

INTERMED

**AUTORITAT PORTUARIA DE BARCELONA
AUTORITA PORTUALE DI GENOVA
PORT AUTONOME DE MARSEILLE**

**FEASIBILITY STUDY OF A RO-RO LINE
FOR CHEMICAL PRODUCTS**

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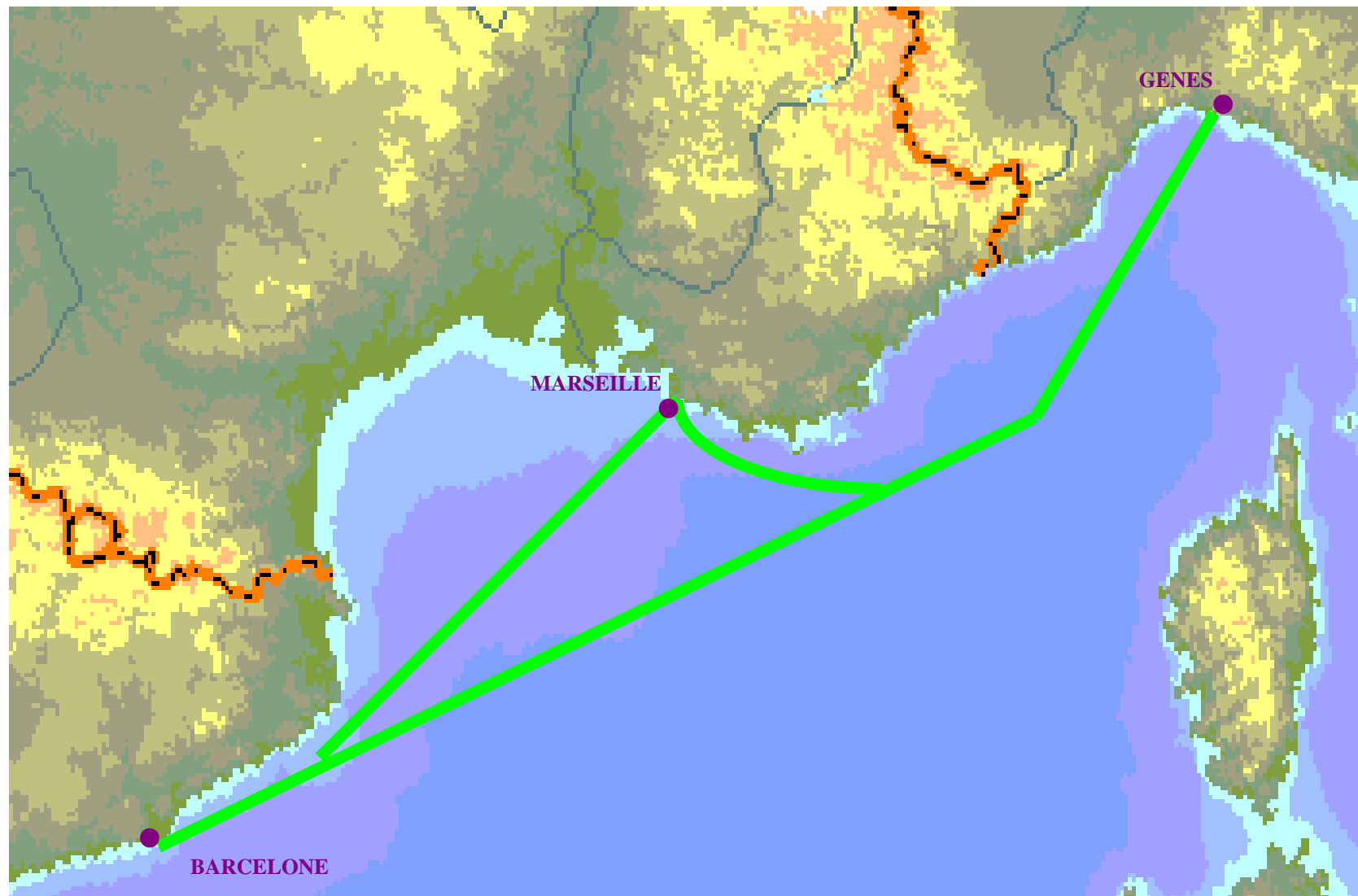
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1. INTRODUCTION

Founded in 1998, INTERMED is the result of a long-standing commitment to increase the competitiveness of the principal ports of the North-Western Mediterranean (MEDNOC).

The Ports of Barcelona, Marseilles and Genoa had already worked together in projects of common interest, but they considered that the economic globalisation and its impact on the West Med. trades called for an even closer working relationship.

The purpose of INTERMED is to highlight the potential of the Mediterranean ports both for overseas customers interested in the European and Mediterranean markets, and for intra-Mediterranean short sea transports.

INTERMED achieved in 1999, with the financial support of the European Commission, a *Preliminary study on the feasibility of substituting land transport of chemical products by shortsea shipping*, (INTERMED, October 1999)⁽¹⁾.

It resulted from the survey of existing trades between the hinterlands of the three ports and from a first approach of cargo stakeholders that there were sufficient grounds for entering into a feasibility phase of new maritime links that would be mostly dedicated to chemical products (including dangerous / hazardous products), and would contribute to the transfer of a part of those road flows towards short sea shipping in the Latin Arc zone.

Aiming at the development of a new short sea market amongst the three ports, a phase II study focused on the feasibility of Ro-Ro services only was thus launched by INTERMED in 2001, with the objective of defining INTERMED's common policy for supporting the launching and development of such services.

(1) An abstract of the study may be read on the European Commission site : europa.eu.int/comm/transport/themes/english/sss/index

2. POTENTIAL CARGO FLOWS (UPDATING) OBJECTIVE AND METHODS

The quantities of cargo flows of chemical products identified in the report issued by INTERMED in 1999 (*Preliminary study, INTERMED, October 1999*) were based on somewhat old statistics. One year and a half later, it appeared necessary to update those data and to determine the most recent trends of these movements along the same patterns, i.e.:

- by commodities, under the same classification;
- by region / province of origin and destination;
- in weight tons;
- by mode of transport, with special attention to road transport, i.e. to the target markets for Ro-Ro services.

DATA COLLECTION

The collection of information concerning flows of chemical products in the zone of the study has been again a difficult task, taking into account the different nature of the sources of information, the different years, and the natures of data.

Several Organisations provided useful data, such as CETMO (Centre d'Études des Transports pour la Méditerranée Occidentale), Chamber of Commerce, Industry and Navigation of Barcelona, EUROSTAT, National Customs, and the three ports themselves. There was a loss of data in Italy since ISTAT has ceased to produce the most valuable regional figures they had supplied for the former study.

IDENTIFICATION OF THE MAJOR TRADES

The exercise retained different data bases from the Spanish and French Customs. Its purpose was to recoup the identification of cargo categories over the most recent periods (1998 - 1999), with the inconvenience that all sources are on a Region / Country basis only. These detailed information were purchased from Spanish and French Customs and treated in order to identify those chemicals accounting as the major trades in the zone of study.

Data from the Spanish Department of Customs had to be retreated under the following format:

Y	F: Flux	CS: Custom	PR: Province	C: Country	TARIC	T: Transport	W: Weight (kg)	Tons	Chemical
Year	E: Export I: Import	8: Barcelona 17: Girona 25: Lleida 43: Tarragona 28: Madrid	8: Barcelona 17: Girona 25: Lleida 43: Tarragona 28: Madrid	F: France I: Italy	Customs tariff code	1: Sea 3: Road			Chemical specific name or nature

REMARKS:

- [1] Catalunya: Provinces of Barcelona, Girona, Lleida and Tarragona.
- [2] The province of Madrid was included as many companies have their social address / head offices located in Madrid, which results in several instances in traffics from factories located in Catalunya belonging to these firms counted as traffics from the Province of Madrid to/from France or Italy, and can be identified when the Province of origin / destination is one of the Catalunya provinces.
 The following are only a list of the most significant products.
 All complete tables are in Annex I.

Data from the French Department of Customs had to be retreated under the following format :

IMEX	ANDEC	Indintra	Temo1	PN19	PP08-P0 Origin	Pays Destination	PD01 Department	Dept	Quat-cu	Chemical
1: Import 2: Export	Year	1: intra – european 2: extra – european	1: Sea 2: Rail 3: Road 4: Air	Customs code, nomenclature NST4	1: France	Italy	19: Rhône-Alpes 20: Languedoc-Roussillon 21: PACA	French Depart.	Tons	Chemical specific name or nature

PRESENTATION

In the following tables, the data are first split up according to the modes of transport, natures of goods, regions, provinces or countries according to the available types of information. All are based on the same methodology as for the 1999-study, and adapted to the changes of types of data in order to produce the most operational and complete outlook of the markets.

MARKET EVALUATIONS IN VOYAGES / TRUCKS

Due to the lack of data for Regions (provinces) / Regions (provinces), particularly for Italy, the identification of trades by origin / destination and products were not sufficient for ascertaining the geographical axes of the trades.

Since the assessment of the potential for Ro-Ro services must be made in number of voyages / trucks, and this indicator is not supplied by statistical sources, calculations were made separately from each of the series of bilateral data, with a view to recoup those information and retain the most valuable ones. All are presented in Mini / Maxi figures in order to take into account the various uncertainties, mainly on unit weights, empty returns and technical / commercial conditions of feasibility to transfer from road schemes to shortsea processes.

2.1. FRENCH REGIONS - ITALY

2.1.1. GENERAL TRENDS 1995 - 1997 (CETMO)

The following tables are summarising information concerning the evolutions of export - import trades between France (3 Southern Regions) and Italy for a wide range of products, beyond the core of the chemical industry (N.S.T. Chapters 3, 6, 7 and 8). Based on the previous study figures, they show the progress of the relevant trades.

Table 1. EASTBOUND : Evolution of exports from PACA, Rhône-Alpes and Languedoc-Roussillon to Italy (1995-1997).

NST Nomenclature	1995 (tons)	1997 (tons)
Chapter 3 Oil and oil products	1.301.978	1.315.157
Chapter 6 Ores, building materials, raw materials for chemical industry	530.013	672.258
Chapter 7 Fertilisers	15.256	24.471
Chapter 8 Chemical products	1.275.320	1.378.568
TOTAL	3.122.567	3.390.454
Variation		8,6 %

Table 2. WESTBOUND : Evolution of imports by PACA, Rhône-Alpes and Languedoc-Roussillon from Italy (1995-1997).

NST Nomenclature	1995 (tons)	1997 (tons)
Chapter 3 Oil and oil products	979.282	1.066.921
Chapter 6 Ores, building materials, raw materials for chemical industry	401.411	454.787
Chapter 7 Fertilisers	24.277	27.723
Chapter 8 Chemical products	322.496	403.957
TOTAL	1.727.466	1.953.388
Variation		13,1 %

Export – import trades between the regions of the hinterland of Port of Marseilles and Italy show an established market accounting for more than 5 million tons, but the data concerning the distribution by Italian regions and provinces are no more available, so that the above are only indicative of the weight of the French South-East Regions for the Italian exporters and importers.

2.1.2. MODAL SPLIT 1995 (CETMO)

The following tables are recalling the tonnage distribution by modes of transport in 1995, for the same N.S.T. products.

Table 3. EASTBOUND : Distribution by mode of transport. PACA, Rhône-Alpes and Languedoc-Roussillon exports to Italy.

NST Nomenclature	Sea		Road		Rail	
	tons	%	tons	%	tons	%
Chapter 3 Oil and oil products	1.024.702	79%	65.561	5%	211.715	16%
Chapter 6 Ores, building materials, raw materials for chemical industry	288.228	54%	136.028	26%	105.757	20%
Chapter 7 Fertilisers	0	0%	15.256	100%	0	0%
Chapter 8 Chemical products	323.590	25,4%	858.140	67,3%	93.590	7,3%
TOTAL	1.636.520	52,4 %	1.074.985	34,4 %	411.062	13,2 %

Table 4. WESTBOUND : Distribution by mode of transport. Italy exports to PACA, Rhône-Alpes and Languedoc-Roussillon.

NST Nomenclature	Sea		Road		Rail		Others	
	tons	%	tons	%	tons	%	tons	%
Chapter 3 Oil and oil products	973.937	98,1%	5.345	1,5%	0	0%	0	0,4%
Chapter 6 Ores, building materials, raw materials for chemical industry	14.270	3,6%	385.760	96,1%	1.375	0,3%	6	0%
Chapter 7 Fertilisers	2.629	10,8%	20.122	82,9%	1.526	6,3%	0	0%
Chapter 8 Chemical products	19.092	5,9%	281.544	87,3%	5.080	1,6%	16.780	5,2%
TOTAL	1.009.928	58,5 %	692.771	40,1 %	7.981	0,5 %	16.786	1,0 %

Sea transport is significant for oil products and for solid bulks, but road accounts for the major part of transport of chemical products, determining an important potential volume that could be transferred from road to short sea.

2.1.3. ROAD FLOWS - 1998 - 1999 (French Customs)

These provisional conclusions are developed further with the most recent information concerning the modal flows of Chapter 8 only, with data by commodities for each of the three French Regions.

Tables 5a and b (Rhône-Alpes), 5c and d (PACA) and 5e and f (Languedoc-Roussillon) in Annexes show all details of road mode liftings for each products category.

Table 5. Recapitulatory movements by road - Chapter 8 products (average 1998 - 1999).		<u>Tons</u>	<u>Road share</u>
Westbound : from Italy to	Rhône-Alpes	250 000	+ 98 %
	PACA	80 000	+ 65 %
	Languedoc-Roussillon	18 000	96 %
	TOTAL	348 000	
Eastbound : from	Rhône-Alpes to Italy	350 000	+ 85 %
	PACA	580 000	58 / 70 %
	Languedoc-Roussillon	14 000	100 %
	TOTAL	944 000	

2.1.4. MARKET ESTIMATES IN VOYAGES / TRUCKS

Table 6. Eastbound		Min.	Max.
All products 3 regions (1995) of which Chapter 8		42 000 34 000	54 000 46 000
Chapter 8 (1998 - 99)	Rhône-Alpes	16 000	20 000
	PACA	<u>24 000</u>	<u>31 000</u>
	All 3 Regions	40 000	52 000

The data are consistent, but the mini / maxi estimates must be reduced in proportion to an assessed number of voyages originating in Rhône-Alpes and moving definitively across the Alps.

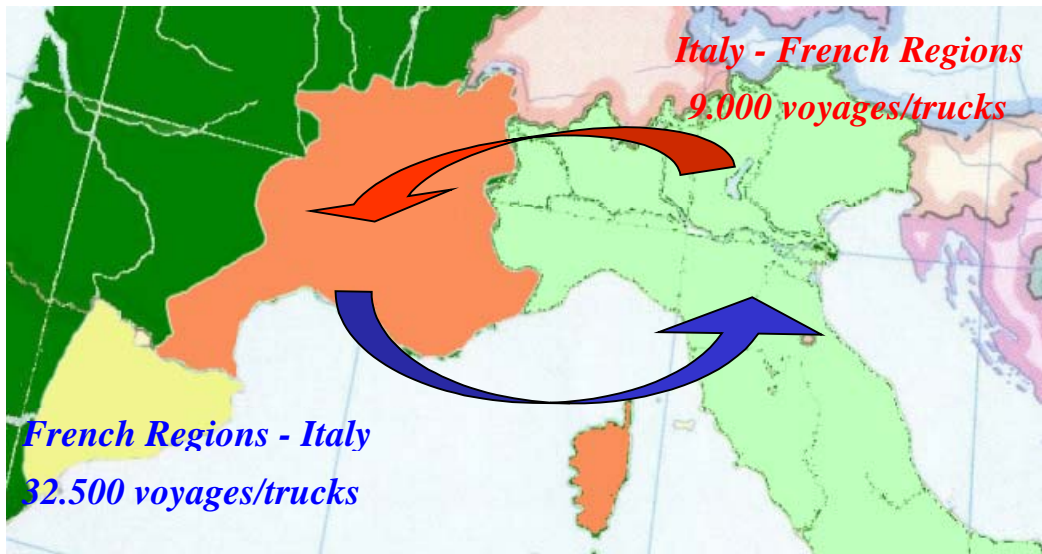
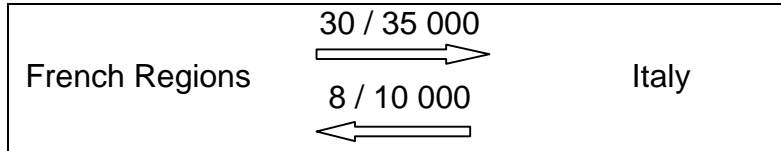
A minimum average total of 30 000 / 35 000 voyages per year is a reasonable estimate, with possible additional flows originating from other French regions and transiting via PACA.

Table 7. Westbound		Min.	Max.
All products / 3 regions (1995) of which Chapter 8		28 000 11 000	36 000 15 000
Chapter 8 (1999)	Rhône-Alpes	11 000	14 000
	PACA	<u>3 000</u>	<u>4 000</u>
	All 3 Regions	15 000	19 000

The data are consistent, but the mini / maxi estimates must be reduced in proportion to an assessed number of voyages destined to Rhône-Alpes and moving definitively across the Alps.

A minimum average total of 8 000 / 10 000 voyages per year is a reasonable estimate, with possible additional flows destined to other French regions and transiting via PACA.

Recapitulatory data (min. voyage trucks)



2.1.5. MAJOR TRADES

WESTBOUND

Plastic materials
Basis raw products

EASTBOUND

Raw plastic materials
Basis products

The market is particularly depending on plastic materials, with PACA-Italy accounting for more than 350.000 tons and Rhône-Alpes - Italy for 300.000 tons, while Languedoc-Roussillon is generating minor volumes only. Fertilizers may also be considered as a significant potential.

Movements of oil products, though instable, could be added to these volumes, as could also some flows originating from / destined to Western Regions in France (Midi-Pyrénées...) and Eastern Countries.

2.2. CATALUNYA - FRANCE / FRENCH REGIONS

2.2.1. GENERAL TRENDS 1995 - 1997 (CETMO)

The following tables are summarising information concerning the evolutions of export - import trades between Catalunya and France (Country + 3 Southern Regions), for a range of products beyond the core of the Chemical industry (NST Chapter 3, 6, 7 and 8). Based on the previous study figures, they show the progress of the relevant trades.

Table 8. EASTBOUND : Evolution of exports from Catalunya to France (1995-1997).

NST Nomenclature	1995 (tons)	1997 (tons)
Chapter 3 Oil and oil products	79.473	111.657
Chapter 6 Ores, building materials, raw materials for chemical industry	223.169	386.682
Chapter 7 Fertilisers	401.732	543.485
Chapter 8 Chemical products	327.488	473.807
TOTAL	1.031.862	1.515.631
Variation		46,9%

Table 9. WESTBOUND : Last available data on exports from PACA and Rhône-Alpes to Catalunya, (1995) ⁽¹⁾.

NST Nomenclature	1995 (tons)
Chapter 3 Oil and oil products	208.949
Chapter 6 Ores, building materials, raw materials for chemical industry	20.271
Chapter 7 Fertilisers	34
Chapter 8 Chemical products	255.672

The first INTERMED study pointed out that 10,5% of Catalonian exportations of chemical products to France were destined to PACA or Rhône-Alpes. Based on this figure, a market accounting for more than 650.000 tons is identified in Catalunya – PACA and Rhône-Alpes trades.

⁽¹⁾ No data available for subsequent years.

2.2.2. MODAL SPLIT 1995 (CETMO)

The following tables are recalling the tonnages distribution by modes of transport in 1995, for the same N.S.T. products.

Table 10. WESTBOUND : Distribution by mode of transport. PACA and Rhône-Alpes exports to Catalunya.

NST Nomenclature	Sea		Road		Rail	
	tons	%	tons	%	tons	%
Chapter 3 Oil and oil products	198.501	95%	10.448	5%	0	0%
Chapter 6 Ores, building materials, raw materials for chemical industry	4.870	24%	15.401	76%	0	0%
Chapter 7 Fertilisers	0	0%	34	100%	0	0%
Chapter 8 Chemical products	52.938	21%	199.424	78%	3.310	1%
TOTAL	256.309	53 %	225.307	46 %	3.310	1 %

Table 11. EASTBOUND : Distribution by mode of transport. Catalunya exports to PACA and Rhône-Alpes.

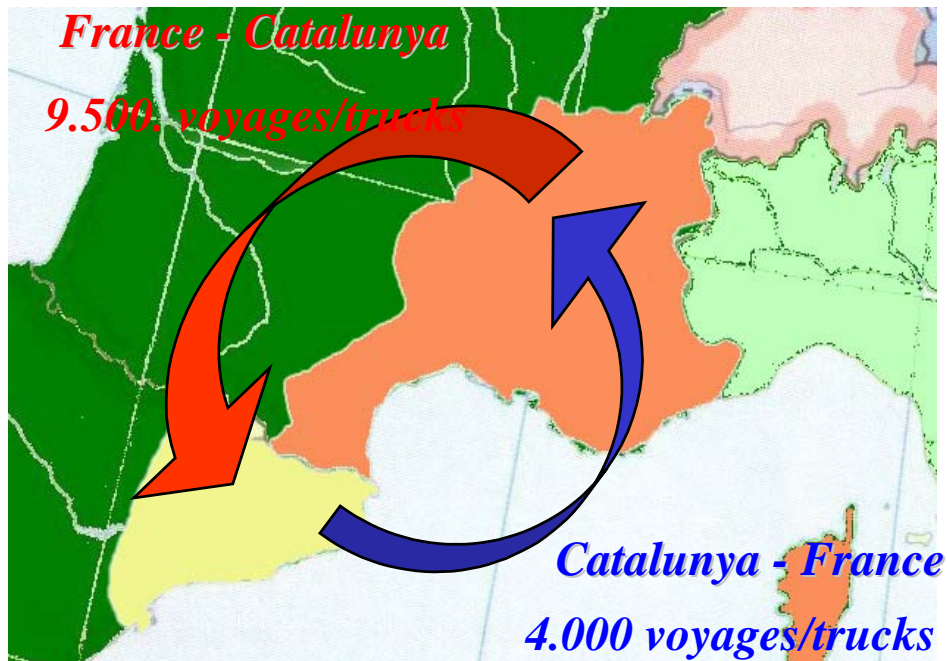
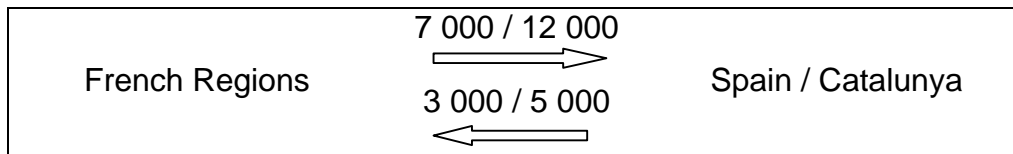
NST Nomenclature	Sea		Road		Rail	
	tons	%	tons	%	tons	%
Chapter 3 Oil and oil products	908	22,5%	3.127	77,5%	0	0%
Chapter 6 Ores, building materials, raw materials for chemical industry	0	0%	30.069	100%	0	0%
Chapter 7 Fertilisers	211	3%	6.604	97%	0	0%
Chapter 8 Chemical products	4.006	6,25%	59.220	92,5%	796	1,25%
TOTAL	5.125	5 %	99.020	94 %	796	1 %

Sea transport is noticeable for oil products only, whereas road transport accounts for the major part of transport of chemical products, determining an important potential volume of goods that could be transferred from road to a short sea alternative.

Table 14. Eastbound		Min.	Max.
All products / 3 regions (1995) of which Chapter 8		4 000 2 500	5 000 3 000
Chapter 8 (1999)	Rhône-Alpes	5 500	6 500
	PACA	<u>3 000</u>	<u>3 700</u>
	All 3 Regions	9 500	12 500

The data are suffering from the same lack of consistency as above.

Those statistical uncertainties should not prevent from the start to retain those flows from potentially moving via Marseilles-Barcelona, but they oblige to be very cautious in the estimates, which would represent the following minima (in number of trucks).



2.2.5. MAJOR TRADES

EASTBOUND

Hydroxide Sodium
 Hydroxide Calcium
 Hydrochlorites, chlorites
 Potassium chlorides
 Organic surface-active products
 Other large volumes : salts, petroleum, bitumen

WESTBOUND

Plastic materials : polyethylene, polypropylene, styrene
 Polymers, polyvinyl chloride

The market is fragmented between plastic materials and other chemicals, specially in some products specifically produced in Catalunya and exported to France (country). The following summarizes the main chemicals and volumes exchanged.

Table 15 <i>France to Catalunya</i>		<i>Catalunya to France</i>	
<i>Chemical</i>	<i>Tons (1999)</i>	<i>Chemical</i>	<i>Tons (1999)</i>
Polyvinyl chloride	38.000	Hydroxides	55.000
Polyethylene		Organic surface-active agents, washing and cleaning preparations	45.000
Anhydrous ammonia	25.000	Hypochlorites	20.000
Polypropylene	20.000	Ammonium sulphate	6.000
Organic surface-active agents	20.000		
Polymers of styrene	15.000		
Dimethyl terephthalate	9.000		
Ammonium nitrate	9.000		
Fertilizers, nitrogenous	8.000		
Triethanol amine	5.000		
Polyethylene terephthalate	5.000		

2.3. CATALUNYA - ITALY

2.3.1. GENERAL TRENDS 1995 - 1997 (CETMO)

The following tables are summarising information concerning the evolutions of export - import trades between Catalunya and Italy for a wide range of products, beyond the core of the Chemical industry (N.S.T. Chapters 3, 6, 7 and 8). Based on the previous study, they show the progress of the relevant trades.

Table 16. EASTBOUND : Evolution of exports from Catalunya to Italy (1995-1997).

NST Nomenclature	1995 (tons)	1997 (tons)
Chapter 3 Oil and oil products	274.587	167.097
Chapter 6 Ores, building materials, raw materials for chemical industry	27.662	37.565
Chapter 7 Fertilisers	70.085	60.695
Chapter 8 Chemical products	320.249	380.158
TOTAL	692.583	645.515
Variation		- 6,8 %

Table 17. WESTBOUND : Evolution of imports by Catalunya from Italy (1995-1997).

NST Nomenclature	1995 (tons)	1997 (tons)
Chapter 3 Oil and oil products	754.884	1.086.816
Chapter 6 Ores, building materials, raw materials for chemical industry	21.437	37.300
Chapter 7 Fertilisers	15.087	7.746
Chapter 8 Chemical products	271.489	394.933
TOTAL	1.062.897	1.526.795
Variation		43,6 %

Export – import trades between Catalunya and Italy show an established market accounting for more than 2 million tons, but the data concerning the distribution by Italian regions and provinces are no more available, so that the above is only an indication of the weight of Catalunya for the Italian exporters and importers.

Eastbound movements were the only ones in the scope of the study that decreased between 1995 and 1997, but this was the result of variations on the oil / products market.

2.3.2. MODAL SPLIT 1995 (CETMO)

The following tables are recalling the distribution by modes of transport in 1995, for the same N.S.T. products.

Table 18. EASTBOUND : Distribution by mode of transport. Catalunya exports to Italy.

NST Nomenclature	Sea		Road	
	tons	%	tons	%
Chapter 3 Oil and oil products	272.664	99,3%	1.923	0,7%
Chapter 6 Ores, building materials, raw materials for chemical industry	0	0%	27.662	100%
Chapter 7 Fertilisers	49.904	71,3%	20.181	28,7%
Chapter 8 Chemical products	6.005	1,9%	314.244	98,1%
TOTAL	328 573	47,4 %	364 010	52,6 %

Table 19. WESTBOUND : Distribution by mode of transport. Italy exports to Catalunya.

NST Nomenclature	Sea		Road		Rail	
	tons	%	tons	%	tons	%
Chapter 3 Oil and oil products	753.374	99,8%	1.510	0,2%	0	0%
Chapter 6 Ores, building materials, raw materials for chemical industry	19	0,1%	21.418	99,9%	0	0%
Chapter 7 Fertilisers	2.905	19,3%	12.182	80,7%	0	0%
Chapter 8 Chemical products	78.527	28,9%	192.485	70,9%	477	0,2%
TOTAL	834.825	78,6 %	227.595	21,4 %	477	0 %

Although sea transport is significant for oil products and fertilisers, road transport accounts for the major part of traffic of all other products, determining an important potential volume that could be transferred from road to a short sea alternative.

2.3.3. ROAD FLOWS - 1998 - 1999
Chapter 8 - 1999

These provisional conclusions are developed further with the most recent information concerning the modal flows of Chapter 8 only, with data by commodities.

Tables 19 a and b in Annexes show all details of road mode liftings for each product category in 1999.

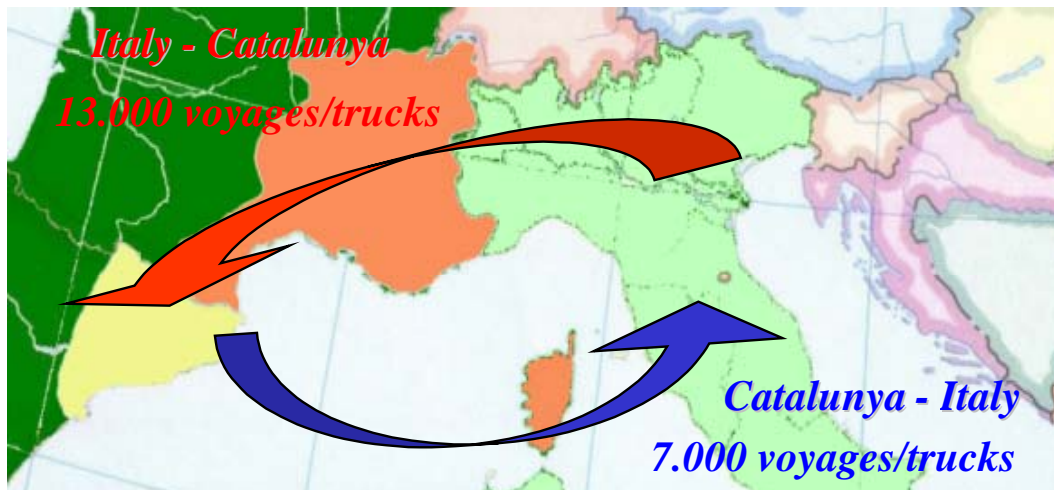
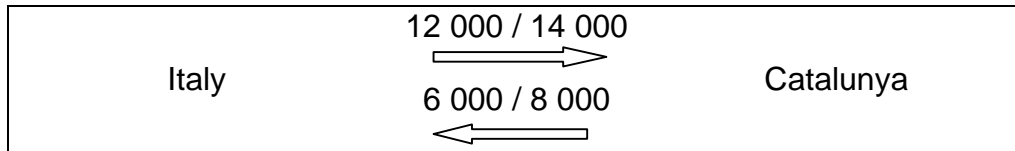
Table 20. Recapitulatory movements by road - Chapter 8 products (average 1998 - 1999)		
EASTBOUND	Catalunya to Italy	327 000 tons
WESTBOUND	Italy to Catalunya	170 000 tons

2.3.4. MARKET ESTIMATES IN VOYAGES / TRUCKS

Table 21.	Eastbound	Min.	Max.
All products (1995)		15 000	19 000
of which Chapter 8		13 000	16 500
Chapter 8 (1999)		13 000	17 000
	Westbound		
All products (1995)		9 000	12 000
of which Chapter 8		8 000	10 000
Chapter 8 (1999)		7 000	9 000

The figures are consistent, with stable figures Eastbound and a decrease Westbound. Besides, the market is properly assessed since the whole road trade is moving on the Italy - Spain motorways through France. The a/m data are thus certainly a fair minimum assessment considering that other Spanish regions may be involved, but that on the contrary part of these might be movements between the hinterlands of ports South of both Genoa and Barcelona.

Recapitulatory data (min. trucks)



2.3.5. MAJOR TRADES

EASTBOUND

Plastic materials
 Organic surface agents

WESTBOUND

Polyvinyl chloride
 Polyethylene and polypropylene
 Styrene polymers
 Polyethylene terephthalate
 Acrylic polymers and polyesters
 Plastic materials

The market is strongly dominated by plastic materials, although organic surface agents account for an important share of the exchanged volume. The following summarizes the main chemicals and volumes exchanged.

Table 22. <i>Catalunya to Italy</i>		<i>Italy to Catalunya</i>	
<i>Chemical</i>	<i>Tons (1999)</i>	<i>Chemical</i>	<i>Tons (1999)</i>
Polymers of ethylene	80.000	Polyvinyl chloride	22.000
Polypropylene in various forms	55.000	Polypropylene and Polypropylene copolymers	20.000
Polymers of styrene	18.000	Polyesters	18.000
Polyethylene terephthalate	15.000	Polymers of ethylene	17.000
Acrylic polymers	10.000	Polyethylene terephthalate	10.000
Styrene-acrylonitrile SAN	9.000	Polymers of styrene	10.000
Acrylonitrile-butadiene-styrene (ABS)	7.500	Acrylic polymers	8.000
Polyvinyl chloride	7.000	Acrylonitrile-butadiene-styrene (ABS)	4.000
Polyethylene glicols	10.000		
Organic surface-active agents	25.000		

2.4. TOTAL POTENTIAL ALL TRADES

2.4.1. AGGREGATED FIGURES

Considering the reservations made about the value of statistical sources (and particularly the lack of recent regional data for Italy) and the precautions taken for assessing the number of voyages by road, the figures of table 22 may be considered as the lowest estimate of the overall potential market of chemicals-laden trucks / trailers moving annually between the three INTERMED's Ports' hinterland.

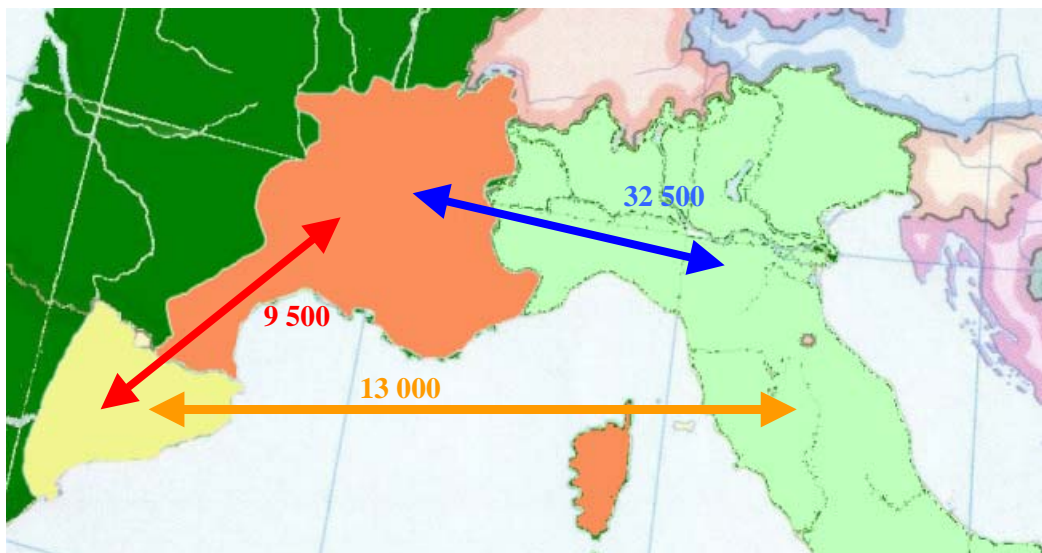
Table 23. TOTAL POTENTIAL TRADE IN VOYAGES / TRUCKS (LOW ESTIMATES)

FROM \ TO	CATALUNYA	FRENCH REGIONS	ITALY	TOTAL
CATALUNYA	-	3 / 5 000 Av. 4 000	6 / 8 000 Av. 7 000	9 / 13 000 Av. 11 000
FRENCH REGIONS	7 / 12 000 Av. 9 500	-	30 / 35 000 Av. 32 500	37 / 47 000 Av. 42 000
ITALY	12 / 14 000 Av. 13 000	8 / 10 000 Av. 9 000	-	20 / 24 000 Av. 22 000
TOTAL	19 / 26 000 Av. 22 500	11 / 15 000 Av. 13 000	36 / 43 000 Av. 39 500	66 / 84 000 Av. 75 000

Notes : • Average based on the min/max estimates
 • Empty returns and/or returns with non-chemical products not counted

Based on these minimum volumes of laden trailers and on the imbalance factor, the overall flows may be accounted for as follows, for each bilateral link (both ways) :

Catalunya – French Régions	9 500
French Regions – Italy	32 500
Italy – Catalunya	13 000
<hr/>	
TOTAL	55 000 x 2 = 110 000



2.4.2. COMMENTS AND FIRST CONCLUSIONS FOR THE FEATURES OF RO-RO SERVICES

- These figures are not fully in line with those of the previous study, which were only expressed in weight tons. The variances observed if translating tons in voyages show a high degree of reliability for the bilateral trades between the hinterlands of Barcelona and Genoa (both ways) and between the hinterlands of Barcelona and Marseilles (both ways). The discrepancies observed on the Genoa / Marseilles trades (both ways) are partly resulting from the exclusion of the "Chapter 6" products, i.e. "ores and raw materials for the chemical industry", which were accounted in the previous study. This way of proceeding was considered as enforcing the reliability of the target potential market, i.e. core industrial products, since most flows of chapter 6 are actually moving on neighbouring cross-border distances, which increases the uncertainty of their shifting potentialities from road to Ro-Ro.

 - The above flows are then focussed on the most actual potentials, and they already show at this first stage the following conclusions for the feasibility of Ro-Ro dedicated services :
 - Heavy imbalances : the in / out ratio is close to 1/2 between Italy and Catalunya and between Catalunya and the French Regions, but it is 1/3 to 1/4 between Italy and the French Regions.
Impacts for Ro-Ro services :
 - loaded and empty loadings,
 - week days with laden trailers and week days with empties
 - one-way movements (for driven-vehicles),
 - option between pure Ro-Ro vessel or Ro-Passengers for drivers

 - Some segments appear to be on the low side, particularly exports from Catalunya. This is the result of the cautious method retained, focussing on Catalunya only, whereas interviews with shippers / receivers showed that the Barcelona (and Tarragona) hinterlands were covering other provinces.
Impacts for Ro-Ro services :
 - smaller trades are more irregular, but their requirements are the same in terms of frequency and quality,
 - smaller trades are requiring consolidation with other cargo volumes (= non-chemicals),
 - identified trades may be enlarged with inland flows, i.e. with longer distances in the door-to-door approach (= adjusted times of departure and arrival, efficiency of port operations...)
-

- The overall volumes may be considered as a significant market as a whole, but it is not when considering that the objective of having Ro-Ro solutions competing with all road haulage cannot lead to a total transfer from the latter mode to the former bi-modal scheme. The bases of new Ro-Ro Lines where there are no such services (Marseilles) must thus be enlarged to other cargo flows, first in terms of commodities, and possibly to broader hinterlands.
-

3. ACTUAL AND POTENTIAL CUSTOMERS' REQUIREMENTS OBJECTIVE AND METHODS

This phase of the study addresses the issue of feasibility in terms of users' needs for Road-Sea solutions vs all Road transports. In comparison with the previous study, the three-party team focussed thus their investigations on the use of Ro-Ro services only, whereas they had a much broader approach in 1999, when they were leaving open choices between all types of technical maritime processes, including bulk and containers.

A series of questionnaires / interviews guides were established and adapted at each national level for actual and potential maritime services users :

- one for the chemical industry as end users: exporters and / or importers/distributors;
- one for the transport services operators : logistics / freight organisers and road hauliers.

The purposes of the questionnaires and interviews were to assess the requirements from Ro-Ro services between the three INTERMED ports, and to go a step further in testing possible features of those services based either on the existing services (Genoa - Barcelona) or on hypotheses (Marseilles - Genoa and Marseilles - Barcelona), for the main following items:

- interest for driven-vehicles or unaccompanied...
- frequency : daily, bi/tri weekly...
- schedule : ETA / ETD, night / day crossing...
- transit-time
- tariff conditions
- quality and safety requirements in ports (handling, parking, reception...) and on board (stowage...)
- intermodal connections
- all others issues related to the competitiveness and quality of road / sea transport schemes against all road solutions.

Predictably, the information and reactions obtained were not of the same nature and quality, with the usual proportion of non-interested or non-available companies, but most could be recouped when interviewing the other parties, either in the counterpart hinterland, or the maritime operators. All opportunities to meet the concerned sectors in collective events were seized at each Regional level. The meetings planned with the three Ports Authorities on commercial issues could not be held.

3.1. LISTS OF COMPANIES

All following Groups and Companies were contacted in the course of the study, either in writing (questionnaires) or in individual or collective (professional bodies) interviews.

The lists may not be exhaustive, and some Companies may not trade within the INTERMED's zone, since several did not reply or said they were not prepared to do so. Nevertheless, it is felt that the largest Companies' position is reflected in the subsequent summary.

Note : In reply to the questionnaire, a few transporters said they were not active in the chemicals transportations, but that the proposed Ro-Ro links could interest them. This information could be useful for the purpose of enlarging the cargo bases in future commercial actions.

3.1.1. ITALY

- CHEMICAL INDUSTRY

AUSIMONT
ATO FINA
DOW
EIGENMANN VERONELLI
ENICHEM
HENKEL
INFINEUM
LONZA COMPOSITES
REPSOL
SHELL
SOLVAY CHIMICA

- TRANSPORT / LOGISTICS COMPANIES

- PROFESSIONAL ORGANISATIONS
FAI – FEDERAZIONE AUTOTRANSPORTATORI
FEDESPEDI – FEDERAZIONE SPEDITOR
 - GROUPS / COMPANIES
AMBRIGIO TRANSPORTI
BERTSCHI
CEMAT
DANZAS
HOYER
HUKTRA
ZUST AMBROSETTI
-

3.1.2. SPAIN

- CHEMICAL INDUSTRY

AISCONDEL
ARAGONES INDUSTRIAS Y ENERGIA
ATO FINA
AVENTIS
BASELL
BASF
BAYER
CATALANA DE POLIMERS
CELANESE CHEMICAL
CLARIANT ESPECIALIDADES QUIMICAS
CRAIGHT VALLEY
DOW CHEMICAL
DSM – RESINS
ERCROS INDUSTRIAL
ERKOL
HENKEL IBFRICA
HISPAVIC
REPSOL
S.A.I. - Q.A
SOLVAY
SYNTHESIA
TRANSFORMANDORA DE ETHYLENE
UQUIFA

- TRANSPORT / LOGISTICS COMPANIES

AMBROGIO
BERTSCHI
BRULL INTER TRANSPORT
CARRERAS
CITESA - TRABUGAS
CONTANK
GEODIS TEISA
GRUPO CARRERAS
HOYER
HUKTRA
TANKISA
T.C.S. TRANS QUITRAN INTERMODAL
TRANSPORTES MARTIN
TRANSPORTES MONFORT
TRANSPORTES PANALON (+ BELDA, TRADILO)
ZOZAYA CISTERNS

3.1.3. FRANCE

- CHEMICAL INDUSTRY

- Professional organisations
ASSOCIATION DES UTILISATEURS DE TRANSPORT DE FRET (AUTF)
UNION DES INDUSTRIES CHIMIQUES (UIC)
- Chemicals group / companies (PACA / Marseilles area)
AIR LIQUIDE
ATO FINA
BASELL (BASF/SHELL)
BAYER
BP CHEMICALS
LYON DELL
ROHM + HAAS
SHELL
SOLVAY

See also : attached lists for regions PACA AND Rhône-Alpes
1999 study (p. 37) : middle – size companies of Rhône-Alpes

- TRANSPORT / LOGISTICS COMPANIES

- Professional organisations
TRANSPORT ET LOGISTIQUE DE FRANCE (TLF)
FEDERATION NATIONALE DES TRANSPORTEURS ROUTIERS (FNTR)
ASSOCIATION FRANÇAISE DES TRANSPORTEURS ROUTIERS INTERNATIONAUX (AFTRI)
UNOSTRA
 - Groups / companies
AMATO
BOURGEY-MONTREUIL
CALBERSON
CHARLES ANDRE
DEBEAUX
GEFCO
HOYER
GIRAUD
GONDRAND
GORLIER
KARL SCHMIDT
LABATUT
NORBERT DENTRESSANGLE
PORTMANN
SAMAT
SCAC
VOS
-

ANNEX TO 3.1.3. CHEMICAL INDUSTRIES / REGION PACA

AGA
AIR LIQUIDE
ALBRIGHT & WILSON
APPRYL
ATOFINA
BERROISE DE RAFFINAGE
BP CHEMICALS
CHIMIOTECHNIC
CMPA
COMHUREX
DU ROURE
DUCLOS CHIMIE
ELF ATOCHEM AGRI
ESSO RAFFINAGE
EXPANSIA
LINDE GAZ INDUSTRIELS
LYONDELL CHIMIE
MONTELL FRANCE
NAPHTACHIMIE
NOVARTIS AGRO
OXOCHIMIE
PAD
PETRONAPHTE
PROVALIS
SANOFI CHIMIE
SHELL CHIMIE
SNPE
SOLVAY
SOPHIM
RHODIA CHIMIE
RHONE ALPES ENGRAIS
TRD
UNI OPAL FRANCE

ANNEX TO 3.1.3. CHEMICAL INDUSTRIES / REGION RHONE ALPES

SIPLAST
AIR LIQUIDE
ATOFINA
AVENTIS
LABORATOIRES CECTAL
SNF FLOERGER
MERCK SCHARP & DOHME CHIBRET
AIR PRODUCST
LINDE GAZ INDUSTRIELS
PROPETROL
CHEMETAL
RHODIA SILICES
GIFRER BVARBEZAT
ELF ANTAR
GIVAUDAN LAVIROTTE
AVENTIS PHARMA
COTELLE
CIBA
RHODIA
VENILLIA
RHODIA CHIMIE
SOLVAY

3.2. LOGISTICS AND TRANSPORTS FEATURES

3.2.1. All trades

Not surprisingly, shippers' perception of the option between road transport and sea-road transport were different according to their cargo volumes, logistic processes, location, etc.

Most chemical exporters and importers generating cargo flows between sites located in the hinterlands of Genoa and Barcelona were already aware of the actual possibilities to use the Ro-Ro option (and not only between these two ports in Spain and Italy), whereas those moving cargoes with the hinterland of Marseilles have no experience of a concrete maritime supply for the time being (with the exception of the very brief experience between Toulon and Leghorn).

This explains why interviews led to differences of appreciations for each bilateral actual and potential maritime link.

All chemical industry firms selected and interviewed are actual exporters at least on one bilateral trade, though not necessarily between the Regions, but their flows are moving by road through these areas (PACA or Catalunya). Distributors/importing firms are less representative of the market, since it appears that suppliers are more frequently taking charge of the deliveries than their customers counterparts.

Information obtained on the features of cargo flows are confirming the statistical analysis, i.e.:

- Products and volumes
 - solid products: important flows of plastic materials, on all trades, plus some regular basic specialities by axe :
 - liquids: lubricating additives, oil products ;
 - apart from the largest flows of plastic materials and base products, most flows are fragmented with average tonnage frequently ranging from 5 000 tons to 20 000 tons a year per industry, product and region/city of origin or destination, i.e. 10 to 40 trailers per month ;
 - most flows evenly spread over the year, without seasonal disruptions.
 - Transport packing and modes (road transport)
 - bulk techniques used for both liquid and solid products, in tanks and semi-trailers ;
 - pallets (Euro-dimensions) used for packed products (drums and cardboards) ;
-

- intermodal rail-road schemes are used for the largest volumes between Italy and France (whole country, mainly North), with rail only limited to a few important flows ;
 - road carriage is the most important technique ;
 - export to Spain are still moving mainly by road, but some companies have started using the maritime services between Genoa and Barcelona, at least for the non-dangerous cargoes, and the other Italy - Spain maritime links ;
 - containers and swapbodies are more experienced on these Southern routes than on the Northern one.
- Other logistics elements
- trailers are commonly loaded every week day or at regular day-intervals ;
 - trips are made during day and night without any other obligation than either the time of departure and/or the time of arrival / delivery at destination, which are either quite regular or specified as "working hours" ;
 - these two features imply that just-in-time deliveries, when put forward, are more based on a sort of limited flexibility than on an accurate punctuality.
- The logistics / road sector
- transport companies involved in the carriage of chemicals are usually large firms in all three countries : most have their own plants or correspondents in the regions they are working with. They are familiar with networking and, when dealing with dangerous cargoes, with regulatory and technical processes.
 - smaller companies are also active on this market, but to a lower extent. In that case, voyages by sea would remain accompanied. Large firm may organise the transport and delivery with different driver, which they are already doing for all-road voyages.
 - the most dangerous cargoes are requiring specialist trained drivers, and this would remain in a Ro-Ro perspective (i.e. : accompanied vehicles).
 - some shippers have initiated with their transport service providers a review of some of their transport schemes, at least for the medium term, and faster for the Italy - Spain trades (changes of equipments).
 - full laden round voyages is the objective of all, but it is difficult to achieve for specialist equipments like tank trailers (e.g. liquid chemical one way / wine the other way).
-

- Costs are said to be quite different by nationality (with Spanish road hauliers reported to be quite economical), by type of organisation (capacity to operate full laden voyages, changes of drivers, management quality...) and prices may be based on full costs (one-way transport) or on variable costs only, with the result that market prices are ranging from 1 to 2 (approx. € 0,50 to € 1,00 / km).
- Road difficulties
- congestion delays and other troubles (strikes, accidents, public works, administrative restrictions...) are spontaneously mentioned by all, either with reference to the recent past and to the current situation, or as a growing concern about the future of road traffic, with risks (and consequences) of possible accidents, restrictions (particularly for the transport of dangerous goods), and a deterioration of punctuality that would further disturb the just-in-time processes.
 - the events that affected road circulation in 1999 - 2001 (accidents of the Mont-Blanc Tunnel and at Menton, strikes and demonstrative blockades, bad weather conditions) have contributed to develop a strong awareness of a need for new modal solutions ;
 - this concern of all parties in Italy, Spain and France is more focussed on the Italy - France road, and to a lower extent on the France - Spain road, where traffic interruptions are said to be due to exceptional circumstances.
- Perception of the new short sea links
- Notwithstanding the Genoa - Barcelona service which is already attracting or at least interesting most of the concerned users (chemical industry and road hauliers), the general concept of completing the triangle between these two ports and Marseilles is commented with reservation or doubts for both legs in view of the short distances (see also views by country below).
 - the usual perception of the positive and negative strengths and weaknesses of maritime transport are not shared by all, except for a general image of long transit times and hindrances resulting from difficulties at ports : lengthy physical operations, complicated administrative process, damage risks (to trailers more than to cargoes)... The main differences in this field between users and operators comes from their practice of maritime transport : those who are familiar with it are more prepared to consider alternative sea-road solutions, and the others are more sceptic or reluctant.
-

3.2.2. SPECIFIC COUNTRY FEATURES

SPAIN

- All producers of the list are actually exporting and importing in the INTERMED area, though not necessarily between the three INTERMED's Ports hinterlands.
- They are commonly referred to as belonging to the Tarragona Industrial Pool or to the Barcelona Industrial Pool. Some are specialists in one specific commodity, and others are covering a wide range of products, in combination with imports.
- There would be a preference for direct links with Tarragona for Companies established in this area, but they generally acknowledge that Barcelona may offer more.
- The annual average of input / output is above 100 000 tons (more than 4 000 trailers) of raw, intermediate and industrial products (non-consumer goods) to all French and Italian regions.
- Road transports are considered as efficient, flexible and low price, but some of the longest land voyages (South Spain / South Italy) are progressively replaced by sea-road between the Southern ports, with trailers (mostly unaccompanied) and other unit loads, whereas the Barcelona - Genoa service is used by both unaccompanied and driven vehicles (with a preference from drivers for the Ro-Ro ferry rather than for the freighter).
- This link is said to be overbooked on certain days, and some transporters who could not load are complaining that they suffered from 24 h delay before the next call or needed to have their vehicle driving all the way between the two countries. Some users have raised the possibility to have the frequency doubling (2 sailings a day).

ITALY

- Exports are more fragmented, with a great number of destinations all over Spain and France, and the major volumes moving to destinations beyond the regions of the study.
 - Suppliers are working either with very few large transport companies and more often with small size road hauliers, which are or would be accompanying their vehicles in a sea-road perspective.
 - Likewise for Spanish shippers as to the Genoa-Barcelona Line, the service is already used or known by Italian shippers, but it seems that they are less active supporters of the Line than their Spanish counterparts, and this was confirmed by the Line operator at the time of interviewing.
-

- As to Marseilles, the stress put by some French shippers on the necessity to have a sea-road alternative to the coastal motorways is weaker among Italian shippers and transporters, since distance is generally considered as too short.
- Some parts of the present and future transport needs could be possibly satisfied by maritime links with Genoa and Barcelona, but there are other requirements for South Italy (Naples – Salerno) and Tarragona, with both Barcelona (this demand being partly met) and Marseilles.

FRANCE

- The positions on shortsea solutions in the INTERMED area have been and are more and more expressed in a collective and public manner : Shippers' Council (AUTF), Union of Chemical industries (U.I.C.) for shippers, and Logistics / Freight Agents / Road haulers (TLF, FNTR, UNOSTRA), at both national and regional levels.
- As a result, individual firms are usually providing comments that are in the same general views, but not always :
 - They confirm the general consensus among exporters and importers, on the interest of alternative sea-road solutions, for the Italian side, with uncertainties about the choice of port(s) to be connected with Marseilles, and doubts about the competitive challenge for the shorter coastal links vs motorways.
 - These feelings are confirmed for Spain, with which cargo flows are less important, more fragmented, and moving with Tarragona more than with Barcelona.
 - The major firms advocate that the Western part of Marseille - Fos is designed for being the natural place of shipment and reception, since it is within the location area of many chemical producers and distributors, as well as of other heavy industries who could aggregate their own flows with chemicals ⁽¹⁾.
- This concern is more focused on the France-Italy roads. Some companies have undertaken an in-depth review of certain transport schemes, at least for the medium term.

(1) This position was stressed at a Meeting held in Marseilles on July 17th, with representatives of the chemical industry, road transporters, shipowners and the Port of Marseilles.

- Organisations and controls of transport operations are not standardised within the industry and regions. In the large scale products, they depend on the firms' global strategies based on the International / European and Mediterranean markets. There are some examples over the recent past of some radical changes of products flows and directions, with important consequences in terms of storage and transport demand, particularly in the petro-chemicals/PVC markets.
- In this context, the growing production capacities of the Marseille-Fos area, added to the Rhône-Alpes outputs and inputs, should generate more movements in the INTERMED zone in the near future, particularly to Italy, and this increases the concern about road congestion.
- Rail transports in the region are generally considered as not satisfactory and offering no reliable alternative to road. There are even situations where shippers are contemplating the possibility to transfer their trade from rail to road or actually did so in recent years.

3.2.3. CONCLUSIONS FOR THE INTERMED'S RO-RO LINKS :

- All shippers are either using or considering favourably the Italy - Spain links, not only between Genoa and Barcelona but also between more Southern ports, and not only with trailers but also with other intermodal unit loads ;
 - There is a general doubt about the practicability of the shorter links with Marseilles, and few shippers are aware of the projects and intentions for this route ;
 - The determining factors are frequency and arrival time (ETA, with shippers mentioning ETD). Price comes next, and it is not the top priority provided their door to door costs are below the all road costs, but it must be all inclusive and stable (no surcharges or likely variations) ;
 - Longer transit-times are not mentioned for the Italy-Spain, but they are perceived as a non-competitive element for France ;
 - The driven / unaccompanied option is generally left to road hauliers ; there is a common feeling that the unaccompanied solution is more competitive due to the driver's additional cost. The existing service is offering capacities, and the potential new ones should retain the possibility to have some also, for some driven vehicles with dangerous products.
-

4. SERVICE PATTERNS

4.1. HYPOTHESES

(See Annex : List of maritime operators interviewed)

- The service between Genoa and Barcelona is considered in this study as the adequate maritime supply for this first link of the three ports, with daily frequencies at fixed ETDs / ETAs. This makes it useless to elaborate a specific service pattern for the Southern leg of the INTERMED Ro-Ro links. This is also justified by the unanimous users' views that the vessels on service are already offering the best operational conditions, with reservations from the Spanish companies who complained about overbooking situations and enquired on the possibilities to have an increased frequency.
 - IMPORTANT NOTE : this choice was made in agreement with INTERMED (Marseilles Meeting 6th July). Consequently, the study does not address the feasibility of rotating service patterns, i.e. combinations between the three ports. The different statuses of the links (one operating, two intended) make it necessary for INTERMED to develop this directly with the maritime Companies.
 - The two other legs may be established according to various schemes, depending on :
 - Frequency and times : the majority of shippers / road hauliers would favour daily and early morning arrivals, but some would accept a 2-3 weekly fixed schedule
 - Characteristics of vessels : capacities, with / without passengers, speed... with all corresponding costs elements (daily chartering, bunkers...)
 - In consideration of the number of possibilities, and in order to retain hypotheses that would be as close as possible to shippers' and road hauliers' expectations, the following scenarii were also made with a view to illustrate the schemes and their competitiveness with all road transports. Their purposes are to assist in the assessment of the feasibility.
 - Common hypotheses for all scenarii :
 - Call at Marseilles / West Harbour (Fos / Port-Saint-Louis-du-Rhône).
 - Distances : 170 N.M. Barcelona
 - Capacities : option for driven / unaccompanied trailer (passengers number)
 - two types of vessels either max. 12 drivers or 30 + if waivers obtained from Register / flag country for accepting more drivers and keeping the status of freighters (not passenger ships).
 - depending on market conditions for the number of trailers (linear meters)
-

List of maritime operators
(Interviewed Companies and Agents)

ITALY

G.N.V. / Grimaldi Group	Genoa – Barcelona and other Med services (+ deep sea)
TARROS	Container / Ro-Ro Med services

SPAIN

VAPORES SUARDIAZ	Ro-Ro services Valencia - Italy and other Med. / Atlantic services
NORDANA LINES	Studying Tarragona / Italy
AG. MARITIMA CONDEMINAS	Agent GNV – Grimaldi Group

FRANCE

CMA - CGM	Deep sea + Med. feeder
Cie MERIDIONALE DE NAVIGATION	Ro-Ro Med. services (Ro-pax)
MARFRET	Ro-Ro / Containers Med. services (+ deep sea)
SNCM	Ro-Ro and Ferries
SUDCARGOS	Ro-Ro / Container Med. services

4.2. SCENARII

SCENARIO A : LOW / MIDDLE

- One single ship for both legs
 - Average speed of Ro-Ros
- Fixed days schedule
 - Two weekly sailings on the larger volume trade (Genoa) and one only on the low volume trade (Barcelona) if a/m schedule not convenient to shippers (but with other inconveniences).
 - Possibility to double frequencies and capacities with two vessels

- PROs : - one vessel only, low speed / low cost
- sufficient time for call / handling at ports
- spare time and speed allowing the recovery of delays at sea
- CONs : - low frequency
- unfitted for driven trucks in both directions

SCENARIO B : HIGH

- Daily frequency / Return voyages in 24 hours
- one vessel for each leg
 - high market targets
 - objectives vessels' speed (assuming fast port operations) :
 - Barcelona 17 - 18 knots +
 - Genoa 22 - 23 knots +
- PROs : - trade covered with two ships only
- one ship (for Barcelona) with standard speed
- spare time / speed or faster ship (Barcelona only, if similar vessels)
- CONs : - night / day trips always in the same directions
- non-substitutable vessels if two different speeds
- high daily cost and bunker consumption for the faster ship (or for both, if substitutable)
- tight port operations
-

SCENARIO C : HIGH

Daily frequency / Early morning arrival at each port

High markets objectives

- two vessels for each leg
- Optional speed depending on accepted ETDs

PROs : - high frequency and regularity

- fixed ETDs / ETAs

- spare time and speed for port operations and delay recovery

CONs : - heavy operational fixed costs

- important risks

4.3. COSTS BASES

4.3.1. Maritime costs - see also Annex List of Ro-Ro chartered

- Vessel costs
 - Those have been obtained from open professional sources and shipbrokers. Daily charter rates are the basis for estimating fixed vessels costs, which may be lower or quite different for operating vessel-owners. They are submitted to a series of variations in market conditions, with a considerable impact on the financial results of the services.
One of the vessel that had been spotted for the study in view of its adaptation to the trade has been quoted at \$ 4 500 in May 2001 against \$ 6 500 mid-2000, while segments of the fleet decreased in the range of – 30 % during the year, and others remained stable due to a strong demand.
 - Dollar vs Euro : The majority of ships, though operated in European / regional seas, are still quoted in \$, which resulted in a + 15% / 20% increase since the introduction of Euro, but some of Ro-Ros have been quoted in € since end 2000.
 - It results from the complete survey achieved for the study of Ro-Ro freighters and Ro-Pax vessels that the range of daily costs is very wide (\$ 6 000 to \$ 15 000 after eliminating exceptional units) depending on many factors : capacities (freight and drivers), speed, oil consumption, age, quality, period of availability etc ... Some technical aspects related to operating facilities (ramp, access to upper deck, door...) may be determining.
The calculation of voyage costs can thus only be made for sample vessels and based on hypotheses (standard vessel type).
 - Bunker costs
 - The consumptions retained are also averages related to the vessel's engine and speed. They cover both fuel oil and diesel oil. This item is also largely affected by the \$ / € rate.
-

ANNEX TO 4.3.1.

RO-RO freighters and Ro-Pax chartered for W. Med.
or similar trades

	YEAR	DWT	L	SPEED	L.M.	PAX	TC/R	REMARK
ALYONA	1981	22 500	205	21	2400	0	\$ 8 000	
ALYSSA	1999	7 500	186	23	2300	325	\$ 22 000	Price reflecting speed, pax-capacity and age
ARIES	1979	6 900	134	15	1220	5	\$ 6 500	
BALTIC-EAGLE	1979	9 450	137	18	1400	12	\$ 6 100	
BRITTA ODEN	1978	8 000	170	15	2200	12	(-) \$ 10 300	Note rate / capacity
CELTIC SUN	1991	5 800	122	20	1140	12	\$ 7 000	
CUPRIA	1977	6 600	142	17.5	1260	8	\$ 6 600	
EUROLANDIA	1976	5 500	127	18.5	1260	92	\$ 7-9 000 ?	Note pax capacity
EVA ODEN	1979	8 800	170	15	2200	12	\$ 11 600	
FINNOAK	1991	6 700	140	16.5	1280	-	\$ 14 900	Specialist : forestry products
GABRIELE WEHR	1978	4 200	141	15.5	1150	12	\$ 6 900	
LEHOLA	1997	5 700	122	17	1140	12	\$ 7 000	
LEILI	1999	5 700	122	17	1140	12	\$ 4 500	\$ 6 500 months
LINDA	1995	11 200	174	19	1960	60	\$ 14 000	in service Genoa-Barcelona
LINDA ROSA	1996	13 500	183	19.5	2030	100	\$ 13 000	Note pax capacity
LYRA	1978	10 700	164	17	1740	12	A 10 500	
NORCLIFF	1995	5 800	125	16	1070	-	\$ 8 900	
NORKING	1980	11 400	171	18.7	2100	12	\$ 15 000	Note rate / capacity
NORQUEEN	1980	11 400	171	18.7	2100	12	\$ 15 000	Note rate / capacity
NOVOROSSIYSK	1994	13 500	170	17.5	2350	-	\$ 8 000	Low rate
PURBECK	1978	2 100	126	15.5	800	56	-	Note rate / capacity
QUITO	1992	12 300	158	14.5	2180	-	\$ 7 800	Low speed
REGAL STAR	1999	7 050	157	17	1740	80	\$ 12 000	Note pax capacity
RODONA	1980	4 550	136	15	1100	6	\$ 7 500	
RORO SARAWAK	1985	9 200	160	15	2200	-	\$ 10 000 +	
ROSEBAY	1976	5 200	136	17	1620	63	\$ 15 000	Note pax capacity
ROXANNE	1976	22 700	206		2400	12	\$ 8 000	
SAPPHIRE	1980	4 500	136	15	1150	12	\$ 7 700	
SEA TRADER	1977	5 300	124	16.5	800	12	\$ 4 000	
SEA HAWK	1975	7 600	138	17	1140	12	\$ 7 200	
SOUTHERN CARRIER	1978	8 000	170	15	2200	12	A 8 900	
STENA CLIPPER	1978	11 000	148	17	1750	12	\$ 12 000	
STENA SHIPPER	1979	8 800	169	18	2050	12	A 11 000	
STENA TENDER	1983	4 400	122	15.5	1250	-	\$ 7 800	
STENA TIMER	1984	4 400	122	15.5	1250	-	\$ 7 800	Down to \$ 6 200 ?
TANGO	1984	6 700	139	15.5	1080	12	\$ 7 300	
THOMAS WEHR	1977	4 300	141	15.5	1150	12	\$ 6 900	
TIDERO STAR	1978	5 500	152	17	1400	12	\$ 7 600	
TOR HAFNIA	1979	8 200	162	16	1560	12	-	
TOR HUMBRIA	1978	14 800	183	18.5	2150	-	A 14 500	
VANS PRINCESS	1978	8 350	121	16	550	6	\$ 5 500	

Notes : - All vessels chartered over the year 2000 for deployment in Mediterranean or similar services.

- T-C : last published rates per day in 2000/2001.

4.3.2. Ports costs (vessel) - see also Annex Detailed bases and calculation

- The three ports' tariffs are complex. They imply several calculations and hypotheses, for Port dues and for all ancillary services, i.e., for each port call :
 - pilotage, with or without reductions e.g. for frequent calls (i.e : Short Sea) or when the sea vessel's captain is allowed to act as a pilot with a special licence;
 - tugs, exceptionally used in bad weather conditions;
 - mooring
 - port dues

The level of all those charges depend on various parameters :

- technical characteristics of vessels and Ro-Ro ships are often penalized in this respect with their high measurement-based tonnage, though they may also be entitled to specific compensatory reductions.
 - cargo unloaded and loaded
 - operating day / hour, with or without additional at night, week-ends ...
- Hypotheses have been made for the three ports for assessing the average complete costs per call when some of those variable parameters are used in tariffs : (volume of cargoes, service frequency etc...). Extra charges have not been retained, and all official discounts have been deducted. All in all, ports costs are presented as approximate lumpsums, to be adjusted case by case.
-

ANNEX TO 4.3.2.

Port costs - Detailed bases and calculation

A - Port dues and service charges

- Bases of Tariffs

Barcelona

Vessel signal Reporting : Tonnage : G.T. / unit
Pilotage : Tonnage : G.T. scales
Tugs : Tonnage : G.T. scales / Tug engine (H.P.)
Mooring : Tonnage : G.T. + Duration of call
Reduction : liner services and frequency
Port dues :

Marseilles

Pilotage : Measurement : cbm/unit
Reduction : frequency
Tugs : Length + max beam and draft – lumpsum / tug /
hour
Reduction : yearly turnover
Mooring : Length + max beam and draft
Port dues : Measurement and vessel type + min. draft
Reduction ro-ro ship
Optional reduction : volume of call/type of
vessel, frequency

Genoa

Pilotage : Tonnage : G.T. scale
Reduction ro-ro ship
Tugs : Tonnage : G.T. scale or measurement
(length x beam)scale
Mooring : Tonnage : G.T. scale
Reduction ro-ro ship
Port dues : Tonnage : net T.scale
Reduction ratio cargo/N.R.T.

Most tariffs and dues are subject to additional on Saturdays, Sundays, Holidays, nights and overtime.

• Hypotheses

- selection of standard ro-ro vessels commonly deployed in the West Mediterranean,
- normal working conditions at ports, i.e. : no tugs, all operations performed during working days (no additional),
- pilotage : regular and frequent ro-ro service vessels are not considered to be piloted by licensed Captains (which reduces the level costs of this item). This formula is currently offered to ro-ro services with the islands, and it could be extended with adaptations in favour of ro-ro coastal services,
- port dues calculated as if each vessel was unloading/loading the equivalent of half her capacities in each port,
- weight tonnage per rolling unit : 25 t.
- application of all frequency/volume reductions.

PORT TARIFFS AND REDUCTIONS

	Barcelona	Marseilles	Genoa
Port Dues Tariff basis Rebate basis Reg. Line	Tonnage + time Frequency status	Volume Tonnage / volume Frequency	Tonnage (Net) + Annual lumpsum Ratio W.T. (cargo)/Net Tonnage (vessel)
Pilotage Tariff basis Rebate basis	Tonnage (Gross)	Volume Frequency + Turnover	Tonnage (Gross) / Vessel type Ro-Ro : Tonnage (Gross)
Tugs Tariff basis Rebate basis	Tonnage Tug H/P	L or B or D	Tonnage (Gross) or L x B Ro-Ro : Tonnage (Gross)
Mooring Tariff basis Rebate basis	Tonnage (Gross)	Tonnage (Gross) Turnover	Tonnage (Gross)

- Recapitulation of port costs (€/call)

Pilotage

Vessel capacities (linear meter)	Barcelona	Marseilles	Genoa
1 050	272	1 140	523
1 150	317	1 261	523
1 200	466	1 327	732
1 300	388	1 214	639
1 800	477	1 578	732

Mooring

Vessel capacities (linear meter)	Barcelona	Marseilles	Genoa
1 050	156	731	464
1 150	156	796	464
1 200	307	831	530
1 300	216	831	504
1 800	307	929	530

Port dues(+ VTS)

Vessel capacities (linear meter)	Barcelona	Marseilles	Genoa
1 050	860	443	10
1 150	1 014	495	9
1 200	1 777	532	16
1 300	1 715	312	15
1 800	1 864	736	17

Tugs (not retained in the calculation of simulated voyage costs)

Vessel capacities (linear meter)	Barcelona	Marseilles	Genoa
1 050	1 527	1 515	1 449
1 150	1 527	1 563	1 873
1 200	2 104	1 673	2 623
1 300	2 104	1 673	2 623
1 800	2 311	1 995	2 897

4.3.3. Total fixed costs

The overall operating costs are only presented for the Marseilles - Barcelona and Marseilles - Genoa links. The study excluded any presentation of those calculations for the Barcelona - Genoa existing link.

- The attached list of vessels is not the whole fleet of Ro-Ro and Ro-pax vessels that could be operated for the trades of the study. However they are reflecting the most recent market possibilities as they were chartered in recent periods. Other vessels are commonly operated by their owners on specific trades, and thus presumed to have been unavailable during the same periods.
 - More than half the fleet was delivered in the 70ies and turned over 20 years. Their average standards are :
 - 1200 to 1400 Linear Meters : 80 to 100 trailers
 - 15 to 17 Knots : from 135 to 170 miles (daily return voyages)
to 270 - 340 Miles (one way daily)
 - \$ 6000 to \$ 7000 over the period 2000 - 2001The faster ships (+ 18 Kn.t) being accommodated over the usual 12 passengers, and offering higher capacities, are rare and expensive, generally above \$ 10 000.
 - There is more diversity among the more recent fleet, in terms of capacities, speed and charter rate, with two major types :
 - one similar to the former ones, in the same range of rates, and offering 2000 to 2200 Linear Meters : 135 to 155 trailers
 - 17 to 19 Knots : from 150 to 190 miles (daily return voyages)
to 300 - 380 miles (one way daily)
 - \$ 8 000 to \$ 15 000, with exceptions, (i.e. no fixed reference market) and \$ 12 000 - 15 000 for the Ro-paxes
 - Conclusion :

Unless more opportunities appeared in the future, e.g. with vessels shifting from North Europe to the Mediterranean, or with owned vessels deployed by shipowners at their own economical conditions, two options are corresponding to the type of service to be analysed (leaving aside the Ro-Pax option) :

 - one with the 1970 - freighter at \$ 6 600
 - one with fast freighters at €22 000
-

4.3.4. Handling costs

Investing into this issue was a delicate issue. Ro-Ro tariffs paid by customers are commonly on a quay / terminal - quay / terminal basis, without any separate price / cost element for discharging or loading the trailers or other rolling freight units, but with differentiations for driven / not driven units, laden / empties or other particulars like single / return voyage or additional for specific cargoes (feeders / dangerous).

Maritime operators and handling companies are reluctant to communicate their contractual conditions for obvious reasons of confidentiality, but also because contracts are providing for different situations. The overall gross costs may depend on the conditions of each call (weather, cargo mix, number and type of operations...).

The simplified estimates retained are an average of min/max costs supplied by operators for each port and, in the case of Genoa-Barcelona, officially published by G.N.V. The same has also been recouped and adjusted with data collected in various studies on handling costs.

With the a/m reservations, the average handling costs per rolling unit (lorries and trucks, driven or not) used in the voyage costs are the minima, i.e.

Barcelona : € 80 - 90
Marseilles : € 120 - 160 (Mini West harbour / Max : East harbour)
Genoa : € 70 - 120

and for each bilateral routes :

Barcelona - Marseilles € 200
Marseilles - Genoa € 190
Genoa - Barcelona € 150

4.4. SIMULATED ACCOUNTS

The total and unit costs of each services pattern have been calculated on the above bases, and with the usual reservations due to the choice of average vessels and market conditions.

SCENARIO A

One ship / freighter / limited to 12 passengers (possibly more with waiver)

Two weekly round voyages with Genoa / one with Barcelona

Standard capacity 70 – 80 vehicles / +/- / 1 100 Linear meters

Charter daily € 6 000

Total annual fixed costs :

Vessel	€ 2 190 000
Bunkers	€ 800 000
Port charges	€ 1 400 000
Others (land, overheads)	€ 1 000 000
Total	€ 5 390 000

Vessel maximum capacities :

Weekly 75 vehicles x 2 x 2 with Genoa : 300
 x 2 x 1 with Barcelona :150

Total per annum : 23 400 vehicles

Vessels occupation rates (%)	Fixed cost per unit (€)
100	230
75	345
50	460

Sale prices to be calculated on the above bases, with differentials between Genoa and Barcelona, plus T.H.C.

SCENARIO B

Two ships / freighters / limited to 12 passengers (possibly more with waiver)

Daily return voyages for both links

One vessel as above for Barcelona. Daily RATE €6 600

One fast vessel for Genoa + 2 000 Linear Meters / 150 vehicles. Daily rate €22 000

Total annual fixed costs :

Barcelona

Vessel €2 400 000

Bunkers €1 800 000

Port charges €2 000 000

Sub-total €6 200 000

Genoa

Vessel €8 000 000

Bunkers €3 800 000

Port charges €2 000 000

Sub-total €13 800 000

Others (land, overheads) €1 500 000

Grand Total €21 500 000

Vessels maximum capacities, per annum

Vessel one : 75 vehicles x 2 x 365 = 54 750 vehicles

Vessel two : 150 vehicles x 2 x 365 = 109 500 vehicles

Total : 164 250 vehicles

Vessels occupation rates (%)	Fixed cost per unit (€)
100	131
75	175
50	262

Sale prices to be calculated on the a/m bases, with differentials between Genoa and Barcelona, plus T.H.C.

SCENARIO C

Four ships / freighters / limited to 12 drivers (possibly more with waiver)
 One daily sailing in all directions : 6 days a week
 3 weekly round voyages for each vessel (with possibility of more with Barcelona)
 Vessels as in Scenario A

Total annual fixed costs :

Vessel	€ 9 640 000
Bunkers	€ 1 170 000
Port charges	€ 2 430 000
Others (land, overheads)	€ 1 500 000
Total	€ 14 740 000

Vessel maximum capacities
 Daily 75 vehicles x 2 x 2 = 300
 Total per annum : 94 000

Vessels occupation rates (%)	Fixed cost per unit (€)
100	157
75	226
50	314

Sale prices to be calculated on the a/m bases, with differentials between Genoa and Barcelona, plus T.H.C.

CONCLUSIONS

The low cost / low investment scenario (A) does not provide enough capacities for obtaining low unit costs, unless the vessel is fully occupied.

The two other scenarii (B and C) are mobilising large cash flows on fixed costs, with the result that, if the high market level is reached, unit costs could be much lower.

This is were the operators involved – ports, maritime operators, logistic / road hauliers and shippers – would have to determine themselves : the chemical industry could well provide the base cargo flow for scenario A, but several other trades would have to be aggregated in scenarii B and C.

4.5. TARIFFS VS COSTS

4.5.1. Sea freight and THCs

Sales rates on a f.i.o. bases as defined in 4.4. above must also incorporate T.H.Cs, which are one of the most determining factors of the competitiveness of Ro-Ro (sea - road) transports.

With f.i.o. costs ranging from € 175 to € 325 with a 75 % occupation rate in all three scenarii, and road prices comprised between € 200 and € 400 for both Barcelona-Marseilles and Genoa-Marseilles, the handling costs / THCs appear to be the key factor.

When dealing with this issue, it is also interesting to take into consideration the differences between the actual existing maritime supply between Genoa and Barcelona on one side and the simulated services between the two ports and Marseilles (although the Genoa - Marseilles link may be compared with the experimental Toulon – Livorno).

4.5.2. References from neighbouring routes

A - Genoa – Barcelona

Grandi Navi Veloci's public communications on prices and costs are based on two series of figures, one for port-port tariffs (sea-freight + handling charges) and one for comparative purposes between all-road and sea-road door to door conditions, corresponding to a 13-meter long truck, laden both ways.

Official Tariff	Ptas	€
Laden / Linear Meter	6 500	39
Empty / Linear Meter	4 350	26
T.H.C. (on/off) / Trailer	4 350 ⁽¹⁾	26
Documentation	600	4
Driver (all in)	5 250	32
Second driver	11 350	68
Return Freight + T.H.C. in / out / unit Base for comparative costs	186 000	1 118

(1) Reduced to Pta 2 200 / € 13,22 for driven trucks

Example of compared door to door costs
(Round trips / laden / both ways / one driver)

Milan - Madrid		Ptas	€
All road		570 240	3 427
Sea road	Road	257 400	1 547
	Sea - freight + THC	186 000	1 118
TOTAL		443 400	2 665

The Sea - road / all road cost advantage (- 23 %) is in the same range in other case examples, respectively :

- 25 % Parma / Madrid (3 640 km)
- 23 % Turin / Madrid (3 440 km)
- 21 % Roma / Madrid (4 190 km)

The distance element is determining, with all road return trip between 3 500 and 4 500 kms and sea road voyages based on a constant distance of 1 310 kms (707 miles) for the sea leg and from 1 500 to 2 300 kms for the road.

When recouped with the outcome of interviews, and though this is valid only for the specific Genoa - Barcelona link, it is possible to retain that :

- The costs of sea freight + THCs are corresponding to a road distance of 564 km x 2, i.e. 13 % below the actual distance by motorway between Barcelona and Genoa.
- In term of costs, the competitiveness of sea-road between the close hinterlands of the two ports is not as high as for the longer distances cases : 10 - 13 % only for return laden voyages within distances below 150 kms from each ports.
- The lower tariff granted by the Company for empties may improve significantly this cost advantage.
- The limits of the comparative exercise are laying with :
 - the actual costs and prices of road, which are frequently lower for Spain than in the case examples, depending on the transporters' organisation and own costs.
 - differences between the a/m sea freight, quoted for a short length average type of truck + trailer, would be reduced for the longer types of units used for the carriage of chemicals.
 - the need to take into consideration other commercial aspects with positive or negative impacts on the price-competitiveness, and mainly :
 - negotiated rates and conditions based on quantities, regularity etc.
 - particulars for dangerous cargoes : limited acceptance, freight additional.

B - Leghorn - Toulon

During the short experiences made end 2000 and early 2001 between these two ports, the following tariff elements were made public :

Average return voyage from F 4 500 / F 5 100 / vehicle : € 686 / € 777
 i.e. single trip € 343 / € 389 Terminal / Terminal

Summary of comparisons (single voyage, including THCs)	
Genoa - Barcelona	€ 470 / € 560
Leghorn - Toulon	€ 340 / € 390
Marseilles - Barcelona (at 75 %)	} € 325 / € 515
Marseilles - Genoa	

5. FEATURES OF RO-RO TRANSPORT OF CHEMICAL PRODUCTS

Chemical products are carried out according to the International Maritime Dangerous Code - IMDG Code - that settle down the stowage, segregation on board, and many other parameters concerning the transport of *classified* dangerous goods. For Ro-Ro operators, the main rules to be followed are the stowage requirements and the segregation restrictions. Thereafter, there are the administrative procedural regulations in ports.

Most of the regulations are applying to all types of vessels carrying unit loads, either containerships or Ro-Ros.

5.1 SEGREGATION OF TRANSPORT UNITS INTO RO-RO SHIPS

The products must be segregated on board so as to avoid that an incident in a transport lorry or another transport units could affect a second unit with an increase in the final consequences of the incident / accident.

Segregation rules establish minimum distances between containers or transport units carrying incompatible dangerous goods.

5.1.1 Segregation patterns

The general rules for segregating dangerous cargoes in maritime transport are summarise in the following table.

CLASS	2.1	2.2	2.3	3	4.1	4.2	4.3	5.1	5.2	6.1	6.2	8	9	
Flammable gases	2.1	X	X	X	2	1	2	X	2	2	X	4	1	X
Gases, Non toxic, non flammable	2.2	X	X	X	1	X	1	X	X	1	X	2	X	X
Gases, toxic	2.3	X	X	X	2	X	2	X	X	2	X	2	X	X
Flammable liquids	3	2	1	2	X	X	2	1	2	2	X	3	X	X
Flammable solids	4.1	1	X	X	X	X	1	X	1	2	X	3	1	X
Substances undergoing spontaneous combustion	4.2	2	1	2	2	1	X	1	2	2	1	3	1	X
Substances releasing flammable gases in contact with water	4.3	X	X	X	1	X	1	X	2	2	X	2	1	X
Comburents	5.1	2	X	X	2	1	2	2	X	2	1	3	2	X
Organic peroxides	5.2	2	1	2	2	2	2	2	2	X	1	3	2	X
Toxic substances	6.1	X	X	X	X	X	1	X	1	1	X	1	X	X
Infectious	6.2	4	2	2	3	3	3	2	3	3	1	X	3	X
Corrosives	8	1	X	X	X	1	1	1	2	2	X	3	X	X
Diverse dangerous products	9	X	X	X	X	X	X	X	X	X	X	X	X	X

Note: Class 1 –explosives– and Class 7 –radioactives– haven't been considered.

CODES:

- 1: "at a distance of"
 - 2: "separated from"
 - 3: "separated by a whole compartment or a whole freight hold from"
 - 4: "longitudinally separated by a whole intermediate compartment or a whole intermediate freight hold from"
 - X: segregation, when needed, is indicated in the list of dangerous goods
-




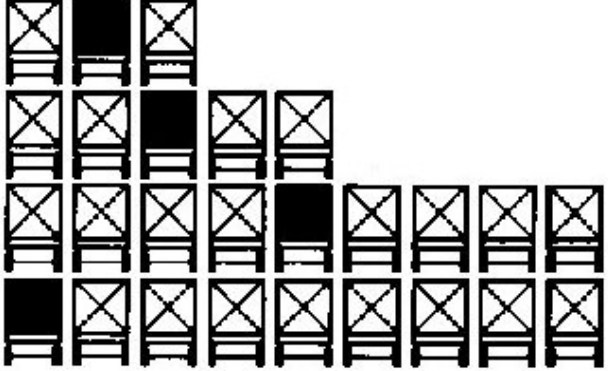
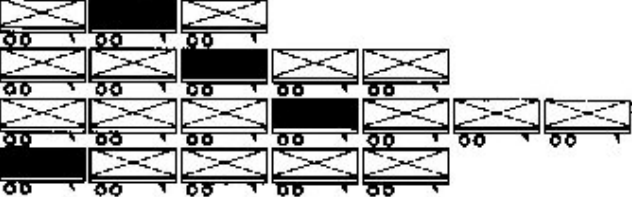
INTERPRETATION OF CODES FOR A RO-RO SHIPS

REQUIRED SEGREGATION	HORIZONTAL						
		CLOSED / CLOSED		CLOSED / OPEN		CLOSED / OPEN	
		ON DECK	BELOW DECK	ON DECK	BELOW DECK	ON DECK	BELOW DECK
"at a distance of"	LONGITUDINAL	no restriction	no restriction	no restriction	no restriction	3 m at least	3 m at least
	TRANSVERSAL	no restriction	no restriction	no restriction	no restriction	3 m at least	3 m at least
"separated from"	LONGITUDINAL	6 m at least	6 m at least or a bulkhead	6 m at least	6 m at least or a bulkhead	6 m at least	12 m at least or a bulkhead
	TRANSVERSAL	3 m at least	3 m at least or a bulkhead	3 m at least	3 m at least or a bulkhead	6 m at least	12 m at least or a bulkhead
"separated by a whole compartment or a whole freight hold from"	LONGITUDINAL	12 m at least	24 at least + deck	24 m at least	24 at least + deck	36 m at least	two decks or two bulkheads
	TRANSVERSAL	12 m at least	24 at least + deck	24 m at least	24 at least + deck	forbidden	forbidden
"longitudinally separated by a whole intermediate compartment or a whole intermediate freight hold from"	LONGITUDINAL	36 m at least	two bulkheads or 36 m + two decks	36 m at least	48 at least including two bulkheads	48 at least	forbidden
	TRANSVERSAL	forbidden	forbidden	forbidden	forbidden	forbidden	forbidden

NOTE: all bulkheads and decks to be fire and liquid resistant.

Where:

UT: Transport unit

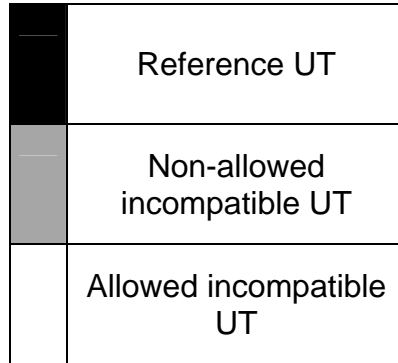
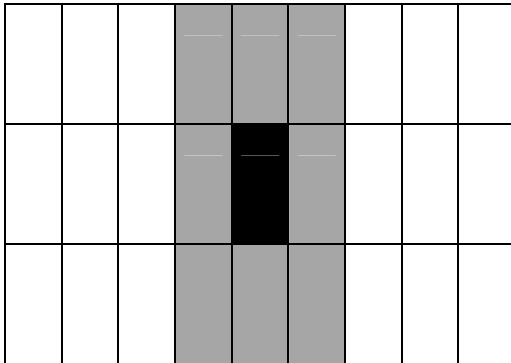
UT of reference 12 m length, 2,5 m width	
Non-allowed incompatible UT	
Allowed incompatible UT	
Transversal distance of:	
Longitudinal distance of:	

Note : Valid for both vertical and horizontal plans (containerships and Ro-Ros)

Examples of segregation rules.

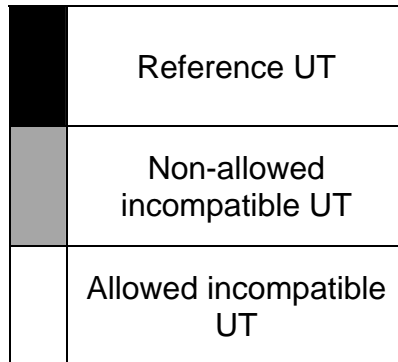
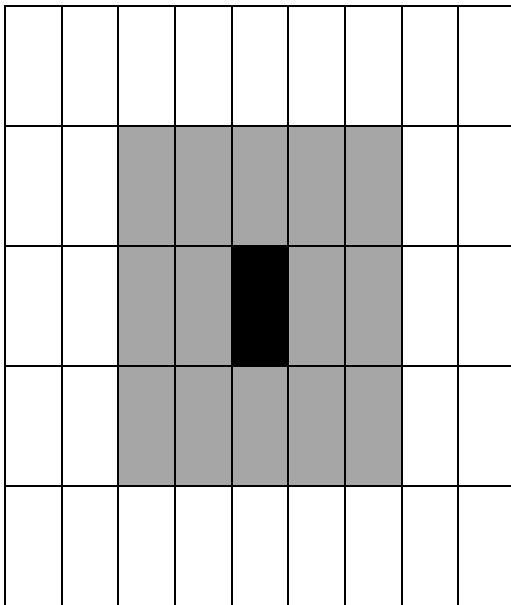
Longitudinal: 3, 6 or 12 m

Transversal: 3 m



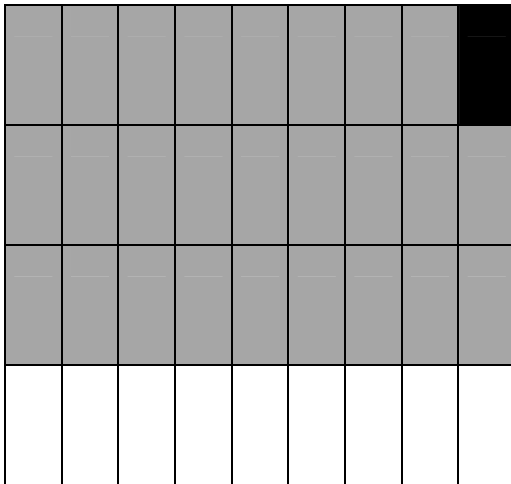
Longitudinal: 12 m

Transversal: 6 m



Longitudinal: 24 m

Transversal: 24 m

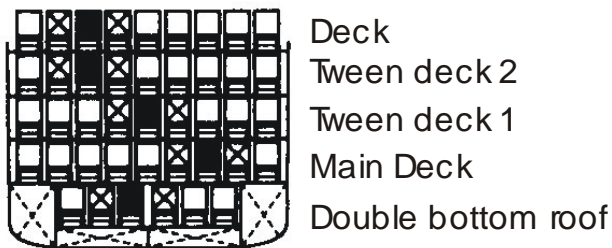


	Reference UT
	Non-allowed incompatible UT
	Allowed incompatible UT

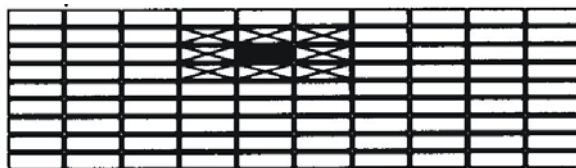
5.1.2 Practical application of segregation rules

"AT A DISTANCE OF"		
OPEN / OPEN	ON DECK	BELOW DECK
LONGITUDINAL	3 m at least	3 m at least
TRANSVERSAL	3 m at least	3 m at least

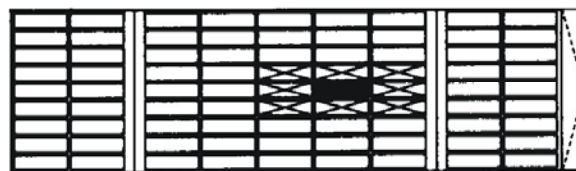
TRANSVERSAL



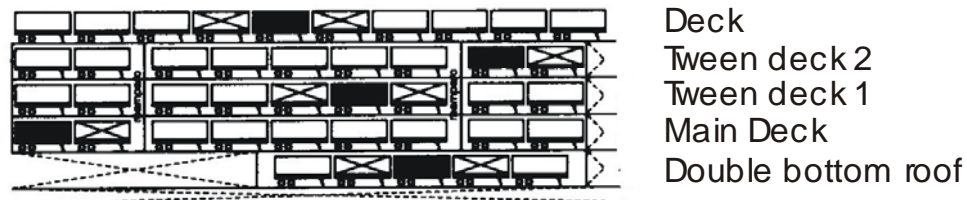
Freight hold



Tween deck 1 below deck

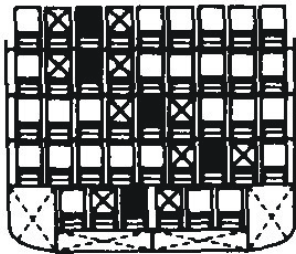


LONGITUDINAL



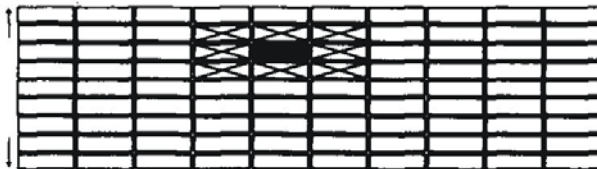
Note : valid for both vertical and horizontal plans (containerships and Ro-Ros)

TRANSVERSAL

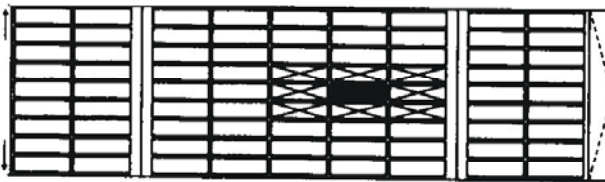


Deck
 Tween deck 2
 Tween deck 1
 Main Deck
 Double bottom roof

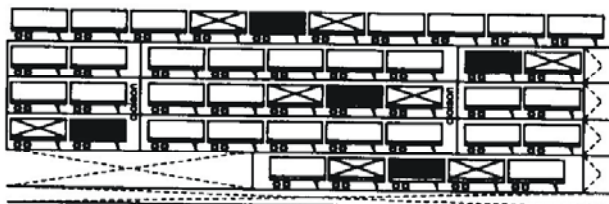
Freight hold



Tween deck 1 below deck



LONGITUDINAL

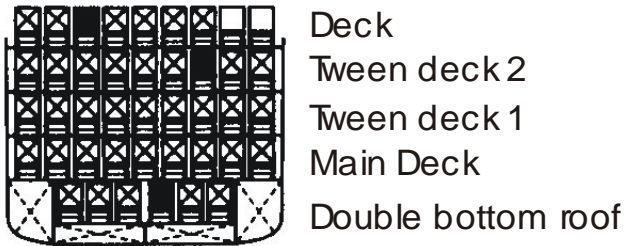


Deck
 Tween deck 2
 Tween deck 1
 Main Deck
 Double bottom roof

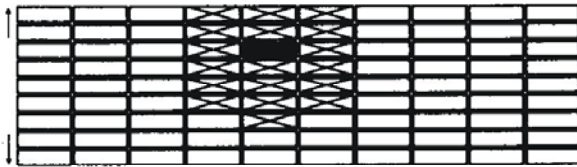
CLOSED / CLOSED OR CLOSED / OPEN	"SEPARATED FROM"	
	ON DECK	BELOW DECK
LONGITUDINAL	6 m at least	6 m at least or a bulkhead
TRANSVERSAL	3 m at least	3 m at least or a bulkhead

"SEPARATED BY A WHOLE COMPARTMENT OR A WHOLE FREIGHT HOLD FROM"		
CLOSED / CLOSED	ON DECK	BELOW DECK
LONGITUDINAL	12 m at least	at least 24 m + deck
TRANSVERSAL	12 m at least	at least 24 m + deck

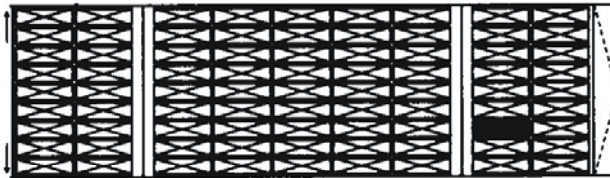
TRANSVERSAL



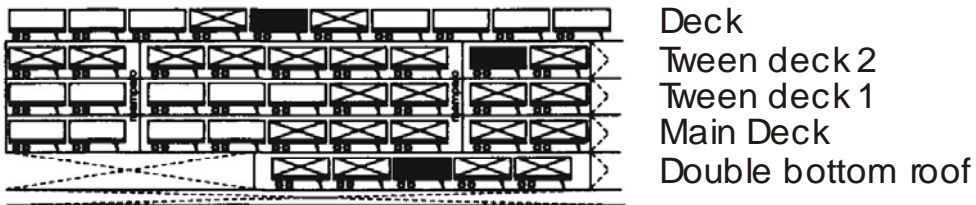
Freight hold



Tween deck 1 below deck



LONGITUDINAL



5.2. STOWAGE OF TRANSPORT UNITS ONBOARD RO-RO SHIPS

(Regulatory and technical rules)

Goods / transport units are properly stowed into the ship in order to reduce the risks of displacements of cargo, leakages, filtrations, etc... during the voyage, according to the nature of the commodities and the vessel type.

Stowage rules establish the feasible locations for goods, on deck or below deck, according to the characteristics of the ship, in particular the authorised number of passengers.

Stowage patterns

<i>STOWAGE CATEGORY</i>	
CATEGORY A	
1. Cargo ships or passenger ships with 25 passengers (max), or a passenger for each 3 m of ship length if it results in a bigger figure	ON DECK OR BELOW DECK
2. Other passenger ships with more passengers than heading 1.	ON DECK OR BELOW DECK
CATEGORY B	
1. Cargo ships or passenger ships with 25 passengers (max), or a passenger for each 3 m of ship length if it results in a bigger figure	ON DECK OR BELOW DECK
2. Other passenger ships with more passengers than heading 1.	ONLY ON DECK
CATEGORY C	
1. Cargo ships or passenger ships with 25 passengers (max), or a passenger for each 3 m of ship length if it results in a bigger figure	ONLY ON DECK
2. Other passenger ships with more passengers than heading 1.	ONLY ON DECK
CATEGORY D	
1. Cargo ships or passenger ships with 25 passengers (max), or a passenger for each 3 m of ship length if it results in a bigger figure	ONLY ON DECK
2. Other passenger ships with more passengers than heading 1.	FORBIDDEN
CATEGORY E	
1. Cargo ships or passenger ships with 25 passengers (max), or a passenger for each 3 m of ship length if it results in a bigger figure	ON DECK OR BELOW DECK
2. Other passenger ships with more passengers than heading 1.	FORBIDDEN

5.3. REQUIREMENTS FOR SPECIFIC CHEMICALS

The following table shows the stowage requirements for some of the chemicals analysed. For each chemical, an in depth analysis is required, as most of them have specific stowage requirements at variance from general rules.

Chemical	UN	IMDG Class	Stowage	Tank features		
				IMO	UN	Disp.
Sodium Hydroxide (solid)	1823	8 (corrosive)	Category A	-	-	-
Sodium Hydroxide (dissolution)	1824	8 (corrosive)	Category A	T3	T7	TP2
Polystyrene Methyl metacrylate	2211	9 (other dangerous products)	Category A	-	-	-
Styrene monomer (stabilized)	2055	3 (flammable liquids)	Category A	T1	T2	TP1
Propylene	1077	2.1 (flammable gases)	Category E	-	T50	-
Acrylonitrile (stabilized)	1093	3 (flammable liquids)	Category E	T10	T14	TP2 TP13
Flammable liquid products for perfumery	1266	3 (flammable liquids)	Category A or B	T1	T2	TP1 TP8
Hypochlorite (dissolution)	1791	8 (corrosive)	Category B	T3	T4	TP2 TP24
Anhydrous ammonia	1005	2.3 (toxic gases)	Category D	-	T50	-
Butadienes (stabilized)	1010	2.1 (flammable gases)	Category B	-	T50	-
Paintings	1263	3 (flammable liquid)	Category A or B	T1	T2 T4	TP1 TP8
Hydrazine (anhydrous)	2029	8 (corrosive)	Category D	-	-	-
Vinyl chloride (stabilized)	1086	2.1 (flammable gases)	Category B	-	T50	-
Flammable resins (dissolution)	1866	3 (flammable liquids)	Category A, B or E	T1	T2 T4 T11	TP1 TP8 TP28
Ethyl acrylate	1917	3 (flammable liquid)	Category B	-	TP4	TP1 TP13
Methyl acrylate	1919	3 (flammable liquid)	Category B	-	TP4	TP1 TP13
Flammable alcohols	1986	3 (flammable liquids)	Category A, B or E	T4	T7 T11	TP1 TP2 TP27 TP28

CODES EXPLANATION

IMO: regulations concerning the transport of IMO (International Maritime Organisation) portable tanks and tank trailers for road transport.

Example:

T50				
UN	Liquefied gases Non-refrigerated	Max. allowable working pressure (bar) Small; Bare, Sunshield, Insulated	Overtures under liquid level	Max. filling density
1005	Anhydrous ammonia	29,0 25,7 22,0 19,7	Allowed	0,53
1032	Anhydrous dimethylamine	7,0 7,0 7,0 7,0	Allowed	0,59

UN: regulations concerning the transport of portable tanks and tank trailers for road transport.

Example:

TP4: the filling degree of portable tanks doesn't exceed 90%, or any other requirement fixed by Competent Authorities.

TP7: Air must be eliminated from vapour room with nitrogen or any other way.

IMO TANKS

5.4. ADMINISTRATIVE PROCEDURES IN PORTS

Some ports have their own well established procedures to deal with the dangerous products delivered, staying and leaving the port.

Port Authorities require the following documentation :

1. MSDS: Material Safety Data Sheet: for goods not already known by the port. Port Authorities have their own databases, so that their information is not required for common products. Forwarding agents must have this available upon request during the port operations. Shipping agencies or forwarders must send MSDS to Terminal operators.

Remarks: MSDS have to be sent nowadays to Terminal operators, but Port Authorities consider that an improvement could be done if the information went from them to the Terminal operator (via intranet, shared database or other solutions).

2. Traffic authorisation for Dangerous Goods: this is sent to Port Authority by the shipping agency. IT contains data on the ship, ETA and ETD, lorry/container data for cargoes arriving by road / rail, with relevant information on the dangerous good: UN number, IMDG type, etc.
3. Declaration of Dangerous Goods: issued by shipper, it contains the commitment that the dangerous goods are accepted for sea transport and have been suitably arranged for the transport.

The Departments of Dangerous Products are managing the Authorisations and issuing acceptances to the shipping agency within a few.

According to shipping agencies, the administrative procedure is well known, but the documentations associated to dangerous cargoes is too burdensome, and those could be improved in order to facilitate port transits.

6. CONCLUSIONS ON FEASIBILITY CONDITIONS

6.1. MARKETS

6.1.1. Customers

- Market size targets are more appropriate than market shares :
Size is adaptable to vessels' capacities, whereas road is partly disputable only by the other transport processes.
 - ➔ target volumes adapted to optimum maritime service patterns, and adequate to the largest potential customer bases
- Chemical trades must be combined with other trades = global approach / all trades and chemicals oriented at the same time
Chemicals markets are significant but not sufficient for ensuring optimum frequency, and may be unstable
 - ➔ No question for Genoa - Barcelona where the established services started without chemicals : but trades must be mixed with passengers' restrictions re-hazardous. The issue to be addressed now is the increase of frequency and capacities
 - ➔ Enlarged freight bases are necessary for launching the other links = canvas other industries trades
 - ➔ Including swapbodies / containers = increase volumes and anticipate on possible future transfers to other freight units
- Actual shippers or logistics transport companies ?
 - ➔ Both, depending on each end user company's own organisation = no single model but mostly close partnerships
End users may influence the modal choice, their logistics transports suppliers are operating it.
 - ➔ Cooperation and possible involvements of leaders from the chemical industry and from the transport sector = commitments possibilities with some large volumes customers
 - ➔ Advantages must be perceived by chemical industry (and others) as well as by road hauliers

6.1.2. Commercial conditions

- Allow comparisons between combined door to door prices and all road transports
 - ➔ All in Port - Port rates, including THCs, without any other item, (possibly except for most hazardous cargoes)
- Sea-Road door-door prices lower than Road
 - ➔ Differentials may be lower than estimated in the previous studies (20 %), but against a high degree of quality / dependability (punctuality)...

- Involvement of shippers and / or their transports services providers
 - ➔ contracts / specifications terms and conditions defining both parties' commitments : services, volumes, quality...
 - ➔ Incentives e.g. volume discounts..., and reciprocal compensations.
 - ➔ New contract terms ?

6.2. SERVICES

FREQUENCY

TRANSIT TIMES

SAILING / ARRIVAL TIME / SCHEDULES

- Genoa - Barcelona :
 - ➔ Satisfactory and optimum for currently growing market (daily crossing)
 - ➔ Improved some quality elements
 - ➔ Prospects for doubled frequency
- Other links : Marseilles - Genoa and Marseilles - Barcelona
Potential customers mostly preferring daily services, but some shippers / road hauliers accepting 2 - 3 weekly sailings
Large majority in favour of night crossings / early morning arrivals
 - ➔ Preferably overnight for driven-trailers, but also for unaccompanied trailers (inland driving facilities)
 - ➔ Determine best option in terms of frequency / schedules, and thus number / speed of vessels (see hereafter)

6.3. VESSELS

6.3.1. Type

- Genoa - Barcelona : alternated Ro-Ro and luxury Ferry / Ro-pax
 - ➔ Chemical laden trailers on freighter only i.e. every even day
- Other links : Pure Ro-Ro freighter or Ro-Pax
 - ➔ Limited pax capacities i.e. : 25 to 30 drivers (vessel under freighter status and not Ro-Pax)

6.3.2. Speed

- Genoa - Barcelona : convenient with schedule and well accepted by the trade
- Other links : options between overnight (1 daily return voyage) or one daily trip (2 days voyage)
options between alternate sailings Marseilles - Genoa / Marseilles-Barcelona or two separate schedules

Unless good vessels opportunities, the combination high speed + drivers' capacities + large garage capacities is the most expensive

- Retain optimal economical solution after a cautious examination with maritime operators
- All services : reliability / respect of time of arrival is a determining advantage vs all road solutions
 - Respect schedules : Vessels must have additional speed potential (weather conditions / time of arrival)

6.3.3. Capacities

- Genoa - Barcelona : some complaints about lack of spaces
 - Study possibilities of better spreading liftings
 - Increase frequency (capacities already high)
- Other links : depending on better assessments of trade potentials
 - Determine best option in combination with choice of vessel's other technicalities (see above : garage / decks / ramps...)
- All services :
 - Vessels capacities to be aligned to the highest demand level / weekday on each route

6.4. PORTS

6.4.1. Costs

- Priority given to handling
- Port dues and services
 - Incentives for launching new services (experimentation)
 - Study possibility to adjust fixed costs at lowest possible level (lumpsum ?) and progressively turn to cost-recovery under variable - cost adjustment schemes (linked with liftings)
 - Pilotage : facilitate Pilots' licences for Vessels' captains of new Shortsea services

6.4.2. Operations and services

- Handling operations and costs : the key issue / an absolute priority
 - Negotiate with terminal operators : guaranties in terms of delays (schedule), working time (shift, night...) and costs
- Coordination of interventions
 - Progress towards "one-stop" or "one-quay" organisational models

6.4.3. particulars by port

- Choice of Terminal / berths : Marseilles = Fos - Port-Saint-Louis du Rhône : close to the chemical industries / depots and open to Ro-Ro experimental operations.
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ANNEXES

**Annex to 2.1.3.
Table 5**

Table 5a. WESTBOUND : Italy fluxes to Rhône-Alpes. Evolution

TARIC Chapter		1998				1999			
		Sea	Rail	Road	Total	Sea	Rail	Road	Total
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.	81	2 726	82 096	84 903	100	2 799	87 087	89 986
30	Pharmaceutical products.	4	-	1 430	1 434	-	-	2 263	2 263
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.	47	5	7 131	7 183	55	16	7 436	7 507
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations.	-	1	285	286	-	-	446	446
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.	-	-	5 715	5 715	-	-	14 581	14 581
38	Miscellaneous chemical products.	55	1 202	27 743	29 000	1 181	99	24 663	25 943
39	Plastic and articles thereof.	163	392	117 727	118 282	285	154	130 174	130 613
	TOTAL BY MODE	350	4 326	242 127	246.803	1 621	3 068	266 650	271.339

**Annex to 2.1.3.
Table 5**

Table 5b. EASTBOUND : Rhône-Alpes fluxes to Italy. Evolution

TARIC Chapter		1998				1999			
		Sea	Rail	Road	Total	Sea	Rail	Road	Total
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.	55	65 268	145 695	211 018	225	59 779	162 244	222 248
29	Organic chemicals.	-	-	-	-	-	-	2	2
30	Pharmaceutical products.	-	-	1 019	1 019	-	-	953	953
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.	-	-	8 272	8 272	14	-	8 659	8 673
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations.	-	-	3 170	3 170	-	-	3 473	3 473
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.	-	-	8 287	8 287	1	-	9 611	9 612
38	Miscellaneous chemical products.	-	-	17 031	17 031	34	29	28 366	28 429
39	Plastic and articles thereof.	12	-	143 761	143 773	32	-	169 151	169 183
	TOTAL BY MODE	67	65 268	327 235	392.570	306	59 808	382 461	442.575

**Annex to 2.1.3.
Table 5**

Table 5c. WESTBOUND : Italy fluxes to PACA

TARIC Chapter		1998				1999			
		Sea	Rail	Road	Total	Sea	Rail	Road	Total
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.	50 380	1 066	38 014	89 460	39 009	319	36 313	75 641
30	Pharmaceutical products.	-	-	348	348	-	-	401	401
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.	16	38	1 878	1 932	28	83	1 675	1 786
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations.	1	2	2 118	2 121	-	1	2 164	2 166
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.	-	-	3 657	3 657	-	-	1 380	1 380
38	Miscellaneous chemical products.	-	-	20 785	20 785	2	-	10 365	10 367
39	Plastic and articles thereof.	806	621	27 323	28 750	373	453	21 699	22 525
	TOTAL BY MODE	51 203	1 727	94 123	147.53	39 413	856	73 997	114.266

**Annex to 2.1.3.
Table 5**

Table 5d. EASTBOUND : PACA fluxes to Italy

TARIC Chapter		1998				1999			
		Sea	Rail	Road	Total	Sea	Rail	Road	Total
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.	315 586	98 986	262 083	676 655	196 136	51 767	230 339	478 242
30	Pharmaceutical products.	-	-	140	140	-	-	182	182
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.	1	-	1 754	1 755	2	-	1 842	1 844
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations.	3	-	1 941	1 944	27	-	2 185	2 212
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.	-	-	3 125	3 125	-	-	1 964	1 964
38	Miscellaneous chemical products.	38	-	23 577	23 615	150	-	20 569	20 719
39	Plastic and articles thereof.	1	5 426	279 008	284 435	1	850	334 474	335 325
	TOTAL BY MODE	315 629	104 412	571 628	991.669	196 316	52 617	591 555	840.488

**Annex to 2.1.3.
 Table 5**

Table 5e. WESTBOUND : Italy fluxes to Languedoc-Roussillon

TARIC Chapter		1998				1999			
		Sea	Rail	Road	Total	Sea	Rail	Road	Total
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.	84	794	7 602	8 480	40	1 845	12 512	14 397
30	Pharmaceutical products.	-	-	2	2	-	-	5	5
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.	47	-	522	569	-	-	850	850
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations.	-	-	53	53	-	-	45	45
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.	-	-	148	148	-	-	475	475
38	Miscellaneous chemical products.	-	-	548	548	-	132	1 118	1 250
39	Plastic and articles thereof.	55	118	7 013	7 186	-	-	7 434	7 434
	TOTAL BY MODE	186	912	15 888	19.686	40	1 977	22 439	24.456

**Annex to 2.1.3.
Table 5**

Table 5f. EASTBOUND : Languedoc-Roussillon fluxes to Italy

TARIC Chapter		1998				1999			
		Sea	Rail	Road	Total	Sea	Rail	Road	Total
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.	8	-	3 513	3 521	-	-	3 635	3 635
30	Pharmaceutical products.	-	-	1	1	-	-	3	3
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.	-	-	745	745	-	-	663	663
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations.	-	-	-	-	-	-	2	2
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.	-	-	102	102	-	-	120	120
38	Miscellaneous chemical products.	-	-	5 069	5 069	-	-	7 875	7 875
39	Plastic and articles thereof.	-	-	2 418	2 418	-	-	3 264	3 264
	TOTAL BY MODE	8	-	11 586	11.856	-	-	15 562	15.562

**Annex to 2.2.3.
Table 12**

Table 12a. EASTBOUND : Spain fluxes to Rhône-Alpes.

TARIC CHAPTER		1998				1999			
		Sea	Rail	Road	Total	Sea	Rail	Road	Total
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.	10	14	45 561	45 585	816	-	65 700	66 516
29	Organic chemicals.	-	-	1	1	-	-	2	2
30	Pharmaceuticals products.	-	-	897	897	-	-	934	934
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.	-	-	1 151	1 151	-	-	1 767	1 767
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations.	-	-	455	455	-	-	908	908
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.	-	-	6 303	6 303	11	-	21 067	21 078
38	Miscellaneous chemical products.	-	-	13 441	13 441	5	-	24 032	24 037
39	Plastics and articles thereof.	88	-	40 966	41054	171	-	39 604	39 775
	TOTAL BY MODE	98	14	108 775	108.887	1 003	-	154 014	155.017

**Annex to 2.2.3.
Table 12**

Table 12b. WESTBOUND : Rhône-Alpes fluxes to Spain.

TARIC CHAPTER		1998				1999			
		Sea	Rail	Road	Total	Sea	Rail	Road	Total
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.	65	3 628	89 247	92 940	211	1 986	133 477	135 674
29	Organic chemicals.	-	-	3	3	-	-	12	12
30	Pharmaceuticals products.	-	-	579	579	-	-	356	356
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.	-	-	4 903	4 903	5	-	6 407	6 412
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations.	-	-	1 216	1 216	1	-	1 495	1 496
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.	-	-	1 461	1 461	-	-	852	852
39	Plastics and articles thereof.	26	-	71 974	72 000	25	-	85 063	85 088
	TOTAL BY MODE	91	3 628	169 383	173.102	242	1 986	227 662	229.890

**Annex to 2.2.3.
 Table 12**

Table 12c. EASTBOUND : Spain fluxes to PACA.

TARIC CHAPTER		1998				1999			
		Sea	Rail	Road	Total	Sea	Rail	Road	Total
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.	17 242	26	42 538	59 626	7 911	1	39 662	47 574
30	Pharmaceuticals products.	-	-	211	211	-	-	184	184
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.	5	-	254	259	1	-	202	203
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations.	1	3	532	536	2	-	593	595
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.	-	-	1 338	1 338	-	-	1 181	1 181
38	Miscellaneous chemical products.	13 076	-	9 661	22 737	5 722	3	15 894	21 619
39	Plastics and articles thereof.	1 262	526	25 711	27 499	232	-	6 821	7 053
	TOTAL BY MODE	31 586	555	80 065	112.206	13 868	4	64 537	78.409

**Annex to 2.2.3.
Table 12**

Table 12d. WESTBOUND : PACA fluxes to Spain.

TARIC CHAPTER		1998				1999			
		Sea	Rail	Road	Total	Sea	Rail	Road	Total
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.	253 680	526	151 468	405 674	251 331	500	151 640	403 471
30	Pharmaceuticals products.	-	-	319	319	-	-	322	322
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.	2	-	2509	2511	-	-	2270	2270
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations.	17	-	1711	1728	10	-	1609	1619
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.	-	-	20 263	20 263	-	-	21 501	21 501
38	Miscellaneous chemical products.	10 173	-	27 230	37 403	15 456	-	26 146	41 602
39	Plastics and articles thereof.	833	-	106 997	107 830	502	-	96 542	97 044
	TOTAL BY MODE	264 705	526	310 497	575.728	267 299	500	300 030	567.829

**Annex to 2.2.3.
 Table 12**

Table 12e. EASTBOUND : Spain fluxes to Languedoc-Roussillon.

TARIC CHAPTER		1998				1999			
		Sea	Rail	Road	Total	Sea	Rail	Road	Total
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.	40 274	-	25 641	65 915	41 286	25	16 518	57 829
30	Pharmaceuticals products.	5	-	13	18	-	-	13	13
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.	151	-	666	817	58	-	782	840
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations.	14	-	29	43	17	-	17	34
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.	-	-	542	542	-	-	775	775
38	Miscellaneous chemical products.	-	-	4 085	4 085	-	-	3 939	3 939
39	Plastics and articles thereof.	44	-	8 792	8 836	22	-	8 577	8 599
	TOTAL BY MODE	40 488	-	39 768	80.256	41 383	25	30 621	72.029

Annex to 2.2.3.
Table 12

Table 12f. WESTBOUND : Languedoc-Roussillon fluxes to Spain.

TARIC CHAPTER		1998				1999			
		Sea	Rail	Road	Total	Sea	Rail	Road	Total
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.	-	-	2 528	2 528	-	-	2 321	2 321
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.	-	-	288	288	-	-	307	307
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations.	-	-	32	32	-	-	41	41
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster.	-	-	282	282	-	-	252	252
38	Miscellaneous chemical products.	-	24	1 632	1 656	-	-	3 138	3 138
39	Plastics and articles thereof.	-	-	5 493	5 493	-	-	6 663	6 663
	TOTAL BY MODE	-	24	10 255	10.279	-	-	12 722	12.722