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WEST-MOS
Western Europe Sea Transport &
Motorway of the Sea
2005-EU-90609-S-SINCOM



Puerto de Castellón

Autoridad Portuaria de Castellón

D 7.13 – CASTELLÓN PRACTICAL STUDY

MARKET STUDY AND COST BENEFIT ANALYSIS AT MICRO LEVEL

Castellón - Italia



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BILBAO PLAZA MARITIMA PUERTOS, S.L.

Proyecto WEST-MOS. Western European Sea Transport and Motorway of the Sea. Frame of the Study

Objet of the Study

- 1.-Market Research: Estimate the demand transferable to a MOS between the Port of Castellón and Italy
- 2.-Economic and Financial Study: Estimate the technical and economic feasibility of the chosen MOS.

1.- Market Research

1.1.-Zoning and Socioeconomic context

Definition of areas that generate and receive traffics

- Spain : - Port of Castellón Hinterland
 - Areas generating flows that pass through the vicinity of the Port of Castellón
- Italy : -North of Italy. 90% intercourses with the chosen areas. Port Marina di Carrara.
- Other countries. Due to their geographic situation. Importance of commercial intercourses with the chosen areas.

1.- Market Research

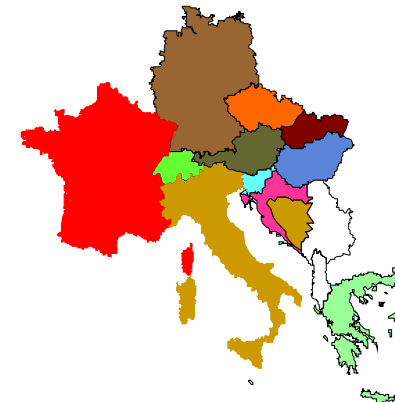
1.1.-Zoning and Socioeconomic context

Hinterland: Castellón, Valencia, Tarragona,
Zaragoza, Madrid, Teruel, Cuenca, Albacete.

Flows: Alicante, Murcia, Almería, Granada, Málaga,
Cádiz, Jaén, Córdoba, Sevilla, C. Real.



Countries: Italia, Suiza, Austria, Francia, Alemania,
Eslovenia, Rep. Checa, Eslovaquia,
Hungría, Croacia, Bosnia, Grecia



Socioeconomic context (population, GDP, foreign trade).
Potential of development

1.- Market Research

1.2.-Analysis of the transport demand

Research on the traffic flows that might be attracted by a MOS between the Port of Castellón-Italian Port

Exclusively road transported merchandises

Information sources

- Transit 2004 Enquiry
- MIS Uniport Bilbao
- Istat (Italian National Statistics Institute)



1.2.-Analysis of the transport demand 1.- Market Research

Trade Province of Castellón-Italy by road (2.006)

Import Main products (000 T.)		Principales Productos Exportación (miles T.)	
Felspar	66	Ceramics	112
Inorganic Chemical Products	32	Enamels	58
Ceramics	20	Fruits	32
Chemical Industrial Products	17	Inorganic Chemical Products	16
Enamels	16	Organic Chemical Products	15
Machinery	15	Fertilizers	8
Others	55	Others	24
Total	221	Total	265
Total Import-Export Province of Castellón-Italy by road 486000 T.			

- Balance between Import and export
- 95% of trade with the North of Italy (Emilia-Romagna, Lombardy, Piamonte, Tuscany ,Liguria, Veneto)
- 75% related with Ceramic Industry

1.2.-Analysis of the transport demand 1.- Market Research

Trade Rest of Hinterland Castellón-Italy by road (2.006)

Import		Exporta	
Province	000 T.	Province	000 T.
Madrid	736	Tarragona	470
Valencia	435	Madrid	342
Zaragoza	167	Valencia	194
Tarragona	163	Zaragoza	170
Albacete	11	Teruel	19
Teruel	5	Albacete	10
Cuenca	3	Cuenca	9
Total	1.520	Total	1.214
Total Import-Export Rest of Hinterland Castellón-Italy			2.734

- **Madrid, Valencia, Zaragoza and Tarragona** add up a **98 %** of the whole trade
- Main products: import **Vehicles, Machinery, Cast Iron and Steel.** export **Plastics and derivatives, Machinery, Paper and cardboard, Fruits and vegetables**

1.- Market Research

1.2.- Analysis of the transport demand

Trade Flow Castellón-Italy by road (2.006)

Import		Export	
Province	000 T.	Province	000 T.
Murcia	91	Murcia	165
Alicante	83	Almería	98
Sevilla	67	Alicante	94
Jaén	30	Córdoba	83
Almería	24	Sevilla	60
Córdoba	21	Ciudad Real	49
Málaga	19	Cádiz	48
Granada	13	Jaén	42
Ciudad Real	10	Málaga	22
Cádiz	9	Granada	18
Total	369	Total	679
Total Import-Export Castellón-Italy Flow		1.048	

Main Products

Import	Export
Plastics and derivatives (10%)	Fruits and vegetables (34%)
Oils (9%)	Oils (18%)
Cast iron and steel and derivatives (9%)	Plastics and derivatives (6%)

- Imbalance between import and export
- Murcia, Alicante, Sevilla, Almería, Córdoba and Jaén add up 82% of the whole.

1.- Market Research

1.2.-Analysis of the transport demand

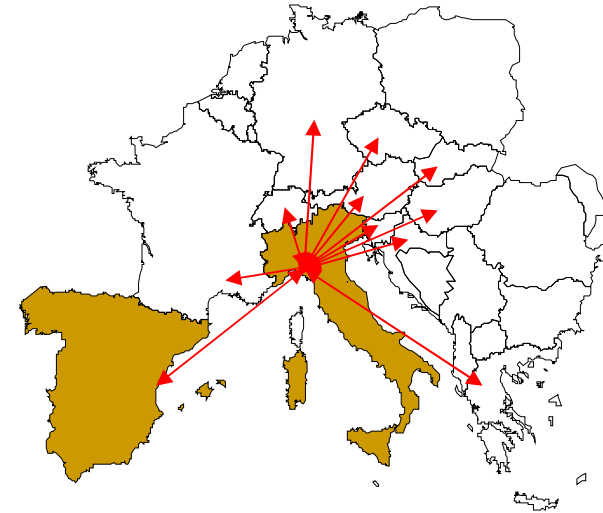
Trade by road with Italy Import-Export 2006 (000 T.)	
Province of Castellón	486
Rest of the Hinterland	2.734
Flow	1.048
Total	4.268

1.- Market Research

1.2.-Analysis of the transport demand

Trade by road with other countries of Origin/Destination . Import-Export (000 T.)	
Prov Castellón	1.604
Rest of Hinterland	10.311
Flows	4.435
Total	16.350

Province of Castellón Intercourses
50% Francia, 30% Alemania.



Main products Castellón-Other Countries	
Import	Export
Felspar (40%)	Ceramics (60%)
Inorganic Chem.Prod.(13%)	Fruits (30%)
Paper and cardboard (10%)	Enamels (5%)
Wood (10%)	

1.- Market Research

1.2.-Analysis of the transport demand

Transport Evolution Prospects

The European Commission document “**European energy and transport - trends to 2030 update 2005**”, shows the evolution of transport in Europe since 1990 and the expected evolution until 2030

Transport of Merchandises by road	% year-to-year increase			
	90-00	00-10	10-20	20-30
Italy	3.5	1.6	1.5	1.0
Spain	5.9	3.1	2.5	1.7
Europe (UE 27)	3.4	2.7	2.2	1.5

Traffic by road forecast

Traffics 000T.	2.006	2.008	2.012	2.020	2.030
Castellón-Italy	486	533	632	864	1.128
Rest Hinterland-Italy	2.734	2.997	3.553	4.863	6.348
Flow-Italy	1.048	1.149	1.362	1.864	2.433
Castellón-Europe	1.604	1.795	2.203	3.181	4.359
Rest Hinterland-Europe	10.311	11.542	14.162	20.451	28.023
Flow-Europe	4.435	4.964	6.092	8.796	12.053



1.- Market Research

1.2.-Analysis of the transport demand

Qualitative Analysis of Demand

Opinions and needs of agents involved with offer and demand of Motorways of the Sea.



1.- Market Research

1.3.-Analysis of the Transport Supply

The following transport parameters, affecting cost and service quality for each mode, have been analyzed.

Analysis of the Road Mode

Analysis of the Railway mode

Analysis of the Maritime Mode

1.- Market Research

1.4.- Approach to the new Transport Supply

A new transport offer, based on a Motorway of the Sea service, is proposed, with the following features.

Origin-Destination of the Line

The line will link the **Port of Castellón** with that of **Marina di Carrara, 509 nautics miles away.**

Tipology of the Service

- **High quality service.** Frequency, **six departs per week.** **Two ships** with the following characteristics:

Tipology Ro-Ro Ship

Total Length (m)	142	Speed (Knots)	22,5 (Vmax=26)
Breadth (m)	23	M. of rolling lane	1.900
Depth (m)	5,4	Capacity platforms (13,6m.)	135
Dead Weight-DWT(tn)	5.928	Nr. of crew members	16
GT (tn)	13.073	Nr. of passengers	12

- **Pure Ro-Ro service,** transport of platforms without driver
- **Transitime of 23 hours,** estimating a 5 hours stay in port for loading and unloading (estimated output of 50 platforms/hour).



1.- Market Research

1.4.- Approach to the new Transport Supply

The following might be an example of **service schedule**:

Day of the week	Depart timetable Port of Castellón	Time of depart P. Marina di Carrara
Monday	07:30	07:30
Tuesday	11:00	11:00
Wednesday	14:30	14:30
Thursday	18:00	18:00
Friday	21:30	21:30
Sunday	01:00	01:00

In this way, the number of **round trips** per year (50 weeks) would be **300**, for two vessels.

The line capacity, considering an occupancy of 80%, and an average weight per platform of 16Tons., would be **1.036.800 Tons/year (65.000 platforms/year)**.



1.- Market Research

1.5.-Comparason Road-Motorway of the Sea

The routes with the chosen origin/destination have been analysed employing the road only mode and also the with the employ of the road-maritime mode, so that the time and the cost of the routes have been obtained and compared.

Spanish Mediterranean-North of Italy

- Time saving: 23%-45%
- Cost saving : 11%-35%



1.- Market Research

1.6.-Motorway of the Sea's potential Demand

Estimation of the **percentage** road **traffic** of merchandises that might be **seized** by the proposed **Motorway of the Sea**.

	% Seizure	
	Italy	Rest of Europe
Prov. Castellón	70	2
Rest of Hinterland	10	0,2
Flows	8	0,2

It has been considered that this **percentages** of seizure will **grow** in the future, due to **external reasons** (increase of traffic congestion, greater pressure on road transport, etc.), and also to **internal reasons** (promotion campaigns, acquired experience), which may suppose an additional annual increase of seized Tons. around **3,3%** for the 4 first years of service and about **5%** yearly during the following 4 years.

It is estimated that the whole of this theoretical traffic will not be seized by the new service, especially during the first years. 1st year **60%**, 2nd year **70%** of the ship's capacity.

1.- Market Research

1.6.-Motorway of the Sea's potential Demand

year*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Seizable 000 Tons	902	945	984	1024	1083	1127	1173	1220	1267	1316	1368	1421	1458	1497	1536	1577
Seizable 000 Platforms	56	59	61	64	68	70	73	76	79	82	85	89	91	94	96	99
Traffic Line 000 Platforms	49	57	61	64	68	70	73	76	79	82	85	89	91	94	96	99

* It has been supposed that the year 1 of start of the line would be 2009. 16 Tons per platform have been considered

% of occupancy of the line

% Occupancy of the Line (2 vessels)	100%	90%	80%	70%	60%
Capacity 000 Platforms	81	73	65	57	49
% Occupancy of the Line (3 vessels)	100%	90%	80%	70%	60%
Capacity in m. Platforms	122	109	97	85	73

On the **7th year** of operation it will be reached a **90% occupancy**, a figure near **saturation**, that might cause waiting lists problems, affecting the quality of the service. This would make convenient to **add another ship to the line**. The new vessel, with similar features to those of the two previous ships, **would increase in 50% the capacity** and the **frequency** of the line, reducing **occupancy per ship to 60%**.

2.- Economic and Financial Study

2.1.-Economic-Financial Features of Maritime Transport

Economic Feasibility Indicators IRR and NPV

- **IRR: Internal Rate of Return.** It calculates the business' profitability. Profitable with $TIR \geq 10\%$.
- **NPV: Net Present Value.** It updates to the present moment magnitudes of future years, to make possible comparisons. Investment is interesting when NPV is positive.

Estimation of IRR and NPV from the

- Income
- Expense
- Investment

Lifespan of the Project 20 years. Estimation in fixed €



2.- Economic and Financial Study

2.1.-Economic-Financial Features of Maritime Transport

Income

Numer of platforms carried each year by the line at freight cost, established in **625 €/journey.**

Running Expenses

Crew

CREW	
Nr. Of Crew Members	16
Rotation factor	2
Annual Cost €/ man	40.000
Annual Crew Cost in €	1.280.000

A crew of European officers and Asian sailors has been considered.

Maintenance and Repairs

Maintenance and repairs	
Annual Cost in €	700.000

A high level of maintenance and repairs has been considered

Insurances

Insurances	
Annual Cost in €	525.000

A shipping company with acceptable records of accident rates has been considered.

Management

Management	
Annual Cost in €	350.000

Great structure and/or few ships

2.- Economic and Financial Study

2.1.-Economic-Financial Features of Maritime Transport

Consumptions (Fuel)

CONSUMPTIONS			
Navigation (T./day)		Prices (€/T.)	
Fuel Oil	100	Fuel Oil	360
Gas Oil	0	Gas Oil	610
Loading Port (T./day)		Total Consumptions T.	
Fuel Oil	0	Fuel Oil	197
Gas Oil	3	Gas Oil	1,25
Unloading Port (T./day)		Total Consumptions in €	
Fuel Oil	0	Fuel Oil	70.921
Gas Oil	3	Gas Oil	762
Heating (T./day)		Total Round Trip	
Fuel Oil	9	Fuel Oil	71.683
		Total trip (outward and return)	35.842

Round Trip	
Total Distance (miles)	1.018
Speed (Knots)	22,50
Days Loading Port	0,21
Days Unloading Port	0,21
Trip length (days)	
Navigation	1,89
Ports	0,42
Total	2,31

Port

60,60 €/platform

Estimation based on the actual Taxes of the Port of Castellon

Estancia en Puerto	5 horas
G.T.	13.000
Escalas año/Buque	150
Capacidad Buque	135 plat.

It has been considered that the ship will be equipped with suitable propulsion means so as to do without towing services. If eventually these services were required the total cost per platform would be increased in 24,96 €.

2.- Economic and Financial Study

2.1.-Economic-Financial Features of Maritime Transport

Capital Expenses

- Lifespan 20 years,
- Straight line depreciation 10 years
- Interest rate 5,5%
- Residual value of the ship of 5% (20 years old) and 30% (12 years old).

For a price of the ship of **35 million €**, with an initial investment of 20%, the recovery expense plus interests is of **3,71 Mll€ yearly per ship**.

Investment

On year 0, at the beginning of the running of the service, an investment of 20% of the value of the ship is carried out, multiplied by the number of ships (2). On year 7 of the running of the service a new investment is done corresponding to the 20% of the value of the third ship on service in the line the following year.

On year 20 of the running of the service, the residual value of the three ships that year will be recovered.

2.- Economic and Financial Study

2.1.-Economic-Financial Features of Maritime Transport

Calculation of IRR and NPV

Incomes MII €																		
Charter Fee		30	35	38	40	42	44	46	48	50	51	53	56	57	58	60	62	63
Ordinary Expenses MII €																		
Crew		2,6	2,6	2,6	2,6	2,6	2,6	2,6	3,8	3,8	3,8	3,8	3,8	3,8	3,8	3,8	3,8	3,8
M&R		1,4	1,4	1,4	1,4	1,4	1,4	1,4	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,1
Insurances		1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6
Management		0,7	0,7	0,7	0,7	0,7	0,7	0,7	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1
Port		2,9	3,4	3,7	3,9	4,1	4,3	4,4	4,6	4,8	5,0	5,2	5,4	5,5	5,7	5,8	6,0	6,1
Consumptions		21,5	21,5	21,5	21,5	21,5	21,5	21,5	32,3	32,3	32,3	32,3	32,3	32,3	32,3	32,3	32,3	32,3
Total Ordinary Costs		30	31	31	31	31	31	32	45	46	46	46	46	46	46	47	47	47
Capital Expenses		7,4	7,4	7,4	7,4	7,4	7,4	7,4	11,1	11,1	11,1	3,7	3,7	3,7	3,7	3,7	3,7	3,7
Investment	14							7										
Incomes-expenses-investm	-14	-7,2	-2,6	0,1	1,5	3,6	5,1	-0,3	-8,9	-7,2	-5,5	3,7	5,6	6,9	8,3	9,7	11,1	12,6
IRR	10%																	
NPV 6% (MII €)	18,3																	

From the result of the calculation carried out, and for the values of NPV and IRR obtained, the conclusion is that **the project proposed of Motorway of the Sea is feasible from the economic point of view** without the contribution of public aids.

Nevertheless, the public aids can contribute, in the launching stage of the line, to fill the gap between the theoretical forecasts and the market reality.

2.- Economic and Financial Study

2.1.-Economic-Financial Features of Maritime Transport

Analysis of the sensitiveness of the profitability indicators

Indexing of CPI

CPI	IRR
1%	11,9%
2%	13,7%
3%	15,5%
4%	17,3%

Ecobonus

25 % discount in charter fee.

Estimated increase of seizure 5%

IRR 13,28% NVP 36,42 MII €

Price of the Ship

Price of Ship increase	IRR	Increase in charter fee	Price of Charter (€)
10%	8%	2%	638
20%	6,3%	3,7%	648

Price of fuel

Increase in Fuel price	IRR	Increase in charter fee	Price of charter (€)
5%	6,8%	2,7%	642
10%	3,80%	5,6%	660
15%	1,00%	8,5%	678

2.- Economic and Financial Study

2.2.-Evaluation of External Costs

External Costs

The external costs are those not taken into account by the fares of the different means of transport, but that in fact have an effect in the society as a whole.

These costs are linked to the accidents, noise, congestion, atmospheric pollution (harm to health, material damages and biosphere degradation), those related to the climatic change and damages to the nature and the landscape.

Obtaining the External Costs

External costs according to INFRAS	€/1000Tkm	
	Road	Sea
Accidents	4,8	0
Noises	4,9	0
Environmental effects	60,5	10,15
Urban Effects	1,1	0
Total	71,3	10,15

External Costs Marco Polo II (€/1000Tkm)	
Road	35
Sea	9

The savings of the proposed MOS line have been estimated for both cases: **Marco Polo II** and **INFRAS**

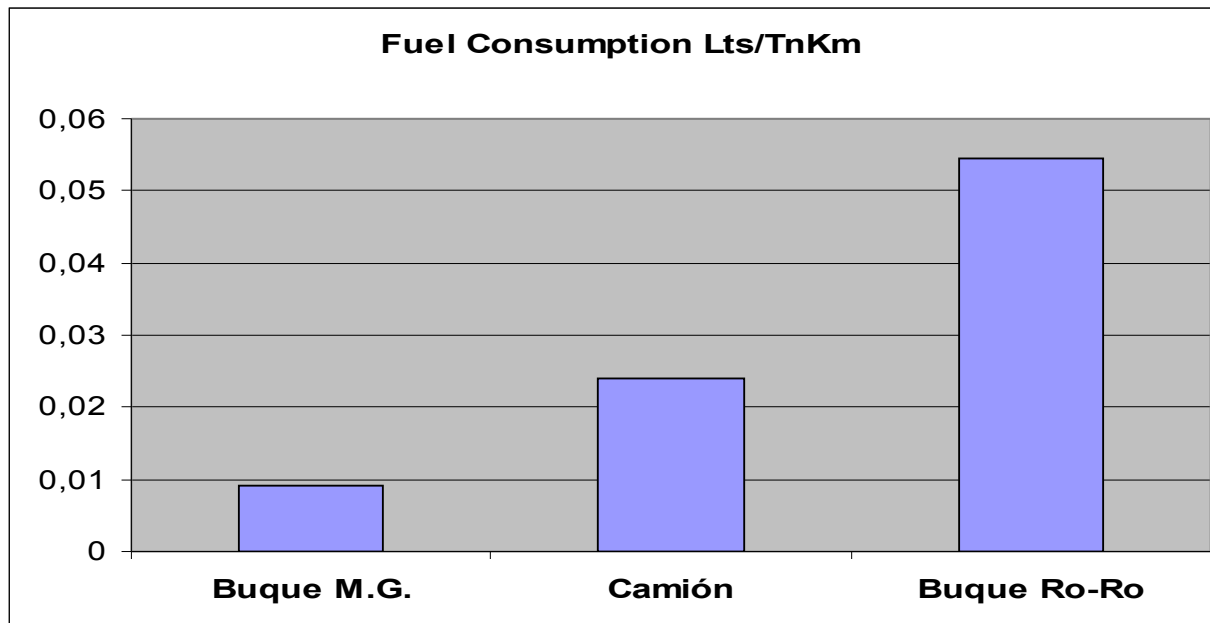
Marco Polo II			INFRAS 2004		
Savings per year Mlll €	Platforms/year	Saving per platform (€)	Savings per year Mlll €	Platforms/year	Saving per platform (€)
29,26	65.000	450	67,13	65.000	1033

2.- Economic and Financial Study

2.2.-Evaluation of External Costs

Consumption of Fuel Road Mode – Maritime Mode

It has been deemed appropriated to analyze the fuel consumption of both modes of transport, because, even if the **maritime transport is in general more efficient energetically than road transport**, this is not so for Ro-Ro transport in particular, as shown below.



3.- End Results

▪ Demand

The demand of traffic seizable by a Motorway of the Sea between the Port of Castellón and the Port of de Marina di Carrara and its foreseen evolution, worked on the traffic by road between the zones studied herein is as follows:

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Traffic m.T.	833	902	945	984	1.024	1.083	1.127	1.173	1.220	1.267	1.316	1.368	1.421

Years	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Traffic m.T.	1.458	1.497	1.536	1.577	1.618	1.661	1.705	1.751	1.797	1.845

▪ Supply

A **new service of transport** is proposed based in a **high quality Motorway of the Sea** with the following features:

- Typology of the service, **Ro-Ro not accompanied**
- Frequency **6 departures per week** (9 since the 7th. Year of service of the route)
- **2 ships** (inclusion of a 3rd since the 7th year of service of the route)

3.- End Results

- Main particulars of the ships: 142 mts of length, 13.000 GT, 22,5 knots of average speed, capacity for 135 platforms
- **Charter fee 625 €**
- **300 round trips** yearly (2 ships), 450 round trips yearly (3 ships)
- Yearly capacity of the route of **1.296 thousand of tones, 81 thousand** of platforms (2 ships), 1.944 thousand of tones,
- 122 thousand platforms (3 ships).

Economic and Financial Feasibility

A **project** of 20 years length has been considered, with the incomes, expenses and investments necessary to develop the service of the **Motorway of the Sea** proposed, obtaining a **IRR of 10 %** and a **NVP of 18,3 million of €**, concluding that the **project is feasible economically** without the help of public aids.

Nevertheless, the public aids can contribute, in the launching stage, to fill any gap existing between the theoretical forecasts and the market reality.