configuration for both the maritime arc as well as the possible "hinterlands" of the ports located on it.

In any case, trans-Pyrenean road traffic is growing fast enough to recommend effective action from the public side to accelerate the reaction by the market. It is not enough to wait until motorways become saturated enough to prompt the creation of the sea transport services on their own, after a degenerative process with excessive external costs. A series of measures need to be programmed from the public side to anticipate a saturation scenario and provide incentives for the creation of a maritime-port offering that is competitive with road transport, and even to persuade road transport operators to make use of it.

3. Analysis and forecast of potential demand.

The most up-to-date information from the Spanish-French Cross-Border Observatory was used to prepare this chapter of the Maritime Transport and Port Sector Plan. This information was gathered in a new survey campaign of road transport operators at the Irún/Biriatou and La Jonquera/Le Perthus passes, mainly in the year 2004. This survey campaign updated the previous statistics, which dated from 1999.

Although this analysis will maintain the tonne as the unit of measurement, it should be noted that the most recent statistics specify an average value of **15 tonnes per lorry**, which could be used for the conversion from tonnes to lorries.

Based on the most recent information, the total volume of motorway traffic crossing the Pyrenees is 103.6 Mt, of which approximately 9% is contributed by Portugal, with less than 1% coming from the Maghreb.

TABLE 1. DISTRIBUTION OF ROAD TRAFFIC BY AREA
THROUGH LA JUNQUERA AND IRÚN. BOTH DIRECTIONS. 2004.
Units: Millions of tonnes per year (Mt)
SOURCE: Spanish-French Cross-Border Observatory

O/D	NORTH-SOUTH	SOUTH-NORTH	TOTAL
Spain	47.6	46.4	**94.0**
Portugal	4.8	4.3	**9.1**
North Africa	0.2	0.4	**0.6**
ROAD	**52.6**	**51.0**	**103.6**

Most of this traffic (90.3 Mt) passes through the Junquera/Le Perthus and Irún/Biriatou passes. The other motorways support short-distance traffic between bordering regions, which falls outside the scope of this Plan and consequently has not been considered. From this point on, the figures will therefore refer to this total volume of 90.3 Mt which is the object of the analysis.

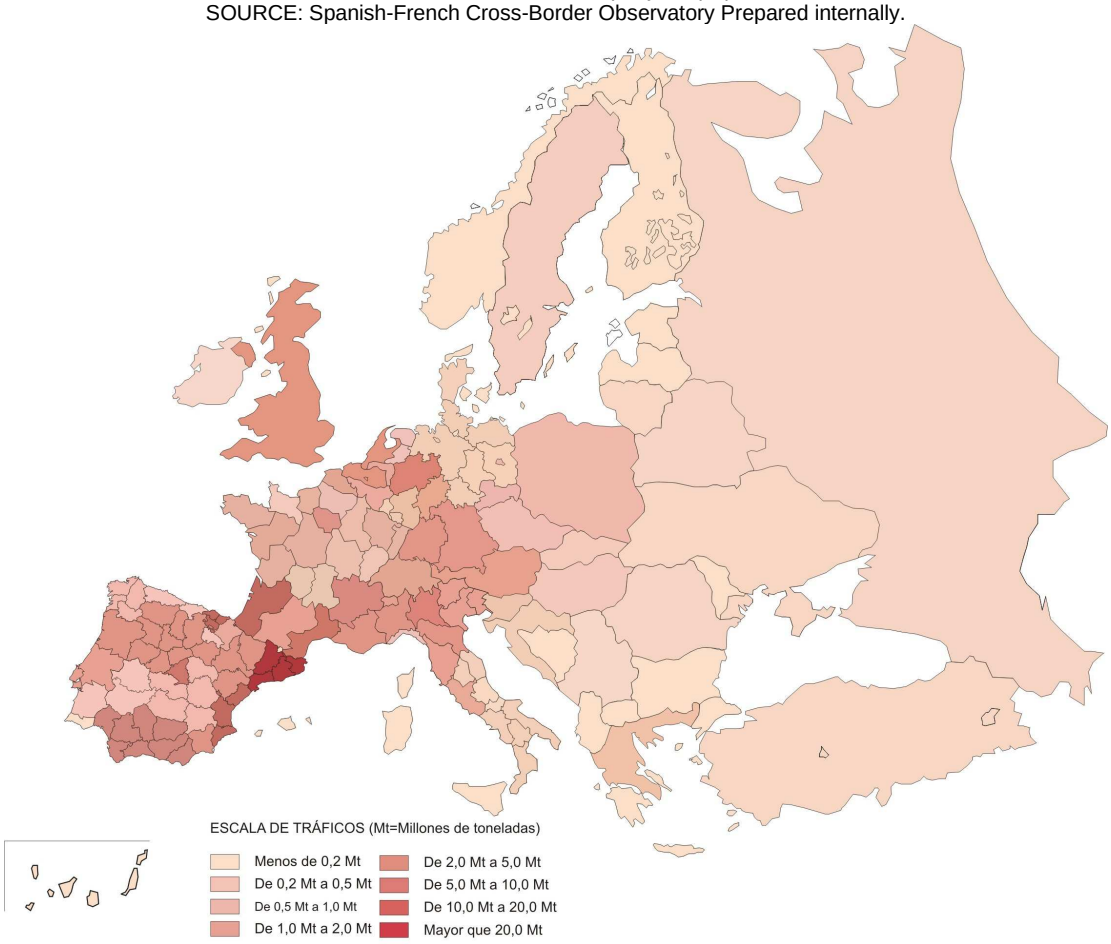
TABLE 2. TRANS-PYRENEAN ROAD TRAFFIC. 2004
Units: Millions of tonnes per year (Mt)
SOURCE: Spanish-French Cross-Border Observatory

PASSES	NORTH-SOUTH	SOUTH-NORTH	TOTAL
La Junquera	23.2	24.4	**47.6**
Irún	22.7	19.9	**42.7**
Sum	**45.9**	**44.3**	**90.3**
Other roads	6.7	6.7	**13.4**
TOTAL	**52.6**	**51.0**	**103.6**

The distribution of the trans-Pyrenean road traffic is shown in figure 6. The regions that contribute the greatest load are those on the edge of the Pyrenees, which indicates that there is short-distance traffic over the border that cannot be transferred to future motorways of the sea. So, for example, more than 4 Mt move between Catalonia and Languedoc-Rousillón. Something similar occurs between the Basque Country and France's Aquitaine region. Due to this proximity, France contributes almost half (44 Mt) of the traffic that passes through Irún and La Junquera, not including conventional roads. It is followed by Germany (15 Mt), Italy (11 Mt), Holland, and the UK, each with slightly more than 4 Mt.

In total, the entire trans-Pyrenean road traffic in 2004 was **123.8 billion t.km**, with an average travel distance of **1,371 km.**

FIGURE 3. – WEIGHT OF EACH ZONE IN RELATION TO ATTRACTED AND GENERATED ROAD TRAFFIC. 2004.
Units: Millions of tonnes per year (Mt)
SOURCE: Spanish-French Cross-Border Observatory Prepared internally.



Road traffic was forecast by applying a gravity model whose explanatory variables are the product of GDP of the origin or destination zones and the distances. Specifically,

the calibration of the model generated demand elasticity values, with respect to GDP and distance, of 1.03 and -2.39, respectively, which are considered reasonable.

The use of the model to forecast traffic demand requires the prediction of the GDPs of all of the areas involved. Two scenarios were adopted: one with high economic growth and another with moderate growth. In the case of Spain, the following GDP growth rates were used:

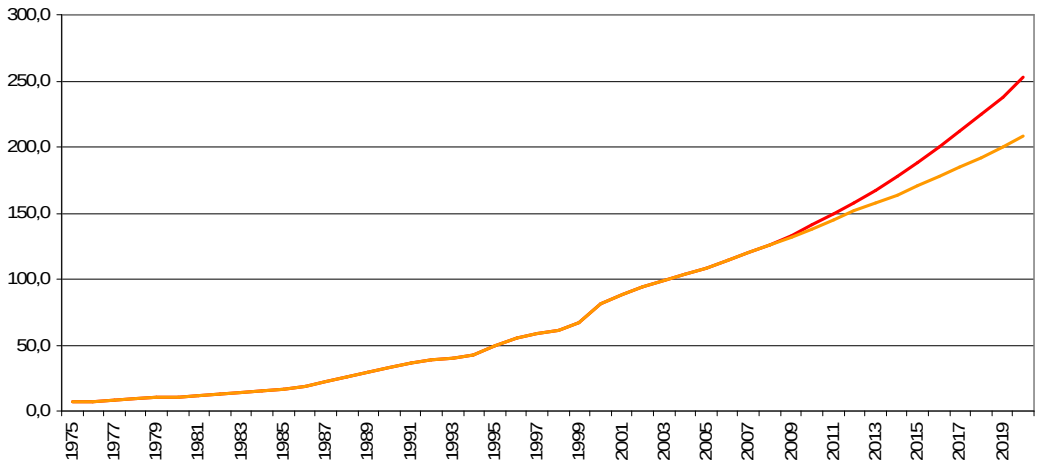
- High growth. 2004-2008: 3.25%; 2008-2012: 3.07%; 2012-2020: 3.0%
- moderate growth: 2004-2008: 3.25%; 2008-2012: 2.45%; 2012-2020: 2.0%

The following values for the expected trans-Pyrenean traffic demand were calculated based on this economic growth and are shown in the curves in figure 4.

TABLE 3. PREDICTED TRAFFIC THROUGH THE IRÚN AND LA JUNQUERA PASSES
Units: Thousands of tonnes
SOURCE: Prepared internally

CURRENT	SHORT-TERM	MEDIUM AND LONG TERM HIGH GROWTH.		MEDIUM AND LONG TERM MODERATE GROWTH	
2004	2008	2012	2020	2012	2020
90,281.4	**110,485.9**	**138,116.9**	**221,012.5**	**132,322.4**	**182,305.8**

FIGURE 4.- PAST AND PREDICTED EVOLUTION OF TOTAL TRANS-PYRENEAN TRAFFIC. HIGH AND MODERATE-GROWTH SCENARIOS AFTER 2008.
Units: Millions of tonnes per year (Mt)
SOURCE: Spanish-French Cross-Border Observatory Prepared in-house.



The traffic projections in the two economic growth scenarios considered (high and moderate) generate rates (6% and 4%, respectively) that are lower than those of the last 20 years (8%, as mentioned earlier). But, be that as it may, this is nevertheless

very high growth, especially since it involves large traffic volumes. Even in the most moderate scenario, the expected traffic would overwhelm the capacity of the trans-Pyrenean motorways. Congestion and its effects require proposals that provide shippers with new transport offerings supported on maritime transport. In other words, the strategy should be aimed at generating complementary modes and getting lorries off of the roads whenever possible, in order to reroute them by sea.

To do this, the most suitable mode is based on **rolling loading and unloading operations ("roll-on roll-off" or "ro-ro")** because it allows lorries to be loaded directly onto ships. From the point of view of the market, road transport operators who use ro-ro ships will, in general, keep their customers, while shipping or maritime transport operators will have the road transport operators as clients. The target audience, from the point of view of maritime transport, is therefore the road shipping operators.

In order for the maritime-sea chain to be truly competitive with respect to the road-only chain, it must move closer to the way in which road-only transport covers the quality/cost requirements imposed by the demand. However, two different forms of transport with different behaviours must be taken into consideration - accompanied and unaccompanied transport:

- **Accompanied transport**, in which the entire lorry (cab and trailer with the load) is put on the ship and the driver travels on the ship as a passenger. According to international regulations (SOLAS Convention), ships with more than 12 passengers are classified as passenger ships. This means that if the number of drivers on board exceeds this number, accompanied transport requires the use of a "ro-pax" ship. This type of ship generates a series of extra structural costs on land to cover the needs of the passengers, which means that fixed costs are much higher than in the case of a pure "ro-ro" ship with no passengers (apart from the crew). One advantage of this mode is that loading and unloading operations are not bound by the conditions imposed by the labour regime governing stowing and unstowing in ports. This makes the port activity more flexible.

  This type of transport is normally aimed at self-employed transport operators with a small number of lorries, that market their services independently with no strong dependency on a large parent company. The idea is to offer a travel alternative that avoids the growing road restrictions, without losing control of the load and the platform itself. There are certain cargo segments such as refrigerated containers, in which transport operators are unwilling to cede or share this intermodal transport element because of its high cost. For this type of traffic, the ship must have electrical power connections in the garage. In any case, it should be noted that this mode results in fixed costs that are higher than for ro-ro ships because of the structural requirements on land and aboard the ship for the passengers.

- **Unaccompanied transport**, in which only the platform with the load is put on the ship, in a port operation carried out with traction units specifically designed for this purpose. In this case, the fixed cost associated with the ship is slightly lower, but on the other hand, the port services for loading and unloading are subject to the labour conditions that apply in the ports. There is a wide range of different types of platforms or trailers.

This mode seeks to attract the interest of larger road transport operators that are able to formalize commercial agreements with their counterparts in other countries to share transport elements. This allows companies to increase the total quantity of goods to be transported and provides greater stability to shipments over time. Also, they normally optimize their fixed assets by cutting the number of traction units in relation to the semi-trailers and also to cut down on empty vehicle returns.

In short, the "unaccompanied" transport mode is ultimately more economical, especially if the labour conditions for loading and unloading can be made more flexible, although this has not happened yet. In fact, different surveys of the sector recognize that the operation of pure ro-ro ships offers the greatest opportunity for its activity.

Regardless of the transport mode, it must be emphasized that the following quality requirements must be fulfilled:

- **Reliability:** delivery within the previously established deadline and under the established conditions
- **Deadline:** travel time until delivery
- **Regularity and frequency:** regular system that allows handling of goods that require frequent rotation in the logistics chain
- **Flexibility:** the ability to react to changes in real time under the transport conditions, including the delivery points and calendars
- **Value-added services such as geo-referenced and real-time information:** the possibility of easily implementing a tracking and tracing system for cargo.

Of course, along with the quality conditions demanded by loaders, the **cost**, which obviously must be as low as possible, must inevitably be taken into account. In this sense, road transport is a mode that while it does not provide a large transport capacity in each trip, does maintain competitive prices, partly as a result of the historic undervaluing of costs by the sector's transport operators themselves when establishing their rates.

It is generally agreed that the **Motorways of the Sea** concept must represent a qualitative leap beyond **short sea shipping**, if a real transport option with a price/quality relationship similar to that of road-only transport services is to be created. The difference between the two concepts lies precisely in that the motorways of the sea represent an offering that is comparable to road transport for the end customer.

In Europe, Spain has been defending the need to define **a set of specific quality criteria** for the motorways of the sea that will make them more recognizable and will make it possible to ensure "ex ante" and "ex post" compliance. In January 2005, Puertos del Estado presented a study of representative motorways of the sea quality criteria to the national maritime-port sector. After receiving comments from the sector for three months, the study was concluded and the English version was sent to the European Commission.

First, when approaching the concept, we must take into account that it forms part of the Trans-European Transport Network (TEN-T). From this perspective, the following are the primary conditions that could be demanded of a motorway of the sea:

- It must be a shuttle service between two or more ports belonging to different countries of the European Union
- The origin and destination ports must be ports that form part of the TEN-T.

In regard to the first condition, there is one fundamental distinction: the idea is not to generate services designed based on a circular system with itineraries supported on multiple stopovers and low frequency, but rather to concentrate the offering in high-frequency maritime services that connect a small number of ports.

In regard to the second point, it should be noted that based on the latest update of these Networks, done in 2001, most of the Spain's general interest ports are already included in category A.

The specified quality criteria must cover the entire transport chain. Each and every one of the links must comply with these minimum requirements to be considered (or certified) as a "Motorway of the Sea". In fact, the quality criteria have been defined for one of the following elements:

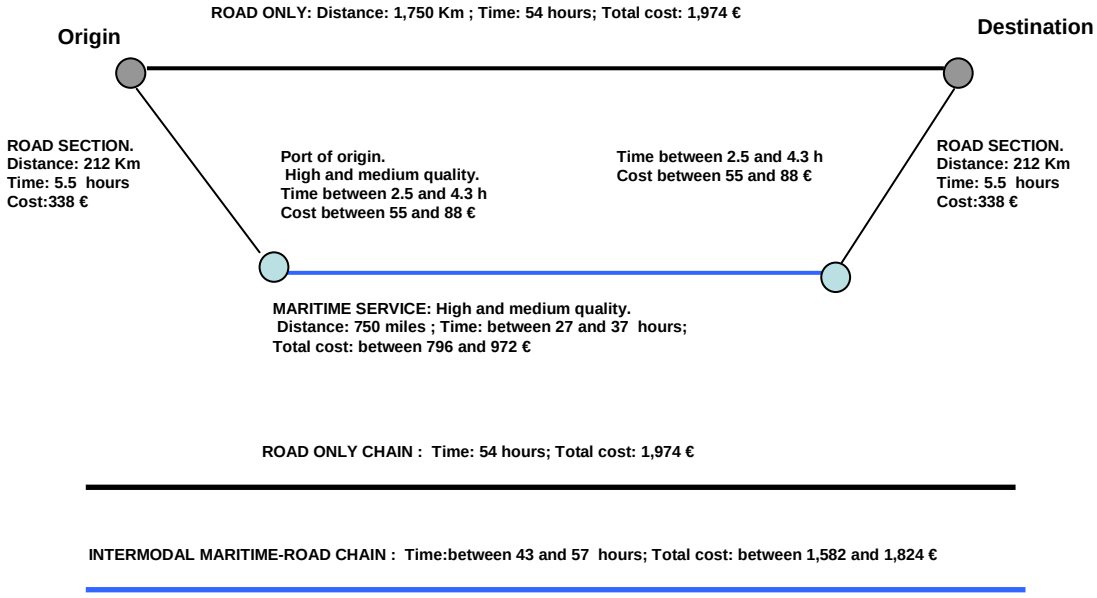
- Land accesses to the ports
- Internal port roadways
- The ro-ro terminal
- The ro-ro ramps
- Loading, stowing, and lashing
- Ship entry and exit
- The ship's stay in the port
- The ship
- Maritime transport service
- Freight rates or prices for maritime transport (recommended)
- Administrative processing

The quality criteria must also be associated with objective and "measurable" values and indicators, with a series of standards or thresholds (verification or fulfilment requirements or numeric values). Together, compliance with these standards guarantees that the short sea shipping service is a high-quality service and can be classified as a "Motorway of the Sea".

The possible transfer of traffic from roads was estimated using discrete selection models calibrated for this purpose, applying these quality criteria to the motorways of the sea supply. The design and calibration work for this type of models was done as part of a series of studies that form part of the R&D programmes promoted by the Ministry of Development.

The discrete selection model was calibrated based on a survey of preferences expressed and stated by road transport operators, forwarding agents, and logistics operators who make freight-routing decisions. For each origin-destination relationship, a comparison was made between the most representative variables of the "pure" road transport chains and the maritime-land option supported by a motorway of the sea, with the required quality criteria. The figure below shows an example of the estimation of cost and time values.

FIGURE 5. TIMES AND COSTS IN ROAD AND MARITIME-LAND TRANSPORT. SUPPORTED BY A MOTORWAY OF THE SEA.
SOURCE: Prepared internally



The results of the application of these models on the expected road traffic show traffic that could potentially be transferred to motorways of the sea would start at a total close to 7 Mt and would increase to 8.6 Mt in 2012, and almost 14 Mt for the horizon year of 2020.

In any case, it should be clarified that this is the maximum potential traffic in an average economic development scenario and based on an average quality hypothesis for the Motorway of the Sea. In addition, the estimate is based on the assumption that the Motorways of the Sea will begin operating in 2008. The economic-financial analysis that is included in the following section provides a more realistic determination of the possible programming of services and development over time that is more in line with the current process to implement the Motorways of the Sea.

TABLE 4. POTENTIAL TRAFFIC ON MOTORWAYS OF THE SEA
Units: Millions of tonnes (Mt)
SOURCE: Prepared internally

Sea corridors in Europe	2008	2012	2020
Atlantic/North Sea Corridor	4.05	5.33	9.24
Western Mediterranean Corridor	2.85	3.31	4.71
Sum	**6.90**	**8.64**	**13.95**

4. Programming of possible subsidies.

To evaluate the quantity and programming of the subsidies required to promote the Motorways of the Sea, a series of initial calculation hypotheses in regard to the fundamental variables that determine the operation of the service and the economic-financial conditions under which the services are provided were applied:

- Pre-established freight rates and frequencies based on the quality criteria required for the motorways of the sea were used: In regard to frequency, a minimum service of 3 departures per week is required for the first three years, increasing to at least 6 departures per week (almost one per day) starting the fourth year. Freight rates were in turn estimated based on the total costs incurred in providing the services, as well as the elasticity of the demand for those services.

- Separate calculations were done for each transport mode - pure unaccompanied (provided by ro-ro ships) and accompanied transport (ro-pax ships), with three types of ships based on top speed (22.5, 27, and 31.5 knots), which results in an effective line speed of 20, 24, and 28 knots, respectively. The speed, along with the sea distance to be covered, directly affects the number of ships needed to cover the required minimum frequency (or the frequency that is imposed by the demand), and is consequently a variable that could be a crucial factor in determining the economic profitability of motorways of the sea. In this situation, the time that the ship stays in port could have a decisive effect, and is directly related to the quality of the port services, especially those related to cargo handling.

- Four basic blocks were considered in the cost calculations, including fixed costs of the ship, variable costs, costs that can be attributed to the port, and structural and commercialization costs. The first two blocks are the most significant of the four. Fixed costs of the ships were calculated assuming that ship construction would be contracted, with financial leveraging, with costs also including crew, insurance and maintenance, repairs, and consumption of spare parts. The variable costs are the costs related to fuel consumption, which, it is a well-known fact, have experienced a sharp increase.

- Lastly, an Internal Rate of Return (IRR) of 10% was established as a condition for profitability. The IRR is the current reference value in viability studies for the granting of State guarantees for the purchase of ships by shipping companies, with a horizon of twelve years.

Based on these general hypotheses, the calculation procedure consisted of estimating the initial minimum traffic to ensure economic-financial viability of an investment project, based on three possible scenarios for the **maximum subsidy per motorway of the sea: 30, 60, and 90 million € (M€).**

The location in time of the initial minimum traffic in each one of the possible motorways of the sea to be developed makes it possible to propose a program of the subsidies aimed at creating incentives for the creation of the motorways of the sea supply.

Also, the alternative scenario of creating additional subsidies for road transport operators to provide an incentive to use motorways of the sea was also tested, following the lines of the subsidies recently approved by the Italian Government, following authorisation by the European Commission ("eco bonuses").

The results for both scenarios are shown in the attached tables. Note that the traffic that is actually transferable from roads is less than the potential traffic estimated in table 5, mainly in 2008. In 2012 and 2020, the traffic volume approaches the estimated potential traffic. This is due to the fact that the motorways of the sea have been programmed based on their potential initial traffic and their technical-economic viability.

TABLE 5.- PROGRAMMING OF MOTORWAYS OF THE SEA OVER TIME
WITH PREDICTED TRAFFIC AND SUBSIDIES FOR SUPPLY ONLY
UNITS: Millions of tonnes (Mt) and millions of € (M€)
SOURCE: Prepared internally

Concept	Maximum subsidy 30 M€	Maximum subsidy 60 M€	Maximum subsidy 90 M€
2005-2008			
Total subsidies	20	40	120
Nº of MoS	1	1	2
Traffic (2008)	0.80	0.80	1.44
2009-2012			
Total subsidies	140	320	450
Nº of MoS	5	5	5
Traffic (2012)	6.22	6.22	6.22
2013-2020			
Total subsidies	50	120	390
Nº of MoS	1	2	4
Traffic (2020)	10.82	11.41	12.87
TOTAL 2005-2020			
Total subsidies	**210**	**480**	**960**
Nº of MoS	7	8	11
Cumulative traffic	85.71	89.42	96.04
Subsidy/MoS ratio	30.0	60.0	87.3
Subsidy/traffic ratio	2.5	5.4	10.0
Subsidy/vehicle ratio	0.2	0.4	0.7

TABLE 6.- PROGRAMMING OF MOTORWAYS OF THE SEA OVER TIME
WITH PREDICTED TRAFFIC AND SUBSIDIES FOR SUPPLY AND DEMAND
UNITS: Millions of tonnes (Mt) and millions of € (M€)
SOURCE: Prepared internally

Concept	Maximum subsidies for supply: 15 M€	Maximum subsidies for supply: 30 M€	Maximum subsidies for supply: 60 M€
2005-2008			
Subsidies supply (M€)	9.5	20	80
Subsidies demand (M€)	0.0	1	1
Total subsidies (M€)	**10**	**21**	**81**
Nº of MoS	1	1	2
Traffic (2008)	0.80	0.80	1.44
2009-2012			
Subsidies supply (M€)	52.4	160	300
Subsidies demand (M€)	13	27	24
Total subsidies (M€)	**66**	**187**	**324**
Nº of MoS	5	5	4
Traffic (2012)	5.38	6.22	6.22
2013-2020			
Subsidies supply (M€)	38.1	100	320
Subsidies demand (M€)	87	120	129
Total subsidies (M€)	**125**	**220**	**449**
Nº of MoS	2	4	6
Traffic (2020)	10.82	12.44	13.38
TOTAL 2005-2020			
Subsidies supply (M€)	100	280	700
Subsidies demand (M€)	100	148	155
Total subsidies (M€)	**200**	**428**	**855**
Nº of MoS	7	10	12
Cumulative traffic	81.29	91.42	97.90
Subsidy/MoS ratio	22.9	42.8	71.2
Subsidy/traffic ratio	2.0	4.7	9.7
Subsidy/vehicle ratio	0.13	0.31	0.58

According to the European Commission's Vademecum for the launch of the Motorways of the Sea, national subsidies can be combined with European funds, either within the framework of the Trans-European Networks (TEN-T) or under the Marco Polo programme.

Based on this background, and with the later indications from the European Commission itself, the assumed hypothesis is for each motorway of the sea to be launched after requesting bids from Member States, which will contribute equal quantities of state subsidies covering 80% of the total, with the remainder provided from European funds.

This would make it possible to programme subsidies as described in the table for the two scenarios considered, which shows the items that would be covered by Spain's part.

TABLE 7.- PROGRAMMING OF SUBSIDIES OVER TIME
UNITS: Millions of € (M€)
SOURCE: Prepared internally

Concept	SUBSIDIES FOR SUPPLY ONLY			SUBSIDIES FOR SUPPLY AND DEMAND		
	Maximum subsidies for supply: 30 M€	Maximum subsidies for supply: 60 M€	Maximum subsidies for supply: 90 M€	Maximum subsidies for supply: 15M€	Maximum subsidies for supply: 30 M€	Maximum subsidies for supply: 60 M€
2005-2008						
Total subsidies	20	40	120	10	21	81
Spain	8	16	48	4	8	32
Other country	8	16	48	4	8	32
European funds	4	8	24	2	4	16
2009-2012						
Total subsidies	140	320	450	66	187	324
Spain	56	128	180	26	75	130
Other country	56	128	180	26	75	130
European funds	28	64	90	13	37	65
2013-2020						
Total subsidies	50	120	390	125	220	449
Spain	20	48	156	50	88	180
Other country	20	48	156	50	88	180
European funds	10	24	78	25	44	90
TOTAL 2005-2020						
Total subsidies	**210**	**480**	**960**	**200**	**428**	**855**
Spain	**84**	**192**	**384**	**80**	**171**	**342**
Other country	**84**	**192**	**384**	**80**	**171**	**342**
European funds	**42**	**96**	**192**	**40**	**86**	**171**

If the two subsidy modes considered thus far are compared (for supply only or combination of supply and demand), note that it is possible to create an equivalence so that three more effective potential scenarios can be considered:

- **Scenario with subsidies with a maximum total up to 30 M€ per motorway of the sea**, equal to the combination of a maximum subsidy of 15 M€ and subsidies to road transport operators equal to 20% of the freight rate. This scenario starts with a motorway of the sea with 0.8 Mt of traffic and culminates in 2020 with 7 motorways of the sea and final traffic of almost 11 Mt.

- **Scenario with subsidies with a maximum total up to 60 M€ per motorway of the sea**, equal to the combination of a maximum subsidy of 30 M€ and subsidies to road transport operators equal to 20% of the freight rate. This also starts with a single motorway of the sea, with 0.8 Mt of traffic, ultimately reaching between 8 and 10 motorways of the sea in operation and a volume between 11.4 and 12.4 Mt by 2020.

- **Scenario with subsidies with a maximum total up to 90 M€ per motorway of the sea**, equal to the combination of a maximum subsidy of 60 M€ and subsidies

to road transport operators equal to 20% of the freight rate. In this case, it is possible to start with 2 motorways of the sea in 2008, with initial traffic of 1.44 Mt, which grows at a faster rate until 2020, with between 10 and 11 motorways of the sea in service, with a final traffic of approximately 13 Mt.

The final values of these tables also deserve some final comments:

- It is understood that in order to launch a motorway of the sea, the opposing inertia must be broken by providing the subsidies needed at the time when adequate medium and long-term profitability can be achieved. This means that the possibility of waiting for traffic to reach the minimum levels needed for motorways of the sea to be profitable to be reached is not viable. An initial incentive is required to push shipping companies to decide to make the investment.

- The maximum subsidy of 30 M€ is the one that provides the best performance from the point of view of public subsidies, but it does not guarantee that sufficient interest will be sparked in the shipping sector. It should also be noted that motorways of the sea also reduce external costs, which could offset these increased subsidy levels, as described in the following chapter.

- The 2009-2012 period is the most intense because it constitutes the cycle of expansion of the motorways of the sea. This is therefore the period that requires the greatest allocation of public subsidies per line. The 2013-2020 period can be considered to be the period of the consolidation of the previously-implemented offer, during which the majority of the subsidies would be concentrated on road transport operators, if this is deemed necessary.

- The possibility of directing subsidies at road transport operators improves the possibilities of developing the Motorways of the Sea for the following reasons:

    - It provides an incentive to use the Motorways of the Sea and the new traffic that is generated will make it possible to reduce the initial deficit of the maritime-land transport services. In any case, note that to achieve an effective reaction from the demand, the subsidies to the road transport operators must be accompanied by an adequate information and promotional campaign.

    - The total quantity of public subsidies, the sum of the subsidies aimed at the supply and the subsidies aimed at the transport demand is reduced,

    - A programming of annual payments for public subsidies that is more uniform over time is achieved, which reduces the risks generated by the initial efforts to launch the Motorways of the Sea, by transferring the largest quantities aimed at providing incentives for transport demand to the future.

5. Expected mobility and evaluation of effects.

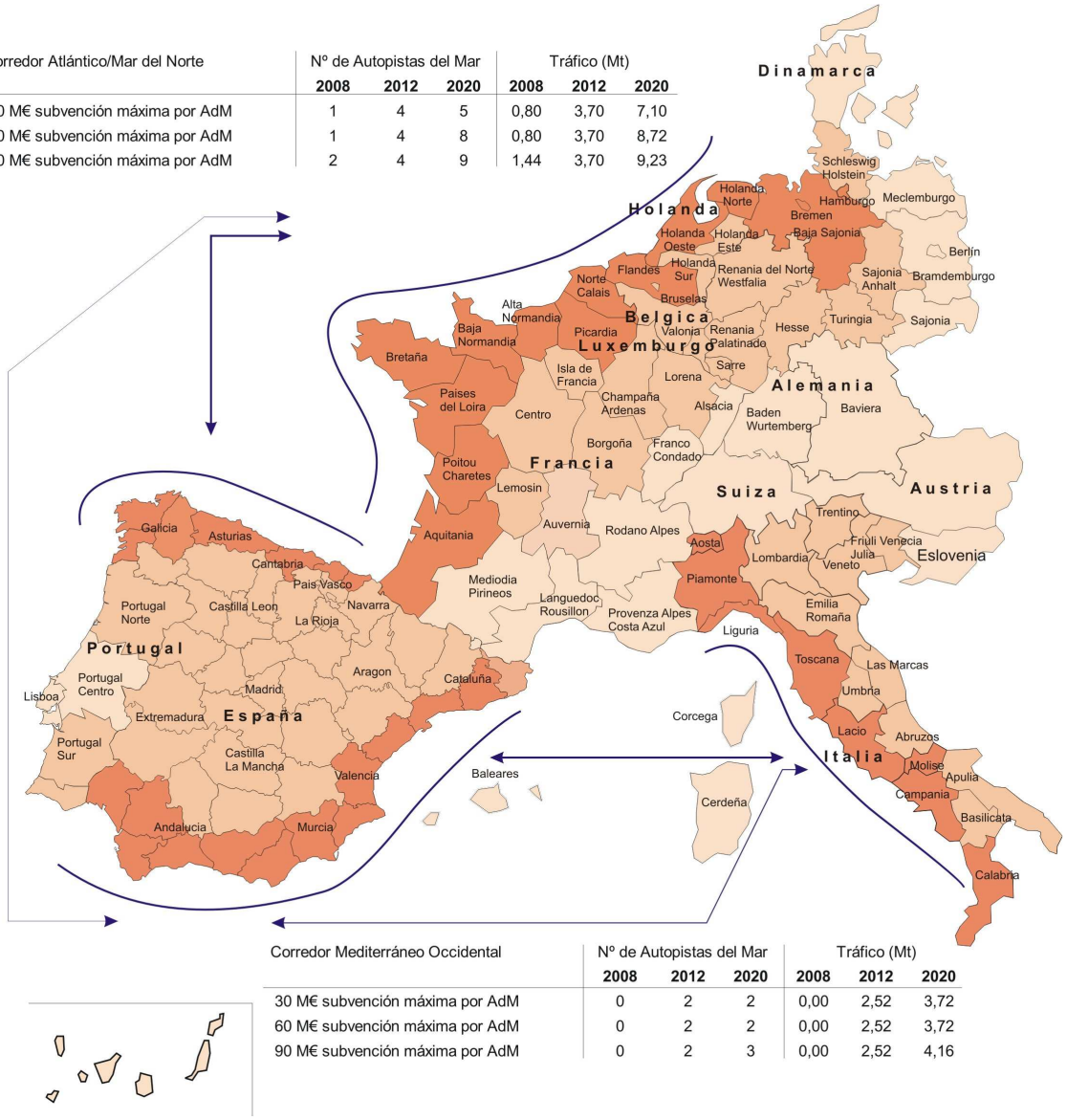
Table 8 summarizes the traffic that would be generated by each scenario for the principal European corridors, compared with the initially estimated potential traffic (table 15). Figure 6 shows the graph of these results.

Initially, in 2008, the appearance of one, or at most two motorways of the sea means that the traffic levels fall far short of the values in the potential demand study. However, in 2012, the traffic that would be handled by the motorways of the sea in service (6.22 Mt) represents 70% of the maximum potential (8.64 Mt) and at the end of the period, the percentage ranges between 77%, 89%, and 96%, depending on the subsidy scenario considered (30, 60, 90 M€ per Motorway of the Sea, respectively).

TABLE 8.- TRAFFIC EVOLUTION ON MOTORWAYS OF THE SEA
UNITS: Millions of tonnes (Mt)
SOURCE: Prepared internally

Concept	Number of Motorways of the Sea			Total traffic (Mt)		
Sea corridors in Europe	**2008**	**2012**	**2020**	**2008**	**2012**	**2020**
Estimated potential traffic						
Atlantic/North Sea Corridor	9	9	9	4.05	5.33	9.24
Western Mediterranean Corridor	6	6	6	2.85	3.31	4.71
Sum	**15**	**15**	**15**	**6.90**	**8.64**	**13.95**
Hypothesis: 30 M€ per Motorway of the Sea						
Atlantic/North Sea Corridor	1	4	5	0.80	3.70	7.10
Western Mediterranean Corridor	0	2	2	0.00	2.52	3.72
Sum	**1**	**6**	**7**	**0.80**	**6.22**	**10.82**
Hypothesis: 60 M€ per Motorway of the Sea						
Atlantic/North Sea Corridor	1	4	8	0.80	3.70	8.72
Western Mediterranean Corridor	0	2	2	0.00	2.52	3.72
Sum	**1**	**6**	**10**	**0.80**	**6.22**	**12.44**
Hypothesis: 90 M€ per Motorway of the Sea						
Atlantic/North Sea Corridor	2	4	9	1.44	3.70	9.23
Western Mediterranean Corridor	0	2	3	0.00	2.52	4.16
Sum	**2**	**6**	**12**	**1.44**	**6.22**	**13.38**

FIGURE 6.- TRAFFIC EVOLUTION ON MOTORWAYS OF THE SEA
BY EUROPEAN CORRIDOR
UNITS: Millions of tonnes (Mt)
SOURCE: Prepared internally



Atlantic / North Sea Corridor	Nº of Motorways of the Sea			Traffic (Mt)		
	2008	2012	2020	2008	2012	2020
30 M€ maximum subsidy per MoS	1	4	5	0.80	3.70	7.10
60 M€ maximum subsidy per MoS	1	4	8	0.80	3.70	8.72
90 M€ maximum subsidy per MoS	2	4	9	1.44	3.70	9.23

Western Mediterranean Corridor	Nº of Motorways of the Sea			Traffic (Mt)		
	2008	2012	2020	2008	2012	2020
30 M€ maximum subsidy per MoS	0	2	2	0.00	2.52	3.72
60 M€ maximum subsidy per MoS	0	2	2	0.00	2.52	3.72
90 M€ maximum subsidy per MoS	0	2	3	0.00	2.52	4.16

Table 6 shows the evolution of overall mobility in terms of t.km in each scenario. The aggregate values of t.km are expressed for each one of the segments of the alternate transport chains that were analysed: maritime-land transport supported by motorway of the sea and road-only transport.

TABLE 9.- EVOLUTION OF TOTAL ROUTE DISTANCES ON MOTORWAYS OF THE SEA
UNITS: Millions of t.km
SOURCE: Prepared internally

YEARS	Maximum subsidy: 30 M€			Maximum subsidy: 60 M€			Maximum subsidy: 90 M€		
	Marit.	Road to port	Pure road	Marit.	Road to port	Pure road	Marit.	Road to port	Pure road
2008	0.70	0.52	0.99	0.70	0.52	0.99	1.17	0.97	1.66
2009	0.75	0.55	1.06	0.75	0.55	1.06	1.26	1.04	1.78
2010	4.82	2.53	6.15	6.61	3.28	8.08	6.61	3.28	8.08
2011	5.10	2.68	6.51	7.03	3.48	8.58	7.03	3.48	8.58
2012	7.48	3.70	9.11	7.48	3.70	9.11	7.48	3.70	9.11
2013	7.95	3.92	9.67	7.95	3.92	9.67	8.69	4.12	10.51
2014	8.45	4.16	10.26	9.24	4.38	11.16	9.24	4.38	11.16
2015	8.98	4.42	10.90	9.82	4.65	11.86	9.82	4.65	11.86
2016	10.46	4.94	12.61	10.46	4.94	12.61	10.91	5.21	13.16
2017	11.13	5.26	13.41	11.13	5.26	13.41	11.62	5.54	14.00
2018	11.86	5.60	14.26	11.86	5.60	14.26	13.77	6.37	16.48
2019	12.63	5.96	15.18	13.19	6.28	15.86	15.40	7.02	18.18
2020	13.47	6.34	16.17	15.65	7.24	18.47	17.48	7.72	20.30

It has already been determined that the transport sector accounts for more than 24% of the greenhouse gases generated by Spain's economic activity as a whole, measured in equivalent CO_2, and that this effect increased 71% during the period 1990-2003.

Of the transport modes that emit the greatest quantity of CO_2 to the atmosphere, road is undoubtedly one of the leaders, emitting in 2003, according to the aforementioned report, 87 million tonnes (Mt), while the other transport modes together emitted a volume of slightly less than 21 Mt. Also, the geographical area in which the greatest greenhouse gas emissions is recorded is the urban-metropolitan area, in which the daily mobility of vehicles is much greater than the values recorded for long-distance transport.

The greenhouse gases evaluated in this section are indicated in the attached table, along with the emission savings for each one of the scenarios considered, with respect to a scenario in which the Motorways of the Sea are not developed.

TABLE 10.- CUMULATIVE REDUCTION OF GREENHOUSE GASES BY PERIODS
UNITS: CO_2 in thousands of tonnes and the rest in tonnes
SOURCE: Prepared internally

Period	Maximum subsidy: 30 M€	Maximum subsidy: 60 M€	Maximum subsidy: 90 M€
	2005 - 2008		
Carbon dioxide (thousands of t.)	12.3	12.3	15.9
Carbon monoxide (t)	20.2	20.2	24.6
Unburned hydrocarbons (t)	9.6	9.6	12.4
Particles in suspension (t)	7.6	7.6	10.4
Nitrogen Oxides (t)	67.9	67.9	55.6
Sulphur Dioxide (t)	-195.6	-195.6	-328.8
	2009- 2012		
Carbon dioxide (thousands of t.)	373.8	436.3	440.1
Carbon monoxide (t)	630.1	731.5	736.2
Unburned hydrocarbons (t)	290.2	338.7	341.7
Particles in suspension (t)	225.3	264.3	267.2
Nitrogen Oxides (t)	2,430.6	2,754.6	2,741.4
Sulphur Dioxide (t)	-5,049.5	-6,087.7	-6,230.6
	2013-2020		
Carbon dioxide (thousands of t.)	1,714.1	1,802.3	1,959.0
Carbon monoxide (t)	2,879.5	3,027.7	3,291.6
Unburned hydrocarbons (t)	1,330.9	1,399.4	1,521.0
Particles in suspension (t)	1,036.5	1,089.8	1,184.3
Nitrogen Oxides (t)	10,941.3	11,504.4	12,519.2
Sulphur Dioxide (t)	-23,637.6	-24,854.0	-26,979.4
	TOTAL 2005-2020		
Carbon dioxide (thousands of t.)	2,100.2	2,250.9	2,415.0
Carbon monoxide (t)	3,529.8	3,779.4	4,052.4
Unburned hydrocarbons (t)	1,630.7	1,747.7	1,875.1
Particles in suspension (t)	1,269.5	1,361.7	1,461.9
Nitrogen Oxides (t)	13,439.8	14,326.9	15,316.1
Sulphur Dioxide (t)	-28,882.7	-31,137.3	-33,538.8

Lastly, the reduction in external costs generated by the implementation of Motorways of the Sea was estimated. To do this, the values recorded in the Marco Polo programme (in the 2004 announcement) were used. These values are lower than those in other studies and are therefore conservative in regard to this analysis.

According to the reports prepared as part of the Marco Polo programme, the external costs that can be attributed to the maritime and road transport modes are 9 € /thousands of t.km for maritime transport, and 35 €/thousands of t.km for road transport.

The values shown in table 11 were calculated by applying these indices to the total route distances estimated for each scenario. This table shows the cumulative savings for the different periods and they are compared with the public subsidies aimed exclusively at promoting the new offering of the Motorways of the Sea, which are also

cumulative for those same periods. It is simple to see that the net savings in external costs for the entire period is higher than the total subsidies, which demonstrates the socio-economic utility of the subsidies as an action aimed at sustainability. The overall benefits are seen in all scenarios, even those with the highest levels of subsidies per Motorway of the Sea.

By periods, it should be noted that the start-up generates a negative balance because the subsidy precedes the launching of the motorways of the sea, in order to give the sector time to ensure that the motorways of the sea are implemented with the required quality criteria. In later periods, the reduction of external costs exceeds the quantities of the public subsidies by a wide margin.

To conclude, it can be affirmed that the effects generated by the Motorways of the Sea justify the total public subsidies (sum of the subsidies aimed at both supply and demand), valued at between 30 and 60 million euros, for the development of motorways of the sea between specific maritime fronts on the Western Mediterranean and the Atlantic. They must be properly programmed according to the level of maturation of the demand that could potentially be attracted by these Motorways of the Sea.

TABLE 11.- CUMULATIVE SAVINGS OF EXTERNAL COSTS BY PERIODS
UNITS: Millions of € (M€)
SOURCE: Prepared internally

Period	Maximum subsidy: 30 M€	Maximum subsidy: 60 M€	Maximum subsidy: 90 M€
2005 – 2008			
Reduction of external costs	10.3	10.3	13.8
Subsidies for supply only	20.0	40.0	120.0
Balance	-9.7	-29.7	-106.2
2009- 2012			
Reduction of external costs	304.6	356.9	360.7
Subsidies for supply only	140.0	320.0	450.0
Balance	164.6	36.9	-89.3
2013-2020			
Reduction of external costs	1,400.1	1,472.2	1,599.9
Subsidies for supply only	50.0	120.0	390.0
Balance	1,350.1	1,352.2	1,209.9
TOTAL 2005-2020			
Reduction of external costs	1,715.0	1,839.3	1,974.4
Subsidies for supply only	210.0	480.0	960.0
Balance	1,505.0	1,359.3	1,014.4