

PRELIMINARY STUDY ON THE FEASIBILITY OF SUBSTITUTING LAND TRANSPORT OF CHEMICAL PRODUCTS BY SHORTSEA SHIPPING

Marc Abeille. COPETRANS
Giorgio Bonetti. ATTILIO CARMAGNANI
Joaquim Casal. Universitat Politècnica de Catalunya (UPC)
Carlos López Pulido. Universitat Politècnica de Catalunya (UPC)
F. Xavier Pérez-Alavedra. Universitat Politècnica de Catalunya (UPC)

Centre d'Estudis del Risc Tecnològic
Universitat Politècnica de Catalunya
Diagonal 647. 08028 Barcelona

Tel. 34 93401 66 75
Fax. 34 93401 71 50
E-mail: certec@eq.upc.es

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1. INTRODUCTION

Large amounts of chemical products are being transported continuously towards and from industrial installations located near urban areas. For large distances sea shipping is largely used, while for relatively short distances the transport is effectuated mainly by land (road or rail transport). However, land transport has several disadvantages concerning diverse economical, logistic and environmental aspects that have become more and more important in the European Union. Furthermore, it implies often the vicinity of largely populated zones or highly crowded roads, which can be affected if an accident occurs.

This subject is especially important for Europe, where the existence of a number of highly industrialised regions originates an important land transport of chemical products. In the frame of the significant effort already effectuated by the European Union to attain a safer situation for the people and the environment, and to evolve towards sustainable development, the circumstances concerning transport should still be considerably improved.

The geographical structure of Europe, with a large amount of coast and important number of sea ports, has originated always a very active sea transport between countries and towns. Cabotage –or, in a wider sense “shortsea shipping”- was an important way to move people and goods. However, due to diverse reasons, land transport has increased in the last decades, giving what was considered to be a good answer to transport requirements. Nevertheless, with the new environmental requirements and the need for a sustainable transport, road transport creates actually important problems in many European areas.

According to Marin-Combeaud¹, from DG VII, “*ShortSea Shipping is the movement of goods and passengers by maritime way between ports located in the Geographic Europe and between these ports and other ports located in a third country whose littoral corresponds to a closed sea that serves as a frontier to Europe*”.

If land transport was substituted by shortsea shipping, the possible effects on the population of an eventual accident would practically disappear; furthermore, important features concerning economical aspects and environmental protection could be significantly improved. We dare say as well that the diverse measures associated to this substitution would have also a positive effect on the quality and efficiency of seaborne passenger services.

Therefore, shortsea shipping should be an interesting alternative, especially in those regions characterised by a strong industrialisation and a high density of population. As a whole, it would be an important step further towards sustainable mobility and thus a significant contribution to the future of the European Union.

¹ La politique Européenne du transport maritime à courte distance. Table Ronde-Intermed, Marseille, Vème Forum Mondial de l’Industrie Chimique Maritime, 3 June 1999.

The main objective of the present study is therefore to determine in a preliminary way the feasibility and advantages of the substitution of land transport by shortsea shipping, for chemical products, in the regions of influence of the Ports of Barcelona, Genoa and Marseille.

1.1 DATA GATHERING

The collection of information concerning the fluxes of goods in the three regions of study, the Mediterranean Corridor formed by Barcelona, Marseille and Genoa, has been an added difficulty to the study itself due to the wide diversity and dispersion of information.

From all the organisms consulted, the CETMO (Centre d'Études des Transports pour la Méditerranée Occidentale), the Chamber of Commerce, Industry and Navigation of Barcelona, ISTAT (Istituto Nazionale di Statistica), the SES (Service d'Etudes et Statistiques-SITRAM database, Paris) and EUROSTAT have been the most useful sources of information when analysing the fluxes of goods.

The Nomenclatures used by these organisms are also different, as they cover the NST (Nomenclature Statistique du Transport) and the TARIC (TARif Intégré Communautaire). An in-depth study has shown that these nomenclatures are quite incompatible to be used together and so that different kind of analyses have been developed by each one of them.

1.2 DATA ANALYSIS

The information collected from CETMO and SES use the NST nomenclature and covers the fluxes of goods by mode of transport. Fluxes can also be obtained by regions for Spain and France countries, but not for Italian regions. Current version of the CETMO database collects fluxes of 1995. This information has been used to split up the total fluxes into the different modes of transport: road, rail, sea and others. The analysis of this information is showed in sections 2.3 and 2.4 and points out the potential market for shortsea shipping: road transport that could be transferred to shortsea transport.

The information collected from the Chamber of Commerce, Industry and Navigation of Barcelona uses the TARIC nomenclature and covers the fluxes of goods between Catalonia, France and Italy for 1995 and 1996. This information has been used in sections 2.5 and 2.6 to identify the main chapters that account for major fluxes between the regions of study in 1995 and 1996. As a result of this analysis, chemical producers or distributors have been identified and contacted.

The information collected from ISTAT uses the TARIC nomenclature and covers fluxes of goods between the following Italian regions: Lombardia, Toscana, Piemonte, Liguria, Emilia-Romagna and Valle d'Aosta, and France / Spain. This information covers years 1997 and 1998 and so that is not compatible with the aforementioned data. This information has been used in section 2.5.2 (Tables 2.13b, 14b, Figures 2.16, 2.17) and 2.5.3 as complementary information to identify the main chapters in bilateral fluxes.

2. FLUXES OF GOODS

2.1 THE WESTERN MEDITERRANEAN ZONE

The potential for shortsea shipping, although significant over all the European coast, is especially important in certain areas characterised by diverse features: high industrial density, high population density, existence of appropriate (number and size) sea ports, existence of problems concerning road transport (congestion, safety, environment) and intense transport of goods. One of these specific areas is that corresponding to the regions of influence of the Ports of Barcelona, Genoa and Marseille, i.e., an area which has clearly the diverse aforementioned features which would justify the substitution of land transport by shortsea shipping.

The zone of study has a high population density, covers industrialised regions, and has a number of sea ports, amongst which three (Barcelona, Genoa and Marseille) with a very important activity. Although these ports have important hinterlands, in them a huge amount of goods are transported from and towards their whole respective countries (Spain, Italy and France) by road. Furthermore, all these three ports are located in highly tourist areas, with all the consequences implied by this fact (amongst them, a significant transport of people by road, with the consequent congestion of the main roads). Therefore, a number of environmental and logistic aspects are involved in the substitution of road transport of certain goods by shortsea shipping.

On the other hand, the Mediterranean area has another interest as it is the way through which pass both inter-oceanic goods and also a place for the distribution of regional goods. Furthermore, it is a “door” for the entrance to the European market of goods coming from Far East and North of Africa. It is, in summary, a strategic position for the North-South in Europe and between the European Union and Africa.

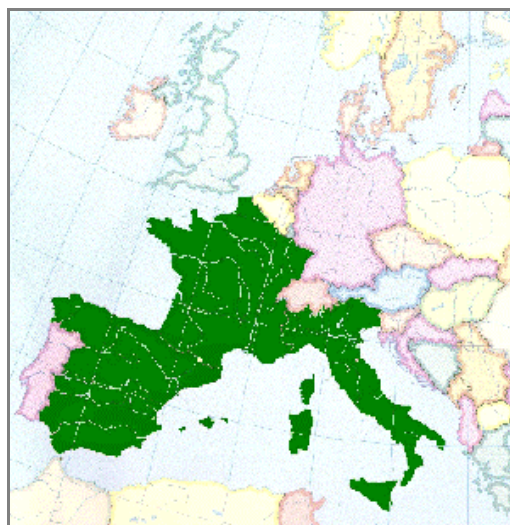


Figure 2.1 The Western Mediterranean European Countries.

2.2 HINTERLANDS

The hinterland of the three ports, Barcelona, Genoa and Marseille comprehends the Mediterranean arc, from the south of Catalonia up to Toscana and Emilia-Romagna in Italy.

Based on previous studies supported by ports and information gathered from several port managers, the following considerations have been settled down:

The hinterland of Port of Barcelona comprehends Catalonia and Aragon in Spain and Languedoc-Roussillon and Midi-Pyrénées in France.

The hinterland of Port of Marseille comprehends Provence-Côte d'Azur-Alpes-Corse(PACA), Rhône-Alpes and Languedoc-Roussillon.

The hinterland of Port of Genoa comprehends Lombardia, Piemonte, Toscana, Liguria, Emilia-Romagna and Valle d'Aosta.

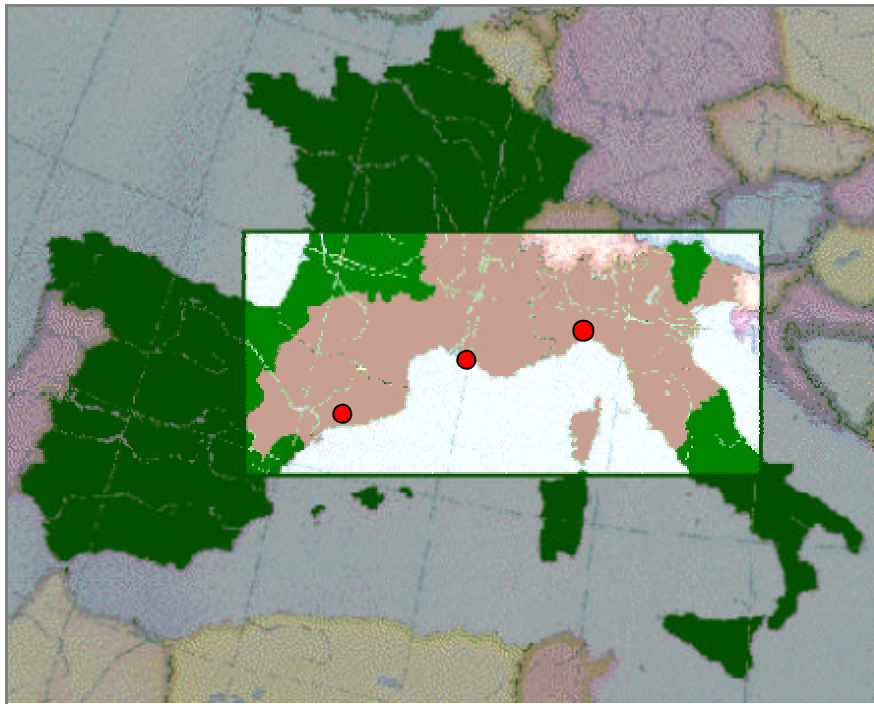


Figure 2.2 Mediterranean corridor. Hinterlands of the three ports.

If we consider the corridor between the three ports, then the following considerations have to be taken into account:

- 1) In the fluxes Spain-France only Catalonia will be considered as a hinterland of Port of Barcelona. There is no sense in considering the south of France in the exchanges Port of Barcelona-Port of Marseille. Aragon has not been considered in this study because it involves minor fluxes.
- 2) In the fluxes France-Spain and vice-versa Languedoc-Roussillon will not be considered, because it is too near to Barcelona and Marseille to include shortsea as a feasibility option.
- 3) Languedoc-Roussillon will be considered as part of the hinterland of Port of Marseille in fluxes France-Italy and vice-versa.

2.3 FLUXES BETWEEN THE CONSIDERED REGIONS

Information concerning the distribution of fluxes of goods according to the different modes of transport: rail, road, sea and others, has been gathered from CETMO (Centre d'Etudes des Transports pour la Méditerranée Occidentale) and it is referred to the year 1995.

It is hoped that the year 1997 currently in progress by CETMO will be available on the near future, so that the figures could be easily updated in consideration of traffic changes, but the other sources already supplied data for this most recent period (1997), though on different bases.

The main features of the information gathered are presented as follows:

1. The information concerning Spanish fluxes is divided by regions. Fluxes with origin or destination in Catalonia have been taken for the analysis.
2. The information concerning French fluxes is divided by regions. Fluxes with origin or destination in PACA, Rhône-Alpes and Languedoc-Roussillon have been taken for the analysis.
3. The information concerning Italian fluxes is referred to the whole country, so that it is not possible to establish the specific fluxes from or towards the hinterland of Port of Genoa.
4. Information is presented with the NST nomenclature (Nomenclature Statistique du Transport). This nomenclature (see Table 2.1) is different from other sources consulted: Eurostat, Chambers of Commerce, etc.

5. The information on fluxes is presented through the following parameters:

- a) Type of good b) Mode of transport c) Origin
 d) Destination e) Total tonnage (**in tons**)

Table 2.1 NST Nomenclature.

Chapter	Type of goods
Chapter 1	Agricultural products and live animals
Chapter 2	Mineral solid fuels
Chapter 3	Oil and oil products
Chapter 4	Iron ore and metal residues
Chapter 5	Steel and metal products
Chapter 6	Ores, building materials, raw materials for chemical industry
Chapter 7	Fertilisers
Chapter 8	Chemical products

For the present study, although information for all goods is given, the interest is focussed on the fluxes of chemical products. Chemical products are included totally or partly in the following chapters in the NST nomenclature:

Table 2.2 Chemical products under the NST nomenclature.

Chapter	Type of goods
Chapter 3	Oil and oil products
Chapter 6	Ores, building materials, raw materials for chemical industry
Chapter 7	Fertilisers
Chapter 8	Chemical products

2.3.1 FLUXES FRANCE / SPAIN

In this section information concerning fluxes from Provence-Côte d'Azur-Alpes-Corse (PACA) and Rhône-Alpes to Catalonia is presented.

Information including all types of goods has been summarized in Table 2.3a.

Table 2.3a Exported goods from PACA and Rhône-Alpes with destination in Catalonia (1995) by mode of transport.

	Sea	Road	Rail	Others	Total
PACA	274900	233148	7635	18	515701
Rhône -Alpes	318	175807	3122	45	179292
Total hinterland	275218	408955	10757	63	694993
Mode of transport	39.6%	58.9%	1.5%	0%	100%

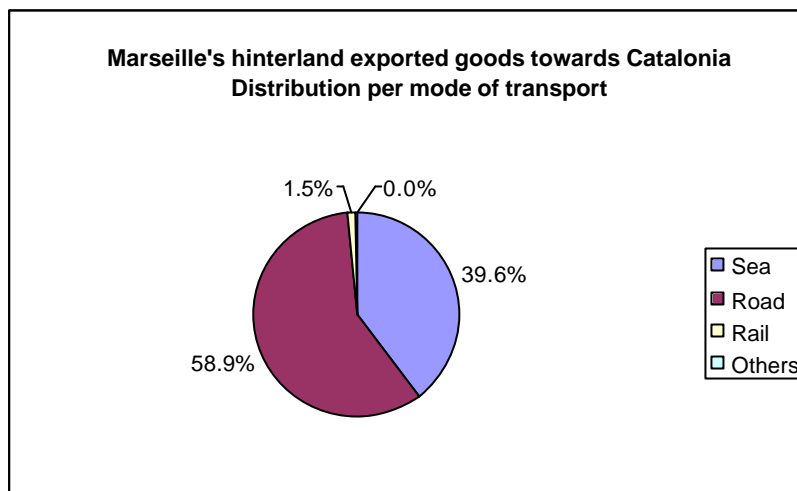


Figure 2.3 Distribution of Marseille’s hinterland exportations to Catalonia.

If we consider total exported goods, Figure 2.3 shows that sea transport accounts for 39.6% of total transport and road transport accounts for 59%. Approximately 700,000 tons were transported from the zone of influence of Port of Marseille towards the zone of influence of Port of Barcelona in 1995, from which more than 400,000 were transported by road.

Table 2.3b Exported goods (**chemical products**) from PACA and Rhône-Alpes with destination in Catalonia (1995).

	Sea	Road	Rail	Total	Total Volume
Chapter 3	95%	5%	0%	100%	208949
Chapter 6	24%	76%	0%	100%	20271
Chapter 7	0%	100%	0%	100%	34
Chapter 8	21%	78%	1%	100%	255672
				Total Volume	484926

From this table can be seen that most of Chapter 3 (Oil products) is already being transported by sea (Port of Marseille has a long tradition in this sector) and that Chapter 7 (Fertilisers) involved only a few tons in 1995.

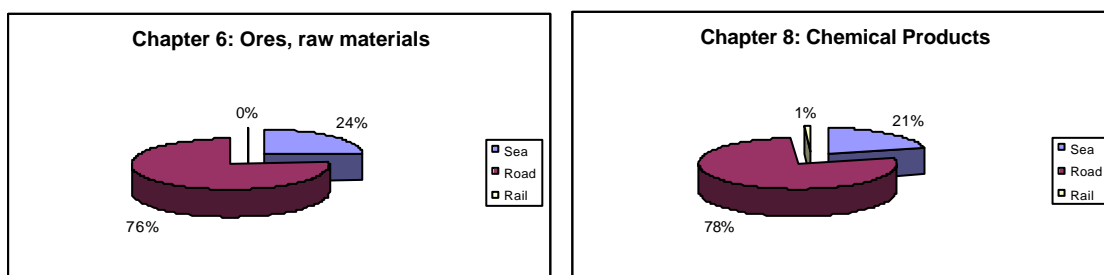


Figure 2.4 Chapters 6 and 8. Distribution per mode of transport.

Figure 2.4 shows that most of goods from Chapter 6 (ores, construction materials and raw materials for chemical industry) and Chapter 8 (chemical products) are currently transported by road and constitute a potential market for shortsea shipping. Furthermore, this potential market is quantified in 215,280 tons that are currently transported by road.

2.3.2 FLUXES SPAIN / FRANCE

In this section information concerning fluxes from Catalonia towards Provence-Côte d’Azur-Alpes-Corse (PACA) and Rhône-Alpes is presented.

Information including all types of goods has been summarized in Table 2.4a.

Table 2.4a Catalonia exported goods with destination in PACA and Rhône-Alpes.
Catalonia exported goods with destination in France (1995).

	Sea	Road	Rail	Others	Total
PACA	5932	100258	14	42	106246
Rhône -Alpes	223	165344	4043	15	169625
Total hinterland	6155	265602	4057	57	275871
Mode of transport	2.2%	96.3%	1.5%	0%	100%
Total France	141843	2049960	10561	424	2202788
	Export Hinterland/ France				12.5%

Table 2.4a shows that if we consider all products exported from Catalonia to France, the 12.5% of them have their destination in the hinterland of Port of Marseille, with a total amount of 275,871 tons.

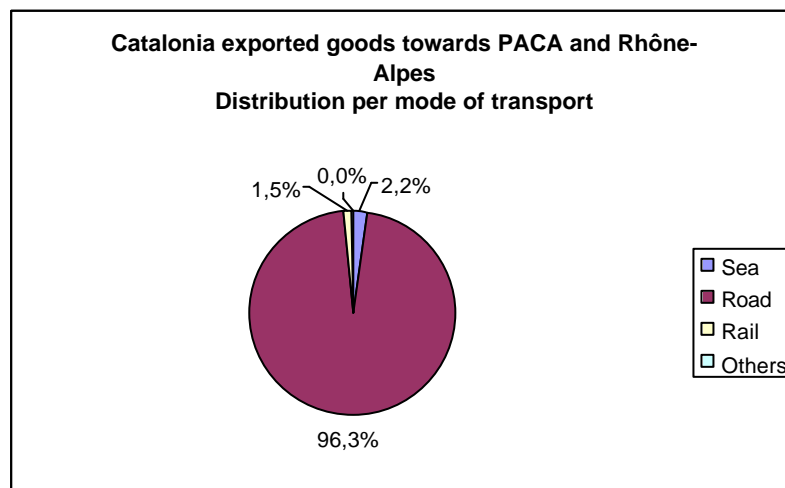


Figure 2.5 Distribution of exportations from Catalonia.

If we consider total exported goods, Figure 2.5 shows that sea transport accounts only for 2.2% of total transport and road transport accounts for more than 95%. Approximately 275,000 tons are transported from Catalonia towards the zone of influence of Port of Marseille, from which more than 265,000 are being transported by road.

Table 2.4b Catalonia exported goods (**chemical products**) with destination in PACA and Rhône-Alpes.
Catalonia exported goods with destination in France (1995).

	Sea	Road	Rail	Others	Total Hint.	Total France	Hint / France
Chapter 3	22.5%	77.5%	0%	0%	4035	79473	5%
Chapter 6	0	100%	0%	0%	30069	223169	13.5%
Chapter 7	3%	97%	0%	0%	6815	401732	1.7%
Chapter 8	6.25%	92.5%	1.25%	0%	64022	327488	19,5%
				Total	104941	1031862	10.2%

Table 2.4b shows the importance of the exportation to these regions, especially for chapter 8 and chapter 6. Although Chapter 7 (fertilisers) involve only 6,815 tons, this is a significant figure considering French regions are consumers of these products and they don't have production plants.

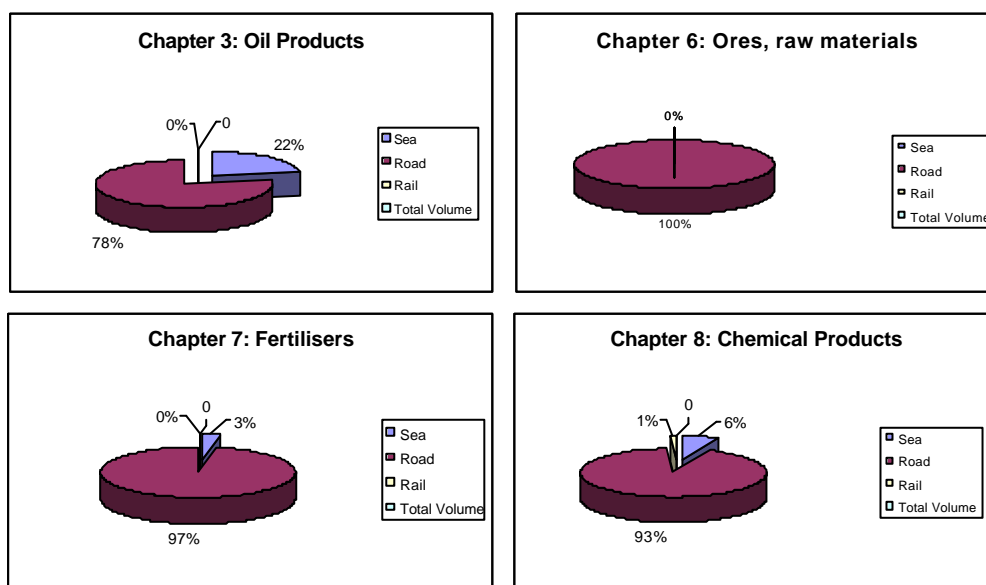


Figure 2.6 Distribution per mode of transport.

Attention has to be paid to the significance of the road transport trade from Catalonia to PACA and Rhône-Alpes; it accounts for more than 90% of total trade in all chapters except 3 (oil and oil products). There is a noticeable potential market for shortsea shipping, especially for those goods under chapters 6, 7 and 8.

Including the four chapters that we have taken as the more significant ones, the total volume that could be transferred from road to sea would be 99,820 tons, corresponding mainly to chapters 6 and 8 respectively. This amount of goods demonstrates that the feasibility to change the road transport for shortsea is also available from this direction of cargo flow.

2.3.3 FLUXES FRANCE / ITALY

Concerning the statistical data from Italy, the information obtained from CETMO is not available by region but for the whole country so that there is not the possibility to estimate the fluxes from or towards the hinterland of Port of Genoa.

In this section information concerning fluxes from Provence-Côte d’Azur-Alpes-Corse (PACA), Rhône-Alpes and Languedoc-Roussillon towards Italy is presented.

Information including all types of goods has been summarized in Table 2.5a.

Table 2.5a Exported goods from PACA, Rhône-Alpes and Languedoc-Roussillon with destination in Italy (1995).

	Sea	Road	Rail	Others	Total
PACA	2062771	1232087	1030722	374	4325954
Rhône-Alpes	136042	1754977	425983	965	2317967
Languedoc-Roussillon	667301	204054	21203	6	892564
Total hinterland	2866114	3191118	1477908	1345	7536485
Mode of transport	38%	42.3%	19.6%	0.1%	100%

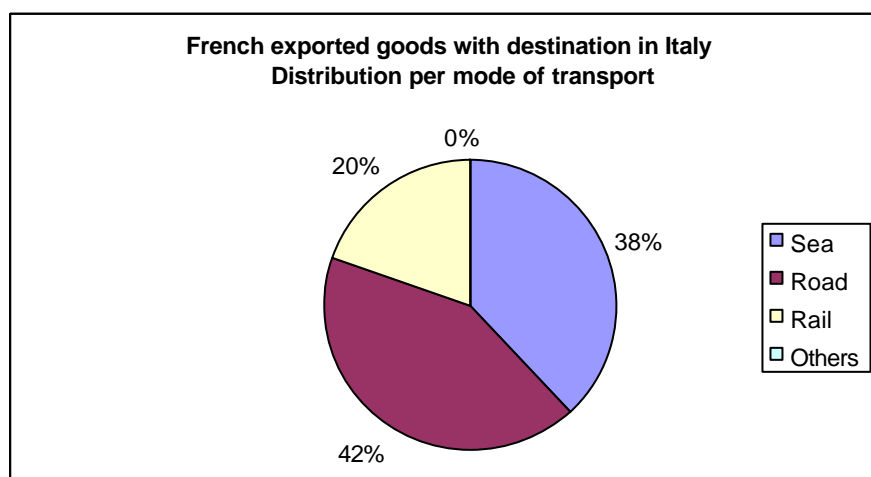


Figure 2.7 Distribution of Marseille’s hinterland exportations to Italy.

A first remark to Table 2.5a is the balanced situation between road and sea transport, and also the significant rate of rail transport in relation to the rest of fluxes. Rail transport is improved due to the European width railway normalisation. Moreover it could also be seen that the total volume exported from these three French regions to Italy accounts for 7,536,485 tonnes.

Table 2.5b Exported goods (**chemical products**) from PACA, Rhône-Alpes and Languedoc-Roussillon with destination in Italy (1995).

	Sea	Road	Rail	Total	Total Volume
Chapter 3	79%	5%	16%	100%	1301978
Chapter 6	54%	26%	20%	100%	530013
Chapter 7	0%	100%	0%	100%	15256
Chapter 8	25.4%	67.3%	7.3%	100%	1275320
	Total Volume				3122567

From this table can be seen again that most of Chapter 3 (Oil products) is already being transported by sea due to the large amount of oil transported by Port of Marseille.

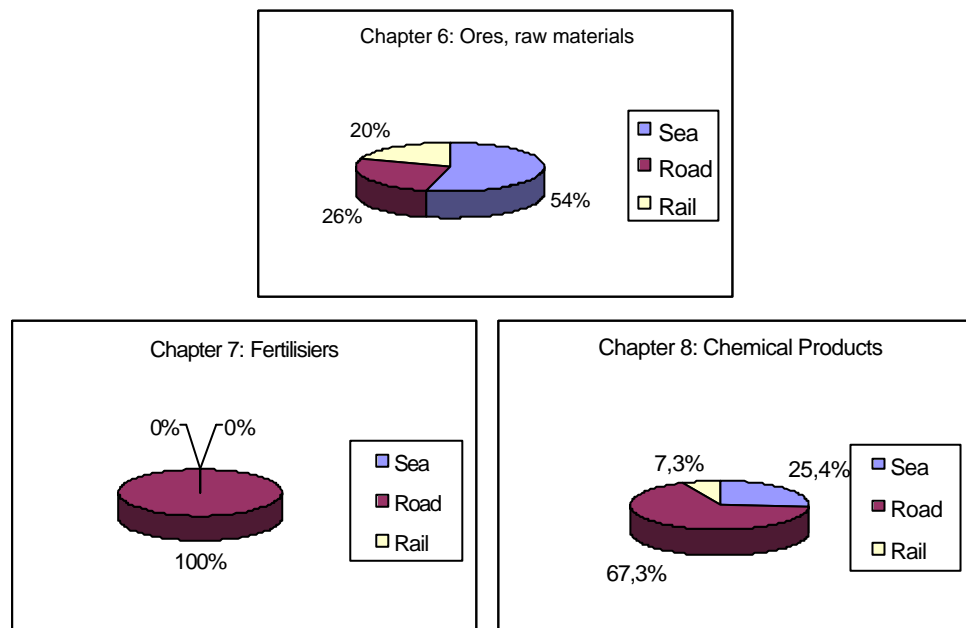


Figure 2.8 Chapters 6, 7 and 8. Distribution per mode of transport.

If Oil products are not considered, then the potential cargoes for shortsea shipping belong to chapters 6, 7 and 8, although an important part (54%) of chapter 6 is already transported by sea and chapter 7 accounts for a little bit more than 15,000 tons.

Chemical products –Chapter 8– are the main market in this case with a total amount of land (road and rail) transport of 951,730 tons.

2.3.4 FLUXES ITALY / FRANCE

In this section information concerning fluxes from Italy towards Provence-Côte d’Azur-Alpes-Corse (PACA), Rhône-Alpes and Languedoc-Roussillon is presented.

Information including all types of goods has been summarized in Table 2.6a.

Table 2.6a Italian exported goods with destination in PACA, Rhône-Alpes and Languedoc-Roussillon.

Italian exported goods with destination in France (1995).

	Sea	Road	Rail	Others	Total
PACA	333889	918050	6420	13072	1271431
Rhône-Alpes	63264	1395278	125349	21679	1605570
Languedoc-Roussillon	1013591	246852	21678	1385	1283506
Total hinterland	1410744	2560180	153447	36136	4160507
Mode of transport	34%	61.5%	3.5%	1%	100%
Total France	2189724	7625231	598361	46679	10459995
	Export Hinterland/ France				40%

If total exportations from Italy to France are considered, then the 40% of them have their destination in the hinterland of Port of Marseille, with a total amount of 4,160,507 tons. This figure gives an idea of the significance of this area of influence.

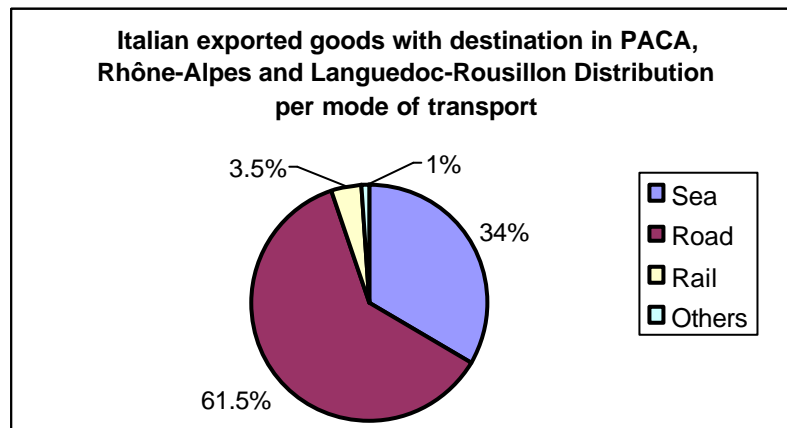


Figure 2.9 Distribution of Italian exportations to the hinterland of Port of Marseille.

Figure 2.9 shows that the Italian exported goods to the regions of influence of Port of Marseille are mainly being done by road, with a 61.5% rate of total transport. Sea transport accounts for 34% of total exportations.

Table 2.6b. Italian exported goods (**chemical products**) with destination in PACA, Languedoc-Rousillon and Rhône-Alpes.
Italian exported goods with destination in France (1995).

	Sea	Road	Rail	Others	Total Hint.	Total France	Hint / France
Chapter 3	98.1%	1.5%	0%	0.4%	979282	1443057	68%
Chapter 6	3.6%	96.1%	0.3%	0%	401411	1014300	40%
Chapter 7	10.8%	82.9%	6.3%	0%	24277	37562	65%
Chapter 8	5.9%	87.3%	1.6%	5.2%	322496	1043923	31%
Total					1727466	3538842	49%

*The percentages by mode of transport apply to the column “Total Hinterland”.

If total exportations of chemical products from Italy to France are considered, approximately the 50% of them have their destination in the hinterland of Port of Marseille, with a total amount of 1,727,466 tons. This figure gives an idea of the significance of this area of influence and the chemical industry located in the boundaries.

From Table 2.6b can also be seen that sea transport is only noticeable for oil products and in minor rate for fertilisers (chapter 7). Road transport accounts for more than 85% of total transport for the rest of chapters.

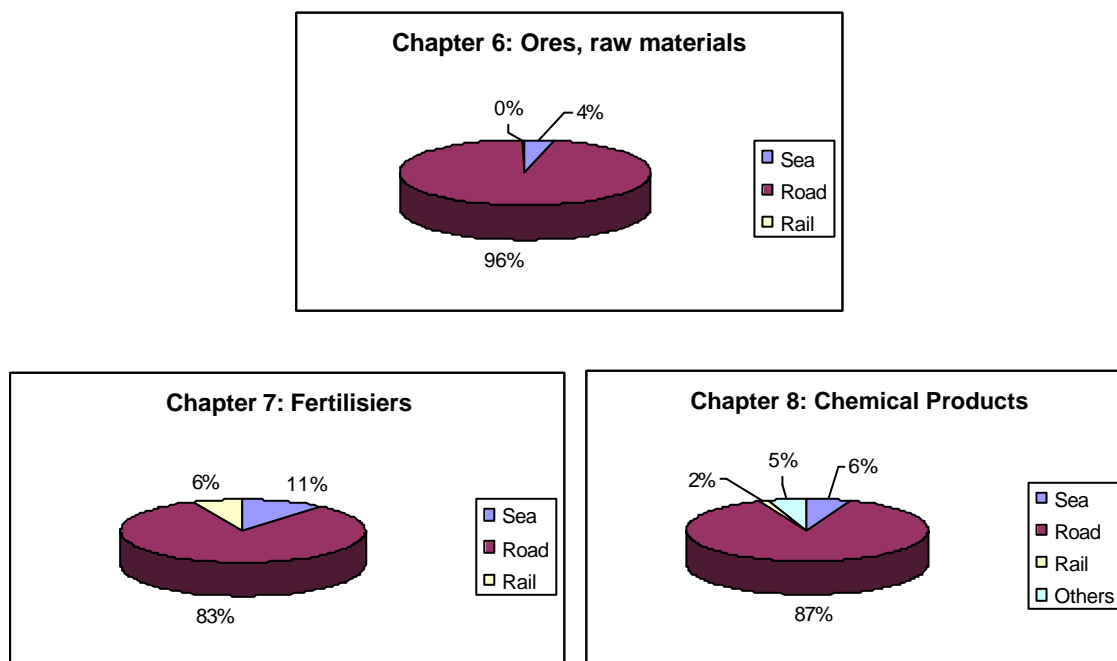


Figure 2.10 Distribution per mode of transport.

The potential volume to change from land (road and rail) transport to shortsea accounts for 695,407 tons, mainly from chapters 6 and 8. Furthermore, these figures demonstrate the large potential market for shortsea shipping.

2.3.5 FLUXES ITALY / SPAIN

Concerning the statistical data from Italy, the information obtained from CETMO is not available for each region but for the whole country so that there is not the possibility to estimate the fluxes from or towards the hinterland of Port of Genoa.

In this section information concerning fluxes from Italy towards Catalonia is presented.

Information including all types of goods has been summarized in Table 2.7a.

Table 2.7a Italian exported goods with destination in Catalonia (1995).

Italian exported goods with destination in Spain.

	Sea	Road	Rail	Others	Total
Catalonia	968711	1047220	13499	1876	2031306
Mode of transport	47.7%	51.6%	0.7%	0%	100%
Total Spain	2217075	2413591	29437	4754	4664857
	Export Hinterland/ Spain				43.5%

If total exportations from Italy to Spain are considered, then the 43.5% of them have their destination in the hinterland of Port of Barcelona, with a total amount of 2,031,306 tons. This figure gives an idea of the significance of this area of influence.

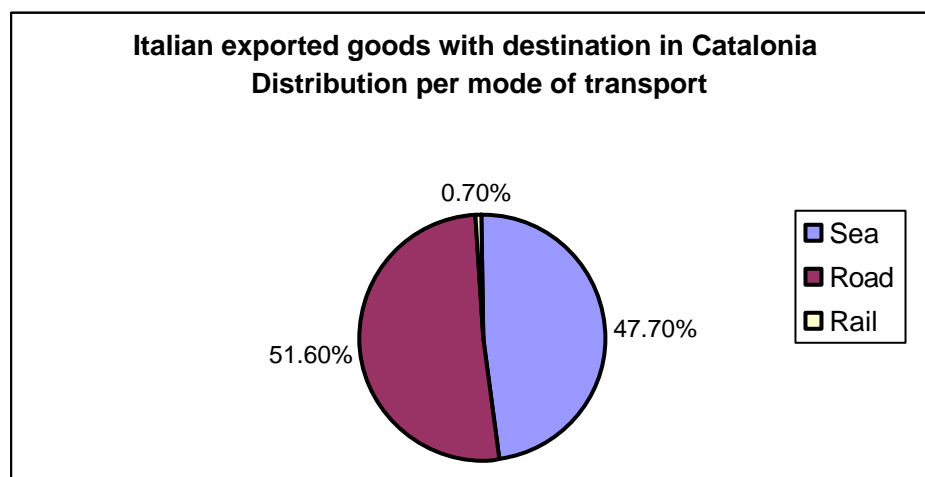


Figure 2.11 Exportations from Italy. Distribution per mode of transport.

Figure 2.11 shows the balanced situation concerning the distribution amongst the different modes of transport. Road and sea transport accounts for approximately 50% of the total market. Rail transport accounts for less than 1% of total exportations.

Table 2.7b Italian exported goods (**chemical products**) with destination in Catalonia.
Italian exported goods with destination in Spain (1995).

	Sea	Road	Rail	Others	Total Hint.	Total Spain	Hint / Spain
Chapter 3	99.8%	0.2%	0%	0%	754884	1556141	48.5%
Chapter 6	0.1%	99.9%	0%	0%	21437	94995	22.6%
Chapter 7	19.3%	80.7%	0%	0%	15087	139305	10.8%
Chapter 8	28.9%	70.9%	0.2%	0%	271489	474350	57.2%
Total					1062897	2264791	47%

If total exportations of chemical products from Italy to Spain are considered, more than 45% of them have their destination in the hinterland of Port of Barcelona, with a total amount of 1,062,897 tons. If we only consider chapter 8, then this figure is increased up to more than 57%. These figures give an idea of the significance of this area of influence and the chemical industry located in the boundaries.

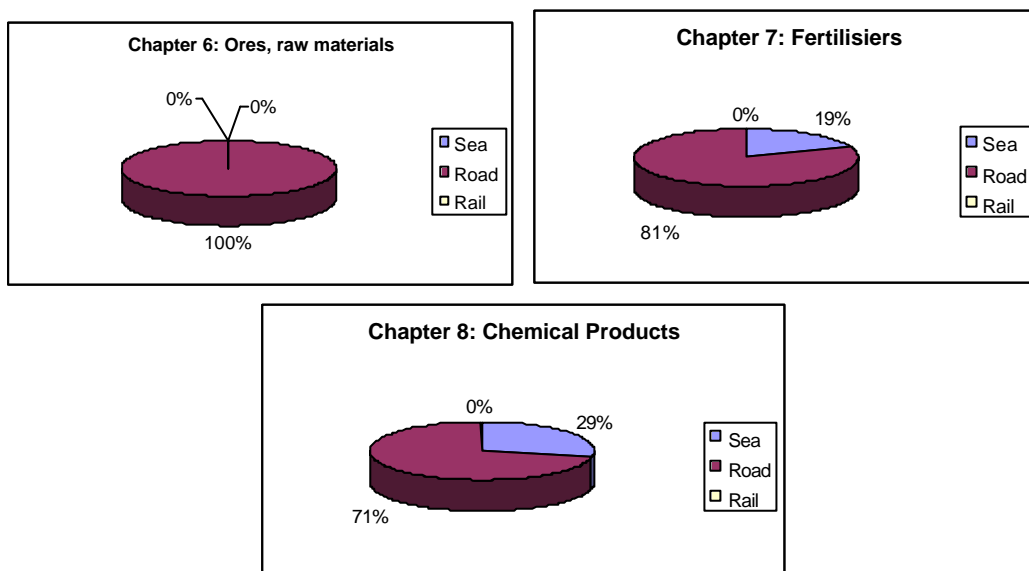


Figure 2.12 Distribution per mode of transport.

Although there is a significant sea transport between Italy and Catalonia, a large potential for shortsea shipping is still noticeable, specially for Chapter 8 which involves a big amount of Italian exportations (271,489 tons in 1995). Road transport accounts for more than 70% of total transport for all chapters except oil products.

If oil products are not considered, there is a potential market of 226,426 tons that could be transferred from road transport to shortsea shipping.

2.3.6 FLUXES SPAIN / ITALY

In this section information concerning fluxes from Catalonia towards Italy is presented.

Information including all types of goods has been summarized in Table 2.8a.

Table 2.8a Catalonia exported goods with destination in Italy (1995).

	Sea	Road	Rail	Others	Total
Italy	475391	789243	257	188	1265079
Mode of transport	37.6%	62.4%	0%	0%	100%

Table 2.8a shows that Catalonia exportations to Italy account for 1,265,079 tons including all types of goods. From this figure, road transport accounts for 62.4% of total transport and sea transport for 37.6%; there is no trade by rail.

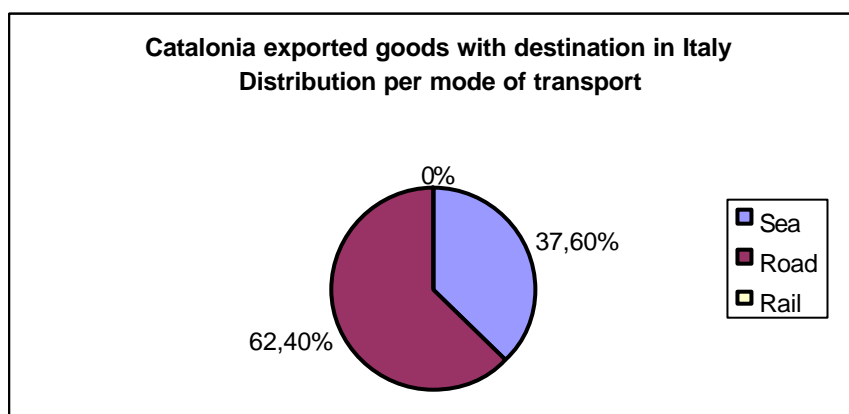


Figure 2.13 Exportations from Catalonia. Distribution per mode of transport.

Figure 2.13 shows that sea transport is noticeable in fluxes Catalonia / Italy. However, Table 2.8b shows that most of this transport corresponds to oil and oil products.

Table 2.8b Exported goods (**chemical products**) from Catalonia to Italy (1995).

	Sea	Road	Rail	Total	Total Volume
Chapter 3	99.3%	0.7%	0%	100%	274587
Chapter 6	0%	100%	0%	100%	27662
Chapter 7	71.3%	28.7%	0%	100%	70085
Chapter 8	1.9%	98.1%	0%	100%	320249
				Total Volume	692583

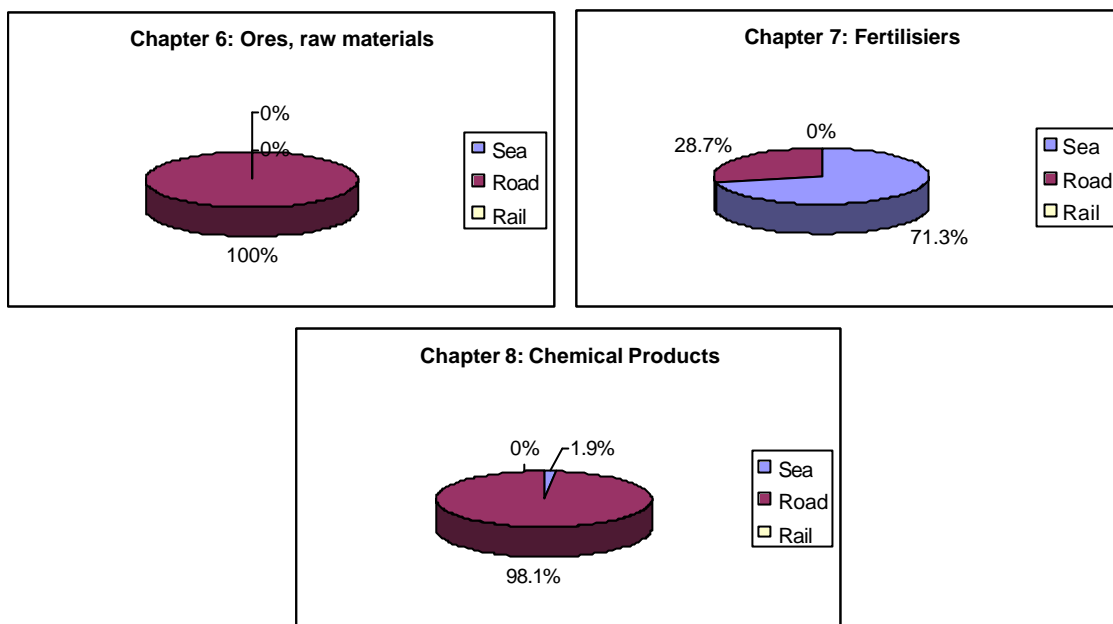


Figure 2.14 Distribution per mode of transport.

There is a potential market for shortsea shipping concerning chapters 6, 7 and 8. Special attention has to be paid to chapter 8, where -with a total amount of 320,249 tons- sea transport accounts for less than 2% of total transport. The same consideration can be applied to chapter 6.

The total volume that could be transferred from land (road and rail) to sea transport accounts for 362,027 tons.

2.4 RESUME OF FLUXES IN THE WESTERN MEDITERRANEAN EUROPEAN COUNTRIES

Next page resumes the volumes of goods exchanged in the three zones of study. To prepare the table, only Chapters 6, 7 and 8 have been considered; Oil products haven't been taken into account.

Figures comprehend land fluxes, both road and rail, that could be transferred to shortsea shipping. Total input and output amount of goods for each port have been calculated from potential fluxes with the rest of zones.

- Chapter 6: Ores, building materials, raw materials for chemical industry.
- Chapter 7: Fertilisers.
- Chapter 8: Chemical products

Table2.9 Potential market (in tons) for Shortsea Shipping concerning Chemical Products in the Mediterranean corridor (1995).

POTENTIAL MARKET FOR SHORTSEA SHIPPING (in Tons)	to REGION 1 BARCELONA		to REGION 2 GENOA (Italy)		to REGION 3 MARSEILLE	
from REGION 1 BARCELONA	<i>TOTAL INPUT BARCELONA</i>	444,731	Chapter 6	27,662	Chapter 6	30,069
			Chapter 7	20,121	Chapter 7	6,604
	<i>TOTAL OUTPUT BARCELONA</i>	458,716	Chapter 8	314,244	Chapter 8	60,016
			TOTAL	362,027	TOTAL	96,689
from REGION 2 GENOA (Italy)	Chapter 6	21,418	<i>TOTAL INPUT GENOA (Italy)</i>	1,570,798	Chapter 6	387,135
	Chapter 7	12,182			Chapter 7	21,648
	Chapter 8	192,962	<i>TOTAL OUTPUT GENOA (Italy)</i>	921,969	Chapter 8	286,624
	TOTAL	226,562			TOTAL	695,407
from REGION 3 MARSEILLE	Chapter 6	15,401	Chapter 6	241,785	<i>TOTAL INPUT MARSEILLE</i>	792,096
	Chapter 7	34	Chapter 7	15,256		
	Chapter 8	202,734	Chapter 8	951,730	<i>TOTAL OUTPUT MARSEILLE</i>	1,426,940
	TOTAL	218,169	TOTAL	1,208,771		

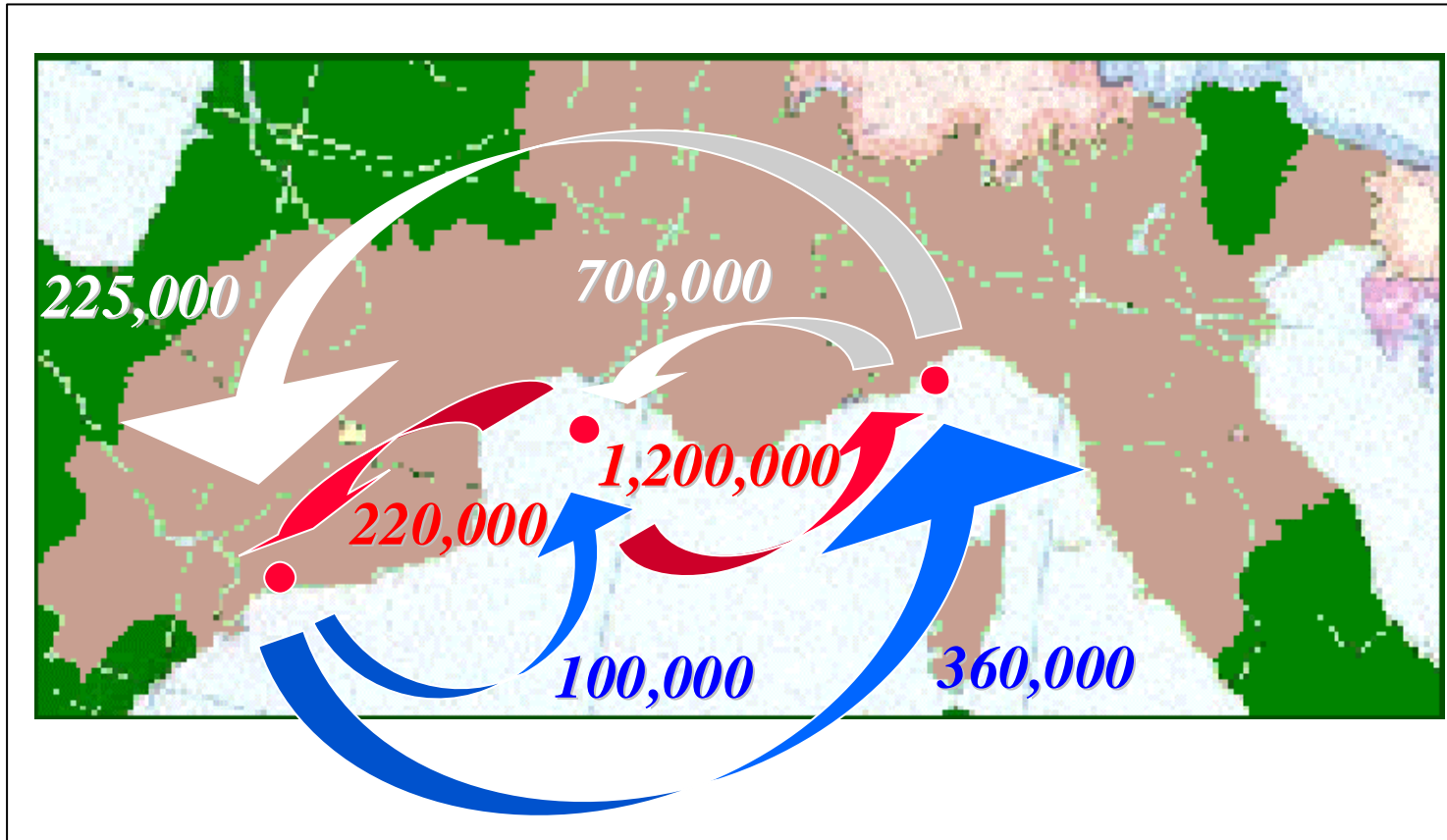


Figure 2.15 Road and Rail fluxes of Chemical Products in the Mediterranean corridor (1995).

2.5 POTENTIAL MARKET FOR SHORTSEA SHIPPING. MAIN CHAPTERS

In section 2.4 the split up of fluxes of chemical products into the different modes of transport has been settled down for year 1995.

In order to study more in depth the goods that could be transferred from land to shortsea transport once the potential market has been identified, an analysis of a more detailed data has been done for years 1995 and 1996 (1997 in Italy / France commerce) and is presented in this section.

The purpose of this section is then to identify with more detail those chapters that account for major fluxes in the regions of study. With this information, an identification of main chemical products, producers and distributors is done in sections 2.6 and 2.7.

The following data have been obtained from ISTAT, the Chamber of Commerce, Industry and Navigation of Barcelona. The nomenclature used in this case –TARIC (TARif Intégré Communautaire)– is the same that EUROSTAT provides and it is not compatible with the information provided by CETMO.

In this Nomenclature, chemical products are considered in chapters shown in Table 2.10.

Table 2.10 Chapters including (totally or partly) chemical products.

Chapters	Products
25	Salt; sulphur; earths and stone; plastering materials, lime and cement
27	Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes
28	Inorganic chemicals: organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes
29	Organic chemicals
30	Pharmaceutical products
31	Fertilisers
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations
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
38	Miscellaneous chemical products
39	Plastics and articles thereof

2.5.1 FLUXES FRANCE / CATALONIA

Table 2.11 Exported goods per chapter from France to Catalonia (1995 / 1996).

Chapter	Products	1995	1996
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	114149	99595
27	Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	128142	218700
28	Inorganic chemicals: organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	141440	131560
29	Organic chemicals	180495	186575
30	Pharmaceutical products	3467	4633
31	Fertilisers	22778	35523
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	12165	12204
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations	11681	13981
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	38072	29463
38	Miscellaneous chemical products	39854	58058
39	Plastics and articles thereof	179341	205717
TOTAL (tons)		871,584	996,009

Table 2.12 Exported goods per chapter from Catalonia to France (1995 / 1996).

Chapter	Products	1995	1996
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	116034	190047
27	Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	85446	84571
28	Inorganic chemicals: organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	73950	98750
29	Organic chemicals	44903	49541
30	Pharmaceutical products	892	1427
31	Fertilisers	453562	545696
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	9122	9283
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations	2703	3046
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	39255	32808
38	Miscellaneous chemical products	26362	24242
39	Plastics and articles thereof	151468	177793
TOTAL (tons)		1,003,697	1,217,204

2.5.2 FLUXES ITALY / CATALONIA OR SPAIN

Table 2.13a Exported goods per chapter from Italy to Catalonia (1995 / 1996).

Chapter	Products	1995	1996
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	18169	22935
27	Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	762509	867112
28	Inorganic chemicals: organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	40839	65871
29	Organic chemicals	94225	68771
30	Pharmaceutical products	1208	1900
31	Fertilisers	3457	2614
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	13228	15961
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations	1131	1790
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	35039	30918
38	Miscellaneous chemical products	22302	37106
39	Plastics and articles thereof	109115	155916
TOTAL (tons)		1,101,222	1,270,894

Detailed information concerning exported goods from Italian regions to Spain has been gathered from ISTAT, although it is referred to year 1997. With this information, the significance of each region in the hinterland can be pointed out.

Table 2.13b Exported goods per chapter from Italian regions to Spain (1997).

(Italian regions comprehend Emilia-Romagna, Liguria, Lombardia, Piemonte, Toscana and Valle d'Aosta).

Chapter	Products	1997
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	218419
27	Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	78558
28	Inorganic chemicals: organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	47887
29	Organic chemicals	65333
30	Pharmaceutical products	3124
31	Fertilisers	1527
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	38458
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations	10479
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	38353
38	Miscellaneous chemical products	55847
TOTAL (tons)		557,985

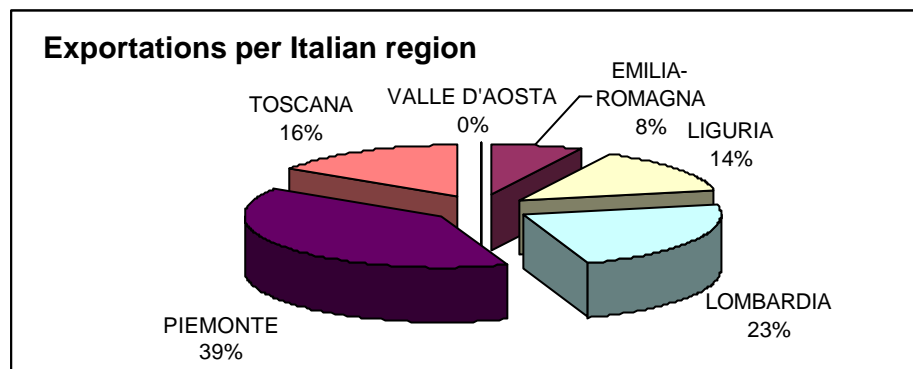


Figure 2.16 Distribution per region of Italian exportations to Spain.

Figure 2.16 shows that Piemonte and Lombardia regions account for approximately 65% of total exportations from the hinterland of Port of Genoa to Spain.

Table 2.14a Exported goods per chapter from Catalonia to Italy (1995 / 1996).

Chapter	Products	1995	1996
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	22984	19136
27	Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	315616	137715
28	Inorganic chemicals: organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	10131	13919
29	Organic chemicals	39550	40159
30	Pharmaceutical products	518	613
31	Fertilisers	70084	38074
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	9592	10095
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations	3474	3371
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	18670	25761
38	Miscellaneous chemical products	37612	37720
39	Plastics and articles thereof	212981	221882
	TOTAL (tons)	741,212	548,445

Detailed information concerning exported goods from Spain to Italian regions has been gathered from ISTAT, although is referred to year 1997. With this information, the significance of each region in the hinterland can be pointed out.

Table 2.14b Exported goods per chapter from Spain to Italian regions (1997).
(Italian regions comprehend Emilia-Romagna, Liguria, Lombardia, Piemonte, Toscana and Valle d’Aosta).

Chapter	Products	1997
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	1034173
27	Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	150068
28	Inorganic chemicals: organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	110572
29	Organic chemicals	82484
30	Pharmaceutical products	4833
31	Fertilisers	48968
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	40087
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations	7589
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	29719
38	Miscellaneous chemical products	24690
TOTAL (tons)		1,533,183

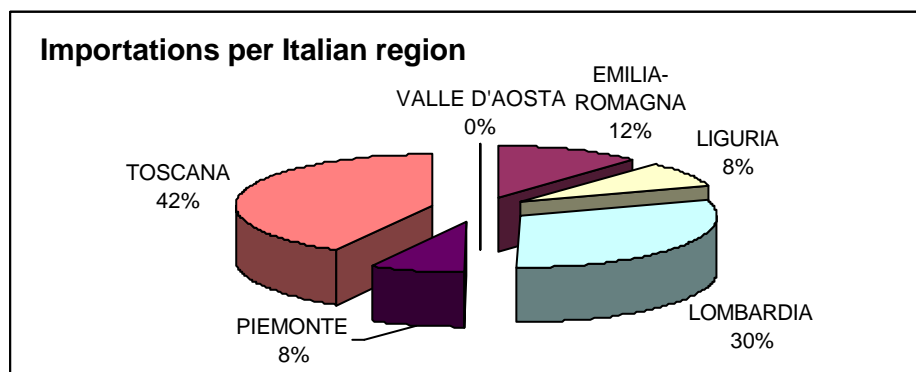


Figure 2.17 Distribution per region of Italian importations from Spain.

Figure 2.17 shows that Lombardia and Toscana regions account for approximately 75% of total importations from Spain in the hinterland of Port of Genoa.

2.5.3 FLUXES ITALY / FRANCE

The following data have been obtained from national sources in Italy (ISTAT) and comprehends year 1997. The information is referred to the fluxes of goods between regions of Port of Genoa’s hinterland and France, regarding export and import trade.

Table 2.15 Exported goods per chapter from Genoa’s hinterland to France (1997).

Chapter	Products	1997
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	293731
27	Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	110687
28	Inorganic chemicals: organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	132531
29	Organic chemicals	108826
30	Pharmaceutical products	3836
31	Fertilisers	20544
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	41848
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations	14738
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	65550
38	Miscellaneous chemical products	116547
TOTAL (tons)		908,842

Next figure shows the distribution of external trade from regions of Genoa’s hinterland towards France.

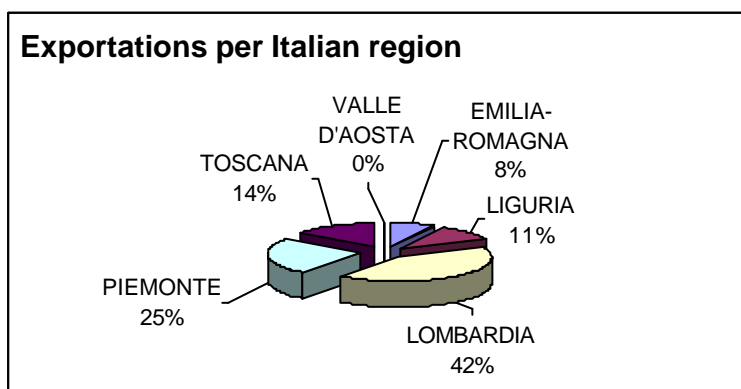


Figure 2.18 Distribution per region of Italian exportations to France.

Figure 2.18 shows that Piemonte and Lombardia regions account for approximately 70% of total exportations from the hinterland of Port of Genoa to France.

Table 2.16 Exported goods per chapter from France to Genoa's hinterland (1997).

Chapter	Products	1997
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	1149819
27	Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	470255
28	Inorganic chemicals: organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	338913
29	Organic chemicals	407493
30	Pharmaceutical products	8696
31	Fertilisers	10369
32	Tanning or dyeing extracts; tannins and their derivatives; dyes; pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	49807
33	Essential oils and resinoids; perfumery; cosmetic or toilet preparations	39377
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	36766
38	Miscellaneous chemical products	156798
TOTAL (tons)		2,767,299

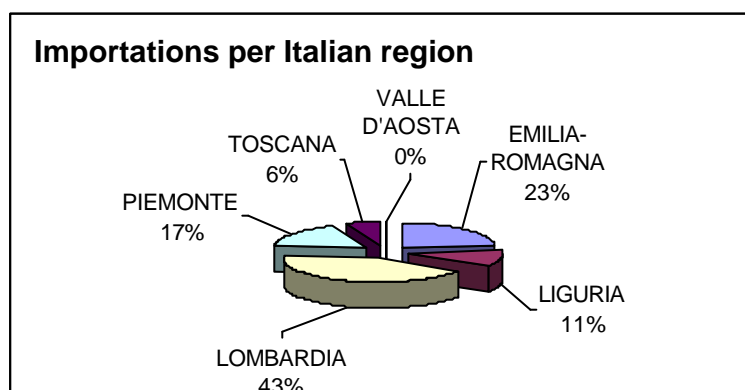


Figure 2.19 Distribution per region of Italian importations from France.

From this figure it can be seen that the major rate of French importations in Genoa's hinterland correspond to Lombardia with a 43 % of total import trade.

The information gathered in this section is analysed with more detail in next section, to proceed from main chapters to chemical products that account for major fluxes in the regions of study.

2.6 POTENTIAL MARKET FOR SHORTSEA SHIPPING. MAIN PRODUCTS

Once the fluxes concerning chemical products have been established in the Mediterranean corridor, a detailed analysis has been done with the identification of products that involve major amounts of transport.

Information from the Chamber of Commerce, Industry and Navigation of Barcelona was split up in order to identify those products that involved major amounts of fluxes in the different bilateral relations: Catalonia / Italy and Catalonia / France. The data are referred to year 1996.

A ranking has been settled down with the fifteen products that account for major amount of transport in each direction of flux.

2.6.1 FLUXES FRANCE / CATALONIA

Table 2.17 Ranking of French chemical products exported to Catalonia (1996).

TARIC Code	Products	Tons
2710	Petroleum oils and oils obtained from bituminous minerals, other than crude; preparations not elsewhere specified or included, containing by weight 70% or more of petroleum oils or of oils obtained from bituminous minerals	161187
2815	Sodium hydroxide (caustic soda); potassium, hydroxide (caustic potash); peroxides of sodium or potassium	67410
3901	Polymers of ethylene, in primary forms	46569
2713	Petroleum coke, petroleum bitumen and other residues of petroleum oils or of oils obtained from bituminous minerals	45026
2901	Acyclic hydrocarbons	36098
2814	Ammonia, anhydrous or in aqueous solution	31960
3902	Polymers of propylene or of other olefins, in primary forms	28650
3904	Polymers of vinyl chloride or of other halogenated olefins, in primary forms	25301
3402	Organic surface-active agents (other than soap); surface-active preparations, washing preparations (including auxiliary washing preparations) and cleaning preparations, whether or not containing soap	24000
2915	Saturated acyclic monocarboxylic acids and their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives	19440
2917	Polycarboxylic acids, their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives	19373
2905	Acyclic alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives	18417
3907	Polyacetals, other polyethers and epoxide resins, in primary forms; polycarbonates, alkyd resins, polyallyl esters and other polyesters, in primary forms	17039
3824	Prepared binders for foundry moulds or cores; chemical products and preparations of the chemical or allied industries	16422
2922	Oxygen-function amino-compounds	15953
TOTAL		572,845

Table 2.18 Ranking of Catalonia chemical products exported to France (1996).

TARIC Code	Products	Tons
3104	Mineral or chemical fertilizers, potassic	530026
2501	Salt (including table salt and denatured salt) and pure sodium chloride, whether or not in aqueous solution or containing added anti-caking or free-flowing agents; sea water	121375
2713	Petroleum coke, petroleum bitumen and other residues of petroleum oils or of oils obtained from bituminous minerals	69010
3901	Polymers of ethylene, in primary forms	32686
2815	Sodium hydroxide (caustic soda); potassium hydroxide (caustic potash); peroxides of sodium or potassium	31128
3402	Organic surface-active agents (other than soap); surface-active preparations, washing preparations (including auxiliary washing preparations) and cleaning preparations, whether or not containing soap	27252
3907	Polyacetals, other polyethers and epoxide resins, in primary forms; polycarbonates, alkyd resins, polyallyl esters and other polyesters, in primary forms	20248
3909	Amino-resins, phenolic resins and polyurethanes, in primary forms	19000
3902	Polymers of propylene or of other olefins, in primary forms	18838
2825	Hydrazine and hydroxylamine and their inorganic salts; other inorganic bases; other metal oxides, hydroxides and peroxides	16445
3903	Polymers of styrene, in primary forms	15467
2828	Hypochlorites; commercial calcium hypochlorite; chlorites; hypobromites	14358
3102	Mineral or chemical fertilizers, nitrogenous	12366
2901	Acyclic hydrocarbons	10205
2710	Petroleum oils and oils obtained from bituminous minerals, other than crude; preparations not elsewhere specified or included, containing by weight 70% or more of petroleum oils or of oils obtained from bituminous minerals	7766
TOTAL		946,170

2.6.2 FLUXES ITALY / CATALONIA

Table 2.19 Ranking of Italian chemical products exported to Catalonia (1996).

TARIC Code	Products	Tons
2710	Petroleum oils and oils obtained from bituminous minerals, other than crude; preparations not elsewhere specified or included, containing by weight 70% or more of petroleum oils or of oils obtained from bituminous minerals	864984
2807	Sulphuric acid; oleum :	44454
3901	Polymers of ethylene, in primary forms	33524
3402	Organic surface-active agents (other than soap); surface-active preparations, washing preparations (including auxiliary washing preparations) and cleaning preparations, whether or not containing soap	27423
3904	Polymers of vinyl chloride or of other halogenated olefins, in primary forms	22095
3902	Polymers of propylene or of other olefins, in primary forms	18725
2901	Acyclic hydrocarbons	13640
3903	Polymers of styrene, in primary forms	12549

TARIC Code	Products	Tons
3824	Prepared binders for foundry moulds or cores; chemical products and preparations of the chemical or allied industries	12341
3907	Polyacetals, other polyethers and epoxide resins, in primary forms; polycarbonates, alkyd resins, polyallyl esters and other polyesters, in primary forms	9434
2926	Nitrile-function compounds	8567
2917	Polycarboxylic acids, their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives	7491
2915	Saturated acyclic monocarboxylic acids and their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives	6747
2905	Acyclic alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives	6484
3906	Acrylic polymers in primary forms	6384
TOTAL		1,094,842

Table 2.20 Ranking of Catalonia chemical products exported to Italy (1996).

TARIC Code	Products	Tons
3901	Polymers of ethylene, in primary forms	90727
2713	Petroleum coke, petroleum bitumen and other residues of petroleum oils or of oils obtained from bituminous mineral	62845
2707	Oils and other products of the distillation of high temperature coal tar; similar products in which the weight of the aromatic constituents exceeds that of the non-aromatic constituents	52444
3104	Mineral or chemical fertilizers, potassic	37966
3902	Polymers of propylene or of other olefins, in primary forms	32323
3907	Polyacetals, other polyethers and epoxide resins, in primary forms; polycarbonates, alkyd resins, polyallyl esters and other polyesters, in primary forms	31546
3903	Polymers of styrene, in primary forms	24331
2710	Petroleum oils and oils obtained from bituminous minerals, other than crude; preparations not elsewhere specified or included, containing by weight 70% or more of petroleum oils or of oils obtained from bituminous minerals	22398
3402	Organic surface-active agents (other than soap); surface-active preparations, washing preparations (including auxiliary washing preparations) and cleaning preparations, whether or not containing soap	20229
3909	Amino-resins, phenolic resins and polyurethanes, in primary forms	17763
3824	Prepared binders for foundry moulds or cores; chemical products and preparations of the chemical or allied industries	13880
2903	Halogenated derivatives of hydrocarbons :- Saturated chlorinated derivatives of acyclic hydrocarbons	11594
3909	Amino-resins, phenolic resins and polyurethanes, in primary forms	9429
3906	Acrylic polymers in primary forms	8662
3904	Polymers of vinyl chloride or of other halogenated olefins, in primary forms	8334
TOTAL		444,471

As a result of the information gathered in this section, the identification of the main chemical producers and distributors has been done in section 2.7.

2.7 IDENTIFICATION OF CHEMICAL PRODUCERS AND DISTRIBUTORS

2.7.1 LOCATED IN CATALONIA

The list of main products has been taken in order to identify the producers, distributors or suppliers. In order to achieve it, the KOMPASS Database has been used.

The KOMPASS database allows to search following several criteria:

- Search companies by product.
Classification according to the volume (\$) of production.
- Search companies by geographical setting.
- Search companies according to country of export / import trade.

With these three criteria, major industries located in Catalonia with export/import trade to Italy and/or France, corresponding to those products gathered in the previous section, have been identified.

Table 2.21 Producers, distributors, suppliers located in Catalonia with export/import trade to Italy/France.

COMPANIES WITH IMPORTATIONS FROM	
FRANCE	ITALY
ELF ATOCHEM ESPAÑA, S.A.	AGIP ESPAÑA, S.A.
RHODIA IBERIA, S.A.	TH. GOLDSCHMIDT, S.A.
BOEHRINGER INGELHEIM ESPAÑA.	SOC. ESP. ESP. FARM. S.A.
AKZO NOBEL, S.A.	NUEVA TANEX, S.A.
LASA LABORATORIOS, S.A.	FARMHISPANIA, S.A.
COMPANIES WITH EXPORTATIONS TOWARDS	
FRANCE	ITALY
QUIMIDROGA, S.A.	CROMOGENIA UNITS
S. E. DE CARBUROS METÁLICOS, S.A.	PURAC BIOQUÍMICA, S.A.
PPG IBERICA, S.A.	WITCO ESPAÑA
COATES LORILLEUX	CIBA Especialidades Químicas
OTHER COMPANIES	
ARCO CHEMICAL ESPAÑA CORP.	AISCONDEL
DU PONT IBÉRICA	HISPAVIC INDUSTRIAL, S.A.
FMC FORET, S.A.	SOLVAY ESPAÑA, S.A.
BENCKISER	MERQUINSA MERCADOS QUÍMICOS, S.A.
AGROPECUARIA DE GUISSONA	KAO CORPORATION, S.A.
ERKIMIA, S.A.	HENKEL IBÉRICA, S.A.
ROHM AND HAAS ESPAÑA, S.A.	DSM ESPAÑA, S.A.

2.7.2 LOCATED IN THE HINTERLAND OF PORT OF GENOA

Producers or distributors in the hinterland of Port of Genoa have also been identified; they are gathered in Table 2.22.

Table 2.22 Producers, distributors, suppliers located in Italy with export / import trade to Spain and France.

LOCATED IN ITALY	
LONZA S.p.A.	AUSIMONT
SISAS S.p.A.	BAYER ITALIA S.p.A.
SYNTHESIS S.p.A	SOLVAY
F.A.R. Fabbrica Adesivi Resine	GUIDO TAZZETI & C. S.p.A.
AHLSTROM PAPER GROUP- Bosso Carte Speciali	CHIMICA POMPONESCO S.p.A.
SHELL ITALIA S.p.A.	ECOFUEL S.p.A.
HENKEL CHIMICA S.p.A.	POLIMERI EUROPA
ENICHEM S.p.A.	

2.7.3 LOCATED IN RHÔNE-ALPES AND PACA

The industries located in both regions have been identified from several sources that were recouped, but none of them are much precise on the regional origins and destinations of cargo flows.

- Directories (paper and Web) of the Chemical professional organisations.
- Database "FRANCE - EXPORT"
- Database Paris Chamber of Commerce.

The criteria retained for selecting producers, suppliers and traders among the extensive lists of firms (up to 400 in both regions) are:

- Export / import to / from one of the two countries (not regions) and in several cases to "Europe" without any more detail;
- Turnover above F 100,000,000 / 15,244,900.
- Producing / trading products of the scope but excluding commodities known to be shipped in limited volumes (e.g. pharmaceutical products, essential oils).

Mention is made to in the list of one or both countries when it appeared in the data, but such cases are rare and concern only a few companies in the Rhône-Alpes region. These lists may however be retained for enquiring or prospecting purposes in the future market studies, together with lists of F/As –truckers who specialise in the transport of chemicals and are playing an active role in the choice of the ways and modes of transport (ref. below Section 4. ShortSea Shipping Features and Section 5. Views of interested parties).

Table 2.23 Producers, distributors, suppliers located in Rhône-Alpes and PACA with export/import trade to Spain and Italy.

COMPANIES LOCATED IN FRANCE	
PACA	RHÔNE-ALPES
Aluminium Pechiney	Aluminium Pechinery
Brenntag	AMOCO Chemical
Cabot-France	BASF
Dow-Corning	BAYER
Elf-Atochem	CEZUS Chimie (Italy)
Ferro-Chemicals	Cyanamide (Spain)
France-Polymères	EKA NOBEL
Gazechim	Elf-Atochem
Hyplast-France	Gifer-Barbuzet (Italy + Spain)
Javel-Leglobe	Groupe Vaissière-Favre
Legré-Mante	Gattefossé SA (Spain)
Lambert - Rivière	Gazechim
Naphtachimie	Givaudan-Lavirotte
Oxochimie	Hoechst
Presta-Négoce	Ets Joud (Italy + Spain)
Shell-Chimie	Métaux spéciaux SA
Société Noir d'acétylène	Pharmacie Centrale de France (Italy + Spain)
Solvay	Rhône-Poulenc Agro. / Chimie / Silicones (It + Sp)
SPCA-Barcroft	Roussel Uclaf
Oil Companies:FINA, ESSO, BP, MOBIL, TOTAL	Sandoz Chimie
Companies identified in the list for Spain/Catalonia	SEPC
	Société Française de Distillerie (Italy)
	Speichim
	Wacker-Chimie

Chemical producers, suppliers, distributors, etc. identified in this section have been contacted in order to obtain their views on the shortsea shipping. The views of other parties, shipowners, forwarders, road transport agencies, etc. have also been collected for a general description of the current situation.

The results of these interviews as well as from several contacts with other agents are presented in Section 5.

3. RISK ANALYSIS IN ROAD AND SEA TRANSPORT

3.1 INTRODUCTION

Recent casualties in road transport –Mont-Blanc tunnel, Tauern tunnel- have highlighted the significance of the transport of hazardous materials by road and the dangerous features of this mode of transport, specially in high-density roads or near urban zones.

According to several studies² an analysis of a large number of accidents showed that the number of accidents occurring during transport accounted for approximately 40% of total accidents. Table 3.1 shows data on the distribution of the origin of accidents.

Table 3.1 Origin of the accidents.

Origin of accidents	Number of registers	% of total
Known general origin	5992	97.1
Unknown general origin	176	2.8
Transportation	2341	39.1
Process Plant	1469	24.5
Storage Plant	1044	17.4
Loading / Unloading	494	8.2
Domestic / Commercial	348	5.8
Warehouse	225	3.8
Waste Storage	71	1.2

However, even though statistical analysis show the importance of transportation accidents, and although there are national and European regulations (ADR), it seems that there isn't a general legal approach, similar to Seveso II directive, to deal with this social problem.

As a measure of the significance of this subject, it has to be taken into account that approximately 2,200 trucks crossed a day (800,000 annually with peaks at 4,000 on certain days) the Tunnel of Mont-Blanc, with a significant number of them corresponding to trucks carrying hazardous materials. The flow of passenger cars during the summer is about 8,000 vehicles a day.

Another significant figure is that approximately 400 professional drivers died in Spain during 1997 from road accidents.

² Vílchez, J.A., Sevilla, S., Montiel, H., Casal, J., Historical analysis of accidents in chemical plants and in the transportation of hazardous materials, *J. Loss Prev. Process Ind.*, 1995, 8, pp. 87-96.

Haastrup, P. and Brockhoff, L., Severity of accidents with hazardous materials. A comparison between transportation and fixed installations, *J. Loss Prev. Process Ind.*, 1990, 3, pp. 395-405

As a result of the recent accidents the security of road transport has been questioned and public pressure has appeared asking for a more safe and environmental-friendly way of transporting hazardous materials.

It is obvious, therefore, that a survey of the feasibility of substituting land transport by shortsea shipping could not ignore the risk aspects of the different transportation modes. In the next paragraphs the main points of these aspects are analyzed.

3.2 FREQUENCIES / CONSEQUENCES OF ACCIDENTS

Frequency of accidents

In one side the frequency of accidents has to be considered as a major parameter to compare the number of accidents for the different modes of transport. Frequencies of accidents in road and in sea transport are reported in the bibliography³.

Table 3.2 Frequencies of accidents.

Mode of transport	Event	Frequency
Road transport	Truck accident rate for highways	3.8×10^{-6} per mile travelled
Sea Transport (Port of London)	Frequency of ship-ship collision of moderate severity due to harbour movements	0.5×10^{-4}
	Frequency of berthing contact	1.5×10^{-4}
	Frequency of grounding	0.3×10^{-4}
	Frequency of fire	0.5×10^{-4}
	Total sea transport*	2.8×10^{-4} per harbour movement

* Total frequency for sea transport doesn't consider incidents during the trip. These incidents would be not significant when compared with the incidents during harbour operations.

Table 3.2 shows that the frequency of accidents for road transport depends on the distance travelled while for sea transport frequency depends mainly on the number of ports called.

Consequences of accidents

On the other side, the consequences of the accident are the second parameter to take into account.

³ Lees, F.P., Loss Prevention in the Process Industries, Butterworths & Co, London, 1986.
Rhyne W.R., Hazzardous Materials Transportation Risk Analysis, Van Nostran Reinhold, 1994

The detailed analysis of the effects and consequences of the diverse accidents have not been included in this study. In fact, the assessment of the diverse typical scenarios for the most representative cases were not included in the targets of this preliminary study. However, both the higher frequency of road accidents and the features of the different scenarios (a high probability of having people near the accident –village or urban areas, crowded roads– in the case of road transport) leads to the qualitative consideration that road transport is clearly associated to higher losses.

Assessment of risk

According to the definition of risk usually accepted, the risk associated to each mode of transport can be assessed as:

Risk = Frequency * Consequences

3.3 RISK ASSESSMENT: ROAD AND SHORTSEA TRANSPORT

In order to assess the risk associated to each mode of transport, an example has been developed.

Table 3.3 Initial data.

Initial data	ROAD TRANSPORT	SHORTSEA SHIPPING
Total Cargo	500 TEU	500 TEU
Number of trucks / ships	250	1
Two distances considered (km)	500	750
2 ports called	Port 1	Port 2

The frequency of incidents can be calculated for the different modes of transport from Table 3.2 as follows:

Road: 250 lorries * distance * frequency = total frequency

ShortSea: 1 ship * 2 ports * frequency = total frequency

Table 3.4 Resulted frequencies.

	500 km	750 km
Road	0.295	0.443
ShortSea	0.00056	0.00056
Road / ShortSea	527	791

Table 3.4 shows that the frequency of accidents for road transport is 500 to 800 times bigger than the frequency for sea transport. For sea transport, the frequency depends mainly on the number of ports called.

NOTES:

1. In the evaluation of frequencies for shortsea transport, those contributions corresponding to the transport from the factory A towards Port 1 and from Port 2 to final destination in factory B should be added. If we consider an example:

Road: 50 km from Factory A to Port 1
 50 km from Port 2 to Factory B

Shortsea: 500 km from Port 1 to Port 2

Then the frequency would be the contribution of each part of the multimodal chain.

Table 3.5 Resulted frequencies for multimodal option.

Mode of transport	Distance	Frequency
Road	100 km	0.059
ShortSea	500 km	0.00056
Total		0.05956

From the total frequency of accident 0.05956, that part from road accounts for 99% and that part from shortsea accounts for 1%.

2. Resulted frequencies showed in Table 3.4 could be different if we consider other sources from the bibliography⁴. In this reference, a study carried out during 1979 to 1990 is presented for the transport of hazardous materials in Spain.

For a number of 5,772 roadtankers, an averaged distance travelled of 70,000 km per year and 226 accidents in a year:

$$\frac{226 \text{ accidents / year}}{5,772 \text{ roadtankers} \cdot 70,000 \text{ km / roadtanker} \cdot \text{year}} = 5.6 \cdot 10^{-7} \text{ accidents / km}$$

⁴ Transporte de mercancías peligrosas por carretera (Road Transport of hazardous materials), Protección Civil, 11, 1991.

The resulting frequencies would be:

Table 3.6 Resulting frequencies.

	500 km	750 km
Road	0.07	0.105
ShortSea	0.00056	0.00056
Road / ShortSea	125	188

Although there is a variation of a factor 4 in the resulting frequencies showed in Tables 3.4 and 3.6, the conclusion is still the same: sea transport is at least 100 times safer than road transport in terms of frequency of accidents.

3.4 ROAD TRANSPORT ACCIDENTS: LAST CASUALTIES

Recent road casualties highlight the risks associated to road accidents, especially if they happen in a tunnel of considerably longitude.

In order to stress the presence of tunnels in the Mediterranean arc, a survey of tunnels has been made in the Italian territory, for the region that connects the north of Italy and the French border.

Table 3.7 Motorway tunnels in the Italy-French border.

	Motorway	Motorway Length Km	No of tunnels	Tunnel Length km	% Tunnels Length
A7	Genova-Serravalle	45	12	3.724	8
A7	Serravalle -Genova	45	15	9.325	21
A7	Serravalle -Milano	62	0	0	-
A7	Milano-Serravalle	62	0	0	-
A10	Genova-Savona	46	50	18.120	40
A10	Savona-Genova	46	41	10.200	22
A10	Savona-Ventimiglia	113	63	31.64	28
A10	Ventimiglia-Savona	113	63	31.64	28
A12	Genova-Sestri L.	45	32	23.898	53
A12	Sestri L. -Genova	45	33	23.873	53
A12	Sestri L. -La Spezia	46	17	10.645	23
A12	La Spezia-Sestri L.	46	15	8.929	19
A26	Genova V. -Alessandria	67	27	12.751	19
A26	Alessandria-Genova V.	67	24	12.525	19

Motorway		Motorway Length Km	No of tunnels	Tunnel Length km	% Tunnels Length
A21	Alessandria-Torino	71	0	0	-
A21	Torino-Alessandria	71	0	0	-
	Torino-Savona	125	44	18.875	15
	Savona-Torino	125	44	18.875	15
	La Spezia - Ventimiglia	250	161	82.562	33
	Ventimiglia -La Spezia	250	153	76.383	31
	Genova-oltre Appennino (via Serravalle)	38	12	9.325	24
	Oltre Appennino (via Serravalle)- Genova	37	27	12.751	34

Table 3.7 shows that for some routes tunnels account for more than 50% of total kilometres and that tunnels account for 20 to 30% of total route for most motorways. These figures stress the risks associated to land transport of chemical products as recent casualties have demonstrated.

3.4.1 THE ACCIDENT OF MONT-BLANC TUNNEL

Date: 24 March 1999

Hour: 11.00 a.m.

Location: Mont-Blanc tunnel, Chamonix (11,600 m); 2 lanes tunnel.
It connects France and Italy.
Approximately 2,000 trucks crossed everyday the Tunnel of Montblanc.

Features: The disaster is reported to have started when a lorry transporting 12 tons of flour and 8 tones of margarine caught fire in the middle (km 6) of the tunnel. The fire is supposed to have started due to a short-circuit in the refrigeration system of the lorry.
The smoke brought on other collisions and explosions and four hours after the fire the temperature was still 500°C at 1,000 m from the origin.
41 people are known to have died.
27 were injured
Up to 34 vehicles involved although many of the passengers were able to make their way to safety on foot.

Results: Traffic is re-routed through the Fréjus tunnel. The French government order a technical-administrative survey on the safety measures of French tunnels and limits the circulation conditions through the Fréjus tunnel.

Safety distance for vehicles carrying hazardous materials was 200 meters.

MEASURES TAKEN TO DEAL WITH THE TRAFFIC AT THE FRÉJUS TUNNEL

In order to reduce the danger at the Fréjus tunnel, the French government took several measures:

- Maximum velocity is reduced from 80 to 70 km/h.
- Heavy traffic is limited to 140 vehicles per hour.
- Safety distance between vehicles augmented from 30 (cars) and 50 (heavy traffic) to 100 metres for all vehicles.
- Vehicles carrying hazardous materials should be escorted when crossing the tunnel.
- Number of extinguishers per kilometre augmented.
- Two security patrols will take care of the security of the tunnel 24 hour per day.

NOTE:

The full reports on the Mont-Blanc tunnel accident are now released on the Internet address: www.equipement.fr.

3.4.2 THE ACCIDENT OF TAUERN TUNNEL

Date: 29 May 1999

Hour: 4.50 a.m.

Location: Tauern tunnel (6,400 m); 2 lanes; Tauern Autobahn (the most important Austrian motorway, it connects Salzburg with the Carintia region and the Italian border).

Features: The disaster is reported to have started when a lorry caught fire after colliding with a car at the northern entrance (600 m inside) of the tunnel. The lorry is suspected of high speed (70 km/h with a 30 km/h limit). 5 people are known to have died. 49 were injured. Up to 60 vehicles involved although many of the passengers were able to make their way to safety on foot. It caused a 40 km queue.

Results: Calls for parallel escape routes to be built at the 25 years old Tauern tunnel and the nearby Katschberg tunnel.

NEW LEGISLATION IN AUSTRIA ON THE TRANSPORTATION OF DANGEROUS GOODS

Recently, the Austrian Parliament has confirmed a decision taken by the government which restricts the transportation of dangerous goods by road on major routes in Austria. The restrictions ban such transports between 15 June and 15 September 1999 and from Friday 8.00 a.m. until Sunday 10.00 p.m. The main consequences for chemical distributors are:

- Deliveries on Fridays will be more expensive or will be made impossible.
- Use of alternative routes will increase time of travel and costs, risk will be augmented considerably by using such routes.
- Deliveries will be concentrated on four days per week, which will increase the traffic volume.
- The degree of the utilisation of the car park (trucks) will be reduced, since distributors will have to cancel deliveries on Fridays.
- Car park costs will increase by 20% as a consequence.
- Transit of dangerous goods through Austria will come to a halt on Fridays at 8.00 a.m. and will massively start again on Monday morning.
- Industry at large will be affected; deliveries to gas stations before the weekends (high demand on holiday traffic routes), or, transportation of bitumen for road surfacing will not be possible.

The new “tunnel decree” will entail additional difficulties for distributors:

- Passing through single pipe tunnels without an accompany vehicle using flash lights is banned. These vehicles cost, one way, between ATS 500 and ATS 1,000 with waiting times of about 1 hour.
- Parking space at the entrances of tunnels for waiting lorries with dangerous goods is not available in most cases.
- It should also be mentioned that vehicle checks by the competent authorities will be more frequent, each check lasting for at least 60 minutes.

3.5 OVERALL CONSIDERATION ON RISK FEATURES

Taking into account the data gathered on the diverse accident frequencies, the consideration concerning the effects and consequences of road and sea transport, and the features of the recent accidents happened in Europe, it is clear that from the point of view of the safety of people shortsea shipping is much more adequate than road transport

From an economical point of view, one of the major advantages of maritime transports, i.e. the possibility to move cargoes every day and night (including Saturdays, Sundays and holidays) is clearly related to the possibility of increasing by as much as two days a week the deliveries dates as a counterpart of slower trips.

4. SHORTSEA SHIPPING FEATURES FOR THE TRANSPORT OF CHEMICALS

4.1 INTRODUCTION

According to the Shortsea Shipping Information Bureau⁵, “*Shortsea Shipping is the intermodal transport of Intra-European cargo on a door-to-door basis, ususally in containers or trailers. A large part of the transport traject is done by sea*”.

This definition is more restrictive than DG VII’s (see above page 4), but it is justified by the fact that the Shortsea Shipping Bureau of Netherlands main objective seems to be concentrated on containers and trailers (not bulk sea shipping) and on intra-European trades (not with non-EU countries).

In this study, and considering the important volumes of bulk cargoes moving by road, a particular stress is similarly put on containers and trailers, but it appeared justified to address also the bulk carriage issue, ie. to explore the possibilities of shifting commodities in bulk from road to full or parcel-tankers.

Shortsea Shipping covers maritime transport services that do not involve any ocean crossing. It includes maritime transport along the coast and between the mainland coasts and islands. It covers national transport (usually called cabotage) and cross border services, as well as sea-rivers transport by coastal vessels to and from ports in the hinterland.

Shortsea shipping also covers maritime transport between the Member States of the Union and Norway and Iceland, other States in the Baltic Sea and the Mediterranean areas.

The shortsea shipping sector is extremely diverse. It covers simultaneously:

- Regular shuttle links or pure tramp fixtures of bulk liquid/solid/gas cargoes as well as container, Ro-Ro or sea-river liner services accepting containers / trailers / rolling stocks/ breakbulk, and car-ferries operated on the passagers market but accepting motor vehicles (including trailers).
- Large movements of crude oil or water by 120 000 dwt and tankers, as well as micro-coastal shipments of sand or stones with very small dredgers or barge-type vessels.

Large bulk flows are already shipped mainly in coastal vessels; however most manufactured and semi-factured goods are transported by road. It is this market that is suitable to be substituted by shortsea shipping, mainly Ro-Ro and container liner services, but also possibly full or parcel-tankers when feasible.

⁵ Shortsea Shipping Information Bureau, The Netherlands, <http://www.shortsea.nl/en/welkom.htm>

The traditional distinction between tramp trades (in the sense of homogeneous and unpacked cargoes) and liner trades (in the sense of unitised cargoes and, to a limited extent, breakbulk cargoes) is valid in the shortsea sector as it is in deep-sea markets. Its commercial consequences are that in the first instance there are a very limited number of shippers and consignees with the most frequent case of one single shipper / charterer for one fully loaded vessel, while in the second instance the market is that of a retail commerce, with the ship carrying hundreds of consignments under the same number of Bills of Ladings.

The Chemical industry is working on both markets and it is concentrated enough for simplifying the promoting /marketing approaches by shipowners or by their agents in the shortsea markets.

On the supply side, neither the types of vessels nor their sizes or their technologies are sufficient to define short sea transport, since small vessels may be operated on ocean routes while large containerships may connect neighbouring ports within their long distance schedules.

For all those reasons, and considering that the Barcelona-Marseille-Genoa triangle should offer opportunities for transferring chemical goods from the road-only to sea or sea-multimodal transports, the choice was made to concentrate on the competitive aspects of sea carriage only versus road.

4.2 SHORTSEA SHIPPING BASIS

Shortsea Shipping transport is based on the door-to-door basis, or factory to factory, with the greater part of the journey by sea; this fact involves that various means of transport – intermodal- are used. Truck, barge or rail does collection in the origin and delivery at destination.

Maritime transport in shortsea is based mainly in containerised cargo on containerships, feeders, and RoRo ships (on mafi-type trailers or not). Container is the most suitable transport unit due to its degree of adaptation of all modes of transport, thus allowing the intermodality.

Containers carry several cargo elements –pallets- and all this cargo is dealt as a whole transport unit during all phases of transport. This feature of containers allows for a reduction of costs involved in transport and a time reduction when handling the cargo at the origin, in the transfer areas and at the destination.

Shortsea transport is suitable for all kinds of cargo in containers. Partloads on groupage containers, chilled and frozen cargo in reefer containers, liquids in tank containers and dry bulk in bulk containers can also be shipped on shortsea vessels.

However, trailers have several advantages over containers: adaptability to larger volumes of all types of pallets (and particularly Euro-pallets), easier stuffing and stripping operations as well as handling in ports when shipped on Ro-Ro vessels, variety of techniques (reefer, tanks for dry, liquid and gaseous products). All this makes them technically and commercially fitted for almost the whole trade. But such is not the case from a financial point of view, since trailers (and trucks) are costing several times more than containers, even special containers.

Last but not least, the transport regulations for dangerous cargoes are much more restrictive for sea-carriage than for road-haulage, and the two series of rules for each mode are far from being harmonised.

Therefore, the chemical industry and transport providers who are currently using dominantly road carriage are naturally better used to trailers than to containers, and it is a disputed issue to arbitrate between the two types of equipment.

Regular liner services appear to be clearly the response to the challenge of cargo transfer from the current all-road schemes to shortsea alternatives, but not the only one since a few bulk trades could possibly be shifted to full or parcel tanker ships.

4.3 TRANSPORT OF CONTAINERISED CARGO

The evolution of container traffic in the last years shows a sustained development in the whole world. Container traffic presents several advantages that makes it suitable for the transport purposes:

- a) Operation costs: exploitation costs in a container terminal could be much lesser than exploitation costs in a conventional general cargo terminal measured per ton handled.
- b) Productivity: productivity measured per man is much bigger in container movements than for conventional general cargoes, which also involve higher costs, less reliability and safety of operations.
- c) Safety: the use of containers offers more protection to the cargo, both during manipulation and transport operations, allowing also less requirements in the origin and destination.

According to the International Standard Organisation –ISO– a container is an instrument of transport that accomplishes with the following features:

- a) It has a permanent character, strength enough to allow for a continuous use.
- b) It has been specially designed to facilitate the transport of goods, without rupture in the cargo, by different modes of transport.
- c) It incorporates devices that facilitate its handling, mainly when transferring from one to other mode of transport.
- d) It has been designed in a way that facilitates its loading and unloading from a mode of transport.
- E) Its intern volume is at least of a 1 cubic meter.

There are two series or types of containers: normalised containers by the International Standards Organisation (ISO), and non normalised types although there is a ISO proposal for their normalisation.

4.3.1 ISO CONTAINERS

The parameters that characterise a container are: maximum length, width and height, maximum gross weight and structural strength. Inner dimensions are also of a great importance in order to distribute the pallets, drums or other cargo units into the container.

Table 4.1 ISO serie 1 containers suitable for maritime transport.

Maximum dimensions and maximum weight				
Container	Length (mm)	Width (mm)	Height (mm)	Max. Gross Weight (kg)
1AA (40 ft)	12192	2438	2591	30480
1A (40ft)	12192	2438	2438	30480
1AX (40 ft)	12192	2438	<2438	30480
1BB (30 ft)	9125	2438	2591	25400
1B (30 ft)	9125	2438	2438	25400
1BX (30 ft)	9125	2438	<2438	25400
1CC (20 ft)	6058	2438	2591	20320
1C (20 ft)	6058	2438	2438	20320
1CX (20 ft)	6058	2438	<2438	20320
1D (10 ft)	2991	2438	2438	10160
1DX (10 ft)	2991	2438	<2438	10160

Containers belonging to 1A, 1AA, 1B and 1C series are the most used in maritime transport. They all have the same width. Concerning their length, 20 to 40 feet is suitable for a modular disposition in cellular containerships, allowing different combinations of containers of different length. Nowadays all containerships are designed to optimise the disposition of containers of 20 and 40 feet and all port handling equipment is also designed for the same purpose.

As the majority of cargo moving in trailers is palletised, the European Industry has adapted its transport patrons to allow cargo units made of pallets of 1000 x 1200 mm or 800 x 1200 mm. These dimensions have been recognised by international organisms and are written down in the ISO 6780. European transport companies work also with 400 x 600 mm units that are compatible with the aforementioned units.

Detailed information on different types of containers: refrigerated containers, isotherm containers, dry bulk containers, etc. is collected in Annexes VII and IX.

Containers belonging to ISO serie 1 are not suitable to admit and optimise the disposition of these pallets as the inside width is only 2.33m (Figure 4.1) Due to this reason, for normalised pallets under ISO 6780 a new container has been recently developed: the 40 feet pallet wide container, for which the loading capacity is 24 pallets of 1x1.20m.

This container has a inner width slightly bigger than 2400 mm and allows for a suitable distribution of pallets ranging from 1000 x 1200 to 800 x 1200 or 400 x 600 mm. With these containers, two pallets can be fit contiguous.

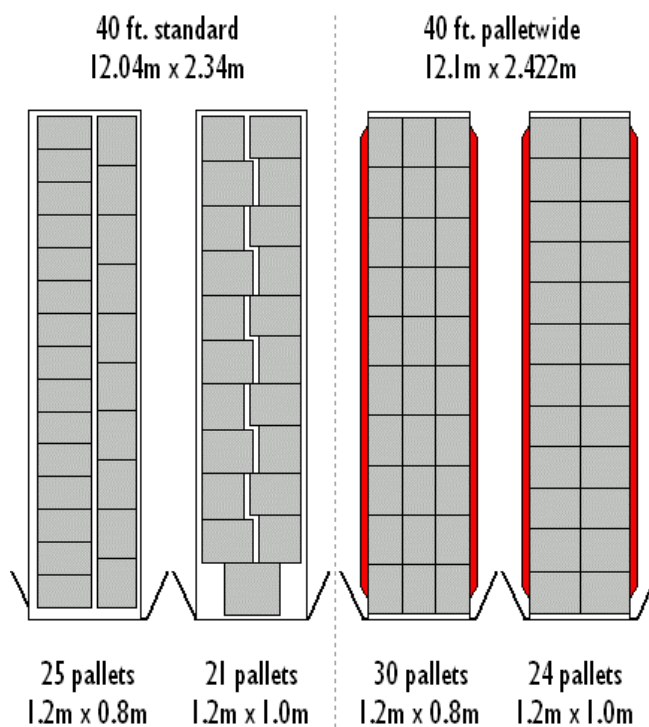


Figure 4.1 Standard 40 ft container ISO serie 1 and 40 ft pallet wide container.

To improve the efficiency of ISO 1 containers, ISO serie 2 containers were developed for a better use of room in containers. The International Standards Organisation edited in 1995 a documentation with the ISO serie 2 containers, containers dimensions gathered in Table 4.2.

Table 4.2 ISO serie 2 containers suitable for maritime transport.

Maximum dimensions and maximum weight		
Length	14900 mm	(49 feet)
	7430 mm	(24 ½ feet)
Width	2590 mm	(8 ½ feet)
Height	2590 mm	(8 ½ feet)
Max. Gross Weight	30480 tons	

If we compare the 20 feet pallet wide container and the 24 ½ feet ISO 2 container, ISO 2 allows for 18 pallets of 1200 x 800 mm while the pallet wide allows for 14 pallets. However, current containerships are not designed to admit ISO 2 containers except on top of the last rows, and apart from few experiences which are currently being tested in some shortsea trades lanes, neither the rail infrastructure, suitable to allow containers 40 or 60 feet or road transport, for which the 49 feet length exceeds the maximum legal length.

Other non-standard containers have been developed and are actually being used for specific destinations, as the 45 feet pallet wide container (13.62m).

When interviewed on the trailers / containers alternative, some shippers (PVC) have advised they were looking for 30' solid bulk / boxes, which would satisfy them as much as the bulk trailers they are now using in view of the weigh limits and the progress of being exempted of pallettisation and lengthy handling on their own terminal sites.

4.4 CONTAINERSHIPS AND FEEDERS

The existing connections between Barcelona, Genoa and Marseilles are of two types :

- 1) Deep sea container Lines scheduling two or all of the three ports within fixed-day and minimum weekly calls are operating ships from 1,000 TEUs and up to 3,500 TEUs capacities.

They are already loading and discharging containers between the three ports, but this is mainly non-commercial trade of empties to be positioned / repositioned for Lines' own logistical purposes, e.g. for maintaining capacities in their inland/terminal depots or reduce imbalances of equipment.

2) Feeder operators whose shortsea vessels (300 to 1,200 TEUs) are calling on fixed-week days two or all of the three ports, thus connecting deep-sea vessels calling direct mainports with ports that are not included directly in the basic schedules. These services are offered by:

- Each Line's dedicated sub-carrier when the Line has enough volumes to deal with on its own;
- Common carriers acting for the account of several deep-sea Lines who prefer to outsource this business.

There again, the vessels are mainly moving deep-sea containers and empty positioned / re-positioned boxes..

Eight (8) intercontinental and six (6) intra-zone weekly / fixed day service vessels calling at least two of the three ports were identified in June 99, plus (4) feeder ships operators, with speeds comprised between 15 and 24.5 knots, i.e. from 8 hours (fastest Barcelona-Marseille) up to 24 hours (slowest Genoa-Barcelona). A number of regular but non-fixed days sailings could be added to this total, thus representing a potential supply of more than a sailing per day between at least two of the three ports.

4.5 RO/RO VESSELS

The roll-on / roll-off (Ro-Ro) concept of sea transportation facilitates rapid loading and discharging of cargo. Cargo is transported into and out of the vessels on wheeled vehicles and loaded via openings in the vessels' side, bow or stern.

The concept of Ro-Ro marine carriage of cargo has grown gradually on shortsea routes, especially throughout Europe.

The West Mediterranean sub-region is a maritime zone where the Ro-Ro sector is quite developed and improving with recent or expected newbuildings:

- Pure Ro-Ro freighters and Ro-Ro/containerships on North-South and West Med-East Med routes, particularly from Italy, France and Spain to Maghrebian ports.
- Ro-Ro-paxes and ferries on the same North-South routes and with or between islands.

One Liner operator has recently opened an East-West service with both vessel types between Italy and Spain, thus offering the most simple substitute to road haulage, with one sailing of each type both ways every two days (i.e. one daily departure) for trailers including drivers.

i) Trailers may embark with their drivers onboard of Ro-pax ships and car-ferries : the transport is then made on the same door-to-door basis as an all-road carriage, with fast

embarking/disembarking movements in ports (but not necessarily low costs) as drivers are taking care of their trucks themselves for those operations (instead of dockers and port workers), while they may take the advantage of the sea trip for their resting obligations.

ii) Unaccompanied trailers onboard of Ro-Ro freighters imply longer loading / unloading and more costly operations, but savings are obtained by road hauliers who do not count the sea-tariff onboard as working or resting times. It is to be noted in this respect that the burden of handling charges is there at the vessel's expense, which could lead to higher freight-rates for shorter trailers than for longer trailers and trucks which are self-handled in ports when drivers have accompanied the vehicles.

Road hauliers and maritime Lines have been consulted on the respective advantages and costs of both formulae, and although there is no definitive standard for all road transport companies, the balance is in favour of accompanied vehicles for the shorter distance e.g. like on the Channel (Marseille-Barcelona, Marseille-Genoa), while for longer distances (Genoa-Barcelona) the social costs of this solution is considered as too high.

4.6 FRANCE / ITALIE / SPAIN LINKS

In the following tables, a summary of road distances between the three considered regions is presented, as well as speed / transit time for different types of vessels.

Table 4.1 Road distances (km).

	Marseille	Barcelona
Genoa	397	860
Barcelona	503	--

Table 4.2 Maritime distances (N. miles).

	Marseille	Barcelona
Genoa	201	352
Barcelona	187	--

Table 4.3 Maritime Transit-time (Hours) versus speed (Knots).

	Marseille			Barcelona		
Speed (Knots)	15	18	22	15	18	22
Genoa	13.40	12.00	9.10	23.50	20.00	16.00
Barcelona	12.50	10.40	9.00	--	--	--

To these duration, an average of 1 to 2 hours should be added at both ends (ports) for the loading / unloading operations, plus the possible waiting time for trailers arriving in advance.

Table 4.4 Road Transit-time (hours) versus average speed (Km/h)

	Marseille		Barcelona	
Speed (Km/h)	70	90	70	90
Genoa	5.70	4.40	12.30	9.60
Barcelona	7.20	5.60	--	--

To these duration, an average of 45 minutes of resting period every 8 to 10 driving hours should be added.

The door-to-door comparisons, which may only be made from precise points of origin to precise points of destination and for actual shipments, leave a general advantage to road in terms of duration for all distances in the areas of the study, so that it is necessary to highlight with the parameters that are favourable to sea transport, i.e. :

1. apart from a few bad weather days mainly in winter, and provided there are no social troubles in ports, sea shipping is generally more reliable with regards to the time of arrival in ports. Road transport is more uncertain as it depends on road congestion, particularly in the coastal and mountain motorways (seasonal parameters);
2. sea shipping offers the possibility to move cargoes 7 days a week and 24 hours a day, and this should be taken into account in a complete cost/benefit comparison ;
3. distances to ports at both ends are also an important factor. The constraints of pre and on - carriage by road (deviation time) may be relieved for certain roads and on certain days but not in all cases ;
4. time schedules properly adapted to the road carriers' needs may reverse the advantages of all-road, e.g. drivers' resting time on board, embarking prior to road restrictions and disembarking after road restrictions (week-ends)...
5. logistical solutions slightly modified by the industry may bring improvements in of their operations, e.g. charges in working time for stuffing / stripping, in storing practices, procedures etc...
6. the cost factor is of course a decisive element, and the first estimates made are showing that maritime transport is cheaper than road on a port to port basis, but that it must keep this advantage for door-to-door operations in a proportion of 20%⁶ if it is to compensate its own inconvenience (lack of flexibility, lengthy procedures etc...).

Table 4.5 is a recapitulative of both container and Ro-Ro shortsea dedicated services amongst the three ports.

⁶ This was also the calculation made by MERCER in the studies for the E.E.C. and the Chamber of Commerce of Marseilles in 1994 - 95 ("Métro côtier" project, i.e. Ro-Ro services between the three same ports).

Table 4.5 West Mediterranean Shortsea Inter-Port Services⁽¹⁾ and total frequencies. (June 1999)

SHORT SEA SERVICES	LINES	SERVICE	Genoa	Marseille Fos	Barcelona	Speed	Remarks
RO-ROS	GRIMALDI	Italy - Spain	X		X		<u>daily</u> ½ + passengers
Weekly/fixed dayx	GRIMALDI COMANAV - IMTC - GRIMALDI	West Med. /N. Africa Med. / Morocco	X X	X	X X	16 11 - 15	+ containers + containers
Non-weekly/non fixed Days	GRIMALDI - GILNAVI	West Med. / Near East	X	X		17 - 20	3/m.
CONTAINERSHIPS	BORCHARD	West Med. / Near East	X	X	X	15 - 16	
Weekly / fixed days	BORCHARD COMANAV - GRIMALDI - TARROS MEDIT.SHIPPING Co	West Med. / Dardanelles Med. / Morocco Med. / Canary	X X X	X X	X X	15 16 - 5 17 - 20	
Non weekly/Non fixed Days	GRIMALDI - MED FERRY MSC MEDIT. SHIPPING Co.	West Med. / Israel Med. / Red sea	X	X X		15 - 17 15 - 16	3 /m. 3 /m.

	RO-RO		CONTAINERS ⁽¹⁾	
	Weekly	Monthly	Weekly	Monthly
GENOA - BARCELONA	8	33-34	6	34-35
GENOA -MARSEILLE	1	7-8	4	23-24
BARCELONA-MARSEILLE	1	4-5	5	23-24

1. Not included: inter-port services of deep-sea liner services (all containers).
Including Ro-Ro / containers.

A new weekly sea-river container service is to be opened by the end of July between Barcelona and the river harbours of Arles and Lyon (capacity 90 TEU).

4.7 COSTS ANALYSIS FOR ROAD, RAIL AND SHORTSEA TRANSPORT

A brief analysis of costs has been done in order to identify the opportunities of Shortsea Shipping in terms of costs.

The costs and ranges of costs are indicative only, since regular lines do not currently serve some of the routes considered in this report. They result from operators' official tariffs when available, from interviews and from the consultants' own hypotheses/estimations.

Costs are based on a door-to-door services and are expressed in EURO.

4.7.1 RAIL COSTS

Contacts with several transport companies were arranged to collect updated costs for the transport of containers by rail. Transport costs include the use of terminal equipment.

Costs from collection and delivery have to be considered. Suggested tariff (road transport) for a radius up to 30 km around the rail terminals is 150 EURO.

As a result of these contacts Table 4.6 shows an averaged railway cost for the transport of a hazardous container.

Table 4.6. Averaged railway costs for a 40' container carrying hazardous material.
(Including 300 EURO for collection and delivery)

Origin / Destination	MARSEILLE		GENOA	
BARCELONA	rail transport	700	rail transport	1000 - 1200
	collection and delivery	150 x 2	collection and delivery	150 x 2
	TOTAL	1000	TOTAL	1300 - 1500

NOTES:

There is not any direct railway link amongst the three ports and therefore the transit time is very long, approximately 4 days to Marseille. If a direct railway link was established, according to conversations with rail operators, prices could be lower although there is not an averaged percentage of reduction.

4.7.2 ROAD COSTS

The costs in road transport depend on the market, the season, the company and many other factors. In this case we propose a range of costs to work with, costs that have been gathered during interviews and contacts with representatives of several transport companies.

The volume of cargo -number of trailers/containers- per week is the driving force that negotiates the price of transport.

Tables 4.7a and b show the cost for the transport of a trailer (16,5m) and a tank trailer carrying hazardous materials.

NOTES:

The transport of containers by road is generally limited to the collection and delivery of cargoes in multimodal transport and there are not specific tariffs for long routes.

Table 4.7a. Averaged road costs for a trailer carrying hazardous material.

Origin / Destination	MARSEILLE	GENOA
BARCELONA	600	900

Table 4.7b. Averaged road costs for a tank trailer transporting a hazardous material.

Origin / Destination	MARSEILLE	GENOA
BARCELONA	750	1050

4.7.3 SHORTSEA SHIPPING COSTS (RO-RO)

There are not any shortsea shipping regular lines between Barcelona and Marseille and between Marseille and Genoa at present; there is a regular line -Grimaldi- that serves the route Barcelona - Genoa with two Ro/Ro ships. Although this operator doesn't accept goods classified as hazardous material (under IMDG Code) consults were made to present expected tariffs.

The volume of cargo -number of trailers/containers- embarked/disembarked per week is the driving force that negotiates the price of transport.

Table 4.8a. Shortsea costs for a trailer (16,5 m) and a 40' container.

Origin / Destination	GENOA -Trailer	GENOA -40' container
BARCELONA	1000	900

NOTE:

Costs from collection and delivery have to be considered. Suggested tariff (road transport) for a radius up to 30 km around the port area is 150 EURO.

Table 4.8b. Shortsea costs for a trailer (16,5 m) and a 40' container considering costs from collection and delivery in a radius up to 30 km from the port terminal.

Origin / Destination	GENOA -Trailer	GENOA -40' container
BARCELONA	1300	1200

4.7.4 CONCLUSIONS

A comparison of costs associated to each mode of transport has been done. Table 4.9 collects the costs associated to each mode of transport in the route Barcelona-Genoa for a 40' container and a trailer (16,5m).

Table 4.9. Costs for each mode of transport in the Barcelona-Genoa route.

Barcelona -Genoa route	Trailer (16,5m)	40' Container
Railway	----	1300 - 1500
Road	900	----
Shortsea (Ro -Ro)	1300	1200

The analysis of costs reveals that shortsea transport is more expensive than road transport for the route Barcelona-Genoa; a surcharge of approximately 40% has been detected in this preliminary study of costs.

However, this surcharge could change in the future with the adoption of special measures - taxes for the use of roads in road transport, promotion of shortsea as an environmental-friendly mode of transport-. In this case the shortsea shipping transport could be considered as a feasible option to reduce the congestion of the Mediterranean roads also in terms of costs.

5. VIEWS OF THE INTERESTED PARTIES

5.1 INTERVIEWS WITH REPRESENTATIVES OF THE LOGISTIC CHAIN

As a result of the identification –Section 2.7– of chemical producers, suppliers, distributors, etc located in the hinterland of the three ports, several interviews were arranged to obtain the views of the different parties of the logistic chain.

In view of the wide range of issues that were to be addressed, the relevant information was selected from open sources as well as private studies, and then recouped by interviews with representative actors of the logistic chain: industrial shippers or forwarding agents representing cargo interests, maritime carriers (shipowners or their agents) road hauliers, ports/terminal operators, etc.

In some cases personal interviews were carried out, in other telephone call was used as a suitable procedure to reach the logistic representative; personal experiences on the subject were also taken into account.

Although a questionnaire was designed to start with (see Annex VIII), the results were that the questionnaire served as an introduction and was useful to make interlocutors react on the subject of shortsea shipping.

This method helped also to guide towards the actual decision makers of logistical and transport modes choices, for instance when managers of local plants were only responsible for physical operations such as expedition / reception of trailers, but were not aware of the commercial relationships and organisation between their head office and road hauliers.

According to the experience gained in these contacts, a resume of the views collected during this process is presented according to the shortsea different trades.

5.1.1 BULK CARGOES

According to the chemical industry and operators who are directly acting on this market through their chartering operations, the majority of cargoes exchanged between the three ports that may possibly be carried by tankers / bulkers are already being moved by sea in consideration of the adaptation of vessels tank capacities and unitary tonnage consignments.

Their fluxes are treated directly or via specialist brokers either on regular bases (contracts of affreightment) or on spot bases (voyage charter party), sometimes with the same contracted vessels which are then operated along a sort of shuttle-service scheme (e.g. caustic soda).

In the first instance contract prices are kept confidential, while the international and regional markets determine rates in the second instance. Those, as well as logistical organisations (ports facilities, tanks capacities) are said to be competitive, since there is apparently no foreseeable risk of a reversal of fluxes from sea to land modes.

The statistics of fluxes between the considered regions in section 2.3. –Fluxes between the considered regions– confirm those statements from the industry:

- Major bulk products are pertaining to N.S.T. chapters 3 (oil and oil products), 6 (ores, raw materials) and 7 (fertilisers).
- Maritime mode is already dominant on those commodities when exchanged in large quantities, and conversely the share of road is important when the volumes are low and fragmented.

This is confirmed when looking at tables:

- a) Table 2.3.b. France-Spain, with road transports below 20,000 t. annually for each chapter.
- b) 2.4.b. Spain-France, with a maximum of 30,000 t. of road transport for Chapter 6 - raw materials.
- c) 2.7.b. Italy -Spain: maximum 21,000 t. of road transport (Chapter 6).
- d) 2.8.b. Spain-Italy: maximum 28,000 t. of road transport (Chapter 6).

Exceptions to this general situation are found in the exchanges between Italy and France:

- e) 2.5.b. France-Italy: 65,000 t. of Chapter 3 –oils– and 135,000 t. of Chapter 6 –raw materials– are transported by road.
- f) 2.6.b.: Italy-France: 385,000 t. of Chapter 6 –raw materials– transported by road.

The assumption was made that origins and destinations of those cargoes are disseminated in the two territories, which is fragmenting the unitary consignments, as justified by the figures and graphs of Tables 2.15 and 2.16 (Genoa's hinterland trade with France).

This should be more precisely cross-checked in the two countries in view of the lack of coherence of statistics, but some representatives of the industry indicated that they had to use road transport anyway for some of their bulk shipments that would in any case retain unitised equipment.

An in-depth approach could also be conducted on the possibilities to consolidate bulk products from various shippers/receivers in various regions towards the three ports who would then be considered as distribution centres for their respective hinterlands. Cost reductions resulting from the mass volume effects would certainly be obtained in using common bulker ships, though the comparison with the all-road transport ought to be made also on door-to-door basis. A joint-chartering approach could result from some of the current concentration movements between petro-chemicals industries.

When interviewed on the commercial feasibility of this consolidation of bulk flows, shippers do not formally reject the approach, which oil and refined producers are already practising on a high scale and for much quantities. They are concerned by the increase of road transport for liquid bulks, but they could be reluctant to join new logistic policies. If the technical and commercial obstacles were not definitive, which is the experts' feeling, some common steps could be initiated by Ports towards joint uses of chartered vessels, terminal tank equipment, and inland connections with ports.

With regards to the type of cargoes and vessels that might be concerned, oil, oil products, and gases are outside those sort of development, and the suggestion is that the liquid products / multi-tank vessels are well used to those operations, and that there would be no technical restraints in any of the three ports where berths, tanks, pipes and hoses are properly adapted.

In fact only Genoa presents some constraints as the two existing petrochemical terminals for flammable products, both close to the inhabited area, have not yet found a new relocation.

The main concern of vessel operators and charterers lies in port costs. Short sea ships performing shuttle-type operations are spending up to 40 % of their time in ports, and they are currently trying to improve this productivity with port operators.

In the port costs structure, the vessels daily costs due to waiting time are by far the highest ones (through there is no fixed rule even in the same port), followed by port dues (with the dominant impression that tankers are paying more to Port Authorities than general cargo vessels) and port service charges (pilotage, towage, which are said to be excessively expensive but subject to negotiated reduced rates on frequency and commercial considerations).

It has been said lastly that charterers in the West Mediterranean are sometimes opting for more economical vessels, and retaining occasionally ships in poor conditions, but this applies to single-tankers and not to multi-tank modern ships.

5.1.2 CONTAINER SERVICES

Obstacles to shortsea transport

It could be assumed that as there are regular empty slots on deep-sea and feeder vessels their carriers could offer spaces at marginal costs for the transport of chemical cargoes between the three ports, but the following restraints have been met on both shippers' and carriers' sides:

Shippers of chemicals are well acquainted with 20' - 40' containers that are largely used for their intercontinental businesses, but they consider these standards to be incompatible with the equipment required in European trades.

The loading factor is determinant, and in this respect the respective characteristics of trailers and containers give an advantage to the former, with cubic volumes up to 90 cbm or even 110-120 cbm (light cargoes) and tonnage capacities up to 44 tons (gross) for cargoes adapted to the Europallet dimensions, whereas 20'/40' boxes are limited to 30/33 cbm and 20/25 weight tons of non Europallet-fitted cargoes.

Depending on their specific cargo unit measurements and weights, some shippers are advocating for 30' boxes that could be carried by two on trailers for inland transport, while others are in favour of 35' or 45'. Those new standards are not easy to handle in ports and to carry onboard of the existing containerships, and both harbours and vessels would need technical works for a better adaptation.

Overall, the large majority accuses also the lack of flexibility of container services for short distance transport. This refers to slowness, low frequency and delays of port operations/transfers from vessels to trailers and vice versa. The low price argument would not be sufficient to overcome these technical obstacles.

Liner Companies operating deep-sea services are concentrating on this international business, so that their marketing and administrative organisations are not fitted to meet the requirements of two different markets. Shortsea operators are certainly looking for additional cargoes, but this would represent:

- Special equipment such as reinforced/tank boxes would be needed by shippers of chemicals/dangerous cargoes;
- Supplementary logistic and marketing costs: several European customers versus a few number of Maritime lines do represent an important investment in the provision of containers, sale force, door-to-door services;
- Intra-European trades are not treated likewise transhipped cargoes, and the latter should not reduce performances required by long haul Lines for the former;
- Procedures at ports are not the same for the two types of containers, e.g. dangerous products and/or shortsea cargoes require specific operations and even movements between berths.
- The procedural handicap versus road is aggravated for containers in general, and this is a common problem with the Ro-Ro alternative (see below).

Opportunities for shortsea transport

The issue of transfer from trailers to containers appears to lead to a general feeling from the two sides - chemical industry and maritime operators - that there is no much room for possibilities, but the technical and commercial arguments raised appear to be questionable:

- Deep-sea Lines' organisation (transhipments, interlining) is certainly quite specific, but carriers do have empty slots between two or all of the three ports, and they could offer transport at very low costs along similar processes as some are already following in the North Continent, when they use their marketing capacities for both intercontinental and intra-european trades vis-à-vis their "global" customers (and indeed the chemical industry tends to be more and more "global", especially for intra-firm fluxes).
- Shortsea operators are in the same position, and those who are not dedicated to deep-sea carriers have the advantage of being quite close to European/Mediterranean markets.
- Curiously, there is no in-depth study of the competitive advantages in term of costs, regularity and safety of containers as compared with the prices and risks of road, would allow to assess if these advantages may overcome the obstacles and be put forward as convincing arguments vis-à-vis the chemical industries who would then be in a position to study the possibilities of modifying their logistical behaviours.

5.1.3 RO/RO SERVICES

Technical restraints and obstacles

i) On the supply side: These are of two types:

- Geographical: too short distance between the three ports.
- Naval: too low speed and capacity of vessels.

Distances compared with road kilometres and transit-times according to vessels' speeds are reproduced in Section 4.

Capacities of the fleet currently available on the market are collected in Table 5.1 (next page).

Service patterns may correspond to a wide range of schedules, but previous studies have proven that fixed-days/fixed times or preferably daily/fixed times services (maybe with the exception of Sunday) are a minimum obligation for a dependable offer.

Table 5.1. Capacities of the fleet currently available on the market.

	Minimum	Maximum	
Ro-Ro freighters	1,200 - 90	2,200 or more 165	Line or Meters Trailers
Ro-pax	1,200 - 80 40	2,200 or more 150 200 or more	L.M. acc. vehicles beds and pax facilities
All	14	22 or more	Knots

The only service currently operating between two of the three ports (Barcelona-Genoa) is fitting to those requirements, with a daily frequency in both directions performed by vessels running speed adapted to the distance. Vessels allow 16 knots for 22 hours - 18 knots for 20 hours, leaving 2 to 4 hours for port operations.

The shorter distances Barcelona/Marseille-Fos and Genoa/Marseille-Fos would require respectively:

- above 19 knots/10 hours for Barcelona
- above 21 knots/10 hours for Genoa

i.e.:

Vessels to be deployed on those distances to be faster ships with higher chartering and bunker costs.

Alternatively cheaper/slower but underemployed vessels.

The only possibility to offer daily sailings adapted to all three routes would be to retain two ships with a minimum speed of 21-22 knots employed at low speed between Genoa and Barcelona.

Former studies have demonstrated that this issue is a major one for determining the number, technical characteristics and capacities of the fleet to be deployed, and therefore the service costs, which may vary from one to three according to parameters like type (freighter vs Ro-pax), speed/consumption etc, of ships.

Concerning regulations, there is not a well establish legal framework on how to proceed with the dangerous cargo loaded onboard of Ro-paxes ships/car-ferries or pure Ro-Ro freighters, or at least chemical industry has not a clear idea about the general procedures to deal with this sort of cargoes.

ii) On the shippers' side

When defined as road hauliers who have the choice of the mode and route of transport (as a result of the outsourcing trend in the chemical industry), and interviewed about their perception of the maritime mode, they favour the driven-trailers formula, (i.e.: Ro-paxes), nightly crossings (to cope with the legal resting obligation) and the longest sea distances (Barcelona -Genoa). All are advocating that flexibility will maintain the advantage of road haulage above almost any cost or incentive argument, and unless restrictions/prohibitions were forcing them to opt for other intermodal techniques.

The image of the maritime sector is not positive: port costs and social troubles, complicated administrative procedures are quoted more frequently than the price barrier.

Actual shippers (i.e. the Chemical industry) seem to be more sensible to the safety and environment arguments, and the recent accidents in the Alpes are accentuating their need to be aware of alternative solutions. However, this remains to be confirmed since they are not instructing their carriers (forwarding agents, logistic operators, road hauliers) to study shortsea solutions.

Due to their own internal processes, shippers and road hauliers are very demanding on the reliability of maritime services:

Fixed time of arrival must be guaranteed as the whole chain is depending on it.

Some weekdays are more intense than others: Fridays and Saturdays (i.e.: sea transport on Saturdays and Sundays), particularly when trailers are moving onboard of vessels while they would face inland restrictions.

Night crossings (already mentioned).

Fast port transit procedures and operations, i.e. the simplest documentation processes (equivalent to all road), reduced controls etc... which should be arranged for 100 % intra-European trades. In this respect, Port and Customs Authorities are said to be flexible on a case by case basis and much more open for U-E procedures than for extra-U-E controls.

Reduced risks of damages: this is said to be a major issue at some berths only of the three ports (e.g. Marseilles not Fos); alternatively fast and favourable treatments of litigations, which are much simpler and to the advantage of cargoes for road transport than for sea shipping.

For all the above segments of the market, and although this was not the purpose of the study, a first approach of shipping and port costs has been made.

From this strict point of view (i.e. without consideration of other parameters such as external costs and door-to-door transit-time and operations), this results in more advantageous conditions in favour of shortsea shipping for port-to-port transport for the following cases:

- i) for bulk tonnages in the range of about 800-1000 w. tons and above.
- ii) for containers when using empty boxes and unused slots, while for dedicated services all depends on the vessel's filling ratio, which has to be above 50-60%.
- iii) For trailers Ro-Ro services of both types (with and without drivers) under the same 50-60% occupation rate condition.

5.2 VIEWS OF THE EUROPEAN COMMISSION

5.2.1 LAST REPORT ISSUED BY THE EUROPEAN COMMISSION

The last report issued by the European Commission (ref. COM (1999) 317 Dated 29th June 99) addresses the progresses made by the Shortsea Shipping sector since the former report (1997).

The first annex of this report addresses a set of complementary measures recommended by the Commission. Some of these measures are reproduced as follows.

Work intensively for the **integration of shortsea shipping in multimodal transport chains**. Offer global solutions, door-to-door services to customers with a high degree in the quality of service. regularity and frequency.

Promote the co-operation between the different modes of transport and parties in the logistic management, to be able to offer general door-to-door services through "unique windows".

Spread more information concerning the shortsea shipping and the available services. Promote the round-tables and other information parties as well as the development of an internet web-site with updated information about shortsea shipping services.

Study the possibility to create new terminals at ports specially destined to shortsea shipping trades, with specific installations and equipment. In this case, Port Authorities should integrate the shortsea shipping in their commercial strategies.

Improve the efficiency at ports to be able to offer a shortsea shipping service suitable to customers operating under the *just in time* logistic.

Set up a framework to identify port best practices and make them known to port users.

Promote the use of EDI in the shortsea shipping to speed up the administrative procedures.

The Commission will also keep on going in the study of the comparative costs between the different modes of transport, to uniform them under the same principles.

5.2.2 CONCLUSIONS FROM THE CODISSART PROJECT

In November 1998, the Maritime Research Centre, Southampton Institute (UK) and the Partners: Cork Nautical Enterprise Centre (Ireland), Oldenburg Institute of Maritime Studies (Germany), University of Turku (Finland), University of Alicante (Spain) and University of Pireus (Greece) issued the conclusions of the Project CODISSART "Comparison of documentation in short sea shipping and road transport", a report for the Directorate-General for Transport (DG VII), The European Commission.

In this report are included some recommendations to facilitate the shortsea trade that are reproduced as follows:

1. Ships engaged in intra-EC voyages and carrying EC cargo should not be required to formally report in or clear outwards. Formal reporting inwards and clearance outwards should only take place at the first port arriving in the EC and last port departing from the EC.
2. EU Member States should adopt a common set of ship arrival and departure forms based on IMO FAL forms 1,3,4 & 5.
3. All EU Member States allow the ship to commence discharge of cargo on arrival, and not require ship reporting in procedures to be completed first.
4. The European Commission should urge Member States, the IMO and classification societies to rationalise the number of certificates and documents that a ship is required to carry.
5. All EU Member States should accept the alternatives to the Single Administrative Document (SAD) for proving the Community Status of the Cargo (T2L), i.e. annotated commercial transport documents such as cargo manifest and bill of landing.
6. The provision of EDI facilities for the declaration of imports (Direct Trader Input) should be made available in regional ports of the EU.
7. The routine inspection of ship's safety certificates on arrival and/or departure should be discontinued on 1 July 2002.

5.3 VIEWS OF THE SHORTSEA SHIPPING INFORMATION BUREAU

According to the Shortsea Shipping Information Bureau⁷, focal points to improve the development of the shortsea shipping include items that are quite similar to those encountered in the study, though sometimes formulated differently and more or less underlined.

1. Infrastructure –interface between different types of transport.

Shortsea transport is by nature intermodal, i.e. it uses mainly containers and trailers. Port terminals that cater for the shortsea trade must be able to guarantee a smooth transfer between different transport methods in order to keep costs as low as possible.

2. Maritime services in ports.

In many ports, maritime services (such as pilotage, boatsmen) are controlled by the port authority or have a monopoly position. Prices are therefore largely non-negotiable. Pricing should be competitive, based on market forces.

3. Information Technology / EDI.

Various studies have been made, but what is needed is active promotion to implement IT in the EU and preferably the use of standard EDIFACT messages.

4. Cargo unit.

In order to compete with road transport, the box that carries the cargo on intermodal services needs to be compatible with other transport modes. Containers should be pallet wide with an internal width of 2.44m in order to compete with trailers capable of carrying 20 pallets of 1.20m. The equivalent of a 13.60 trailer is a 45 ft pallet wide container, although in the 1996 the EU issued a directive banning the use of 45 ft boxes on European roads within 10 years.

5. Harmonisation (local taxes).

Local cargo dues, which are levied only on cargo arriving by sea, should be abolished.

6. Customs documentation / control.

As ports in the EU are considered to be outside community borders, they are subject to customs control, even when a vessel sails between two EU ports. In contrast, a trailer on the same route over land does not encounter any customs control.

7. Technical innovation.

Technical innovation, such as increasing ships' speed, can not only improve the competitiveness of shortsea shipping but also reduce the impact on the environment. Innovations that will only be economically feasible in the longer term, such as new loading and unloading systems and ship design, are also important.

⁷ Shortsea Shipping Information Bureau, The Netherlands, <http://www.shortsea.nl>

8. Availability of cargo flow statistics within the EU.

Since 1993, local statistics for the flow of goods have not been available. However, this information is of vital importance to new intermodal services, whether sea, rail or barge, since they need large volumes to create the required frequency and pricing.

9. Administrative burdens.

Some port authorities cause delays and hinder fast transit times by requiring extra information from local agents. The outcome of an EU study “on documentary and procedural requirements in shortsea shipping” is therefore important. More significant is the need for a follow up to create a “level playing field” for all types of transport.

10. Fiscal incentives for pre- and after carriage.

Intermodal transport generally has higher costs because of the extra physical handling required. To compensate for this, trucks that carry containers to and from railheads could be exempted from extra road taxes or be allowed to carry a higher payload (e.g. 44 tonnes gross).

11. Environment.

Environmental concerns are central to EU policy and important to every EU member. Shortsea Shipping, which is an environmentally friendly mode of transport in several respects, should therefore be on the agenda for more governmental attention and action. Modern ships are themselves built to high standards to reduce pollution and each ship, carrying the cargo of many trucks, plays a significant role in relieving congestion and pollution on the roads of Europe.

Among the above, a tentative classification of the main required criteria for the transfer of chemical products to the sea shipping option, as a result of the study:

4. Cargo Unit.
1. Infrastructure –interface between modes.
6. Customs documentation / control.
5. Harmonisation.
2. Maritime services in ports.

5.4 CONCLUSIONS RESULTING FROM THE EXPERIENCE GAINED DURING THE PROJECT

- It is not infrequent for companies to ignore the mode of transport used in the distribution of their products. Forwarding agents / logistic operators often offer the distribution without the specification of the mode of transport.
- Companies governing the distribution of their products feel they don't have enough volume to study the maritime transport although in most cases several trailers are chartered every week. Companies operating under request feel maritime transport not adequate for their purposes.

Lack of information is therefore seen as a major point to be improved. Proposed actions to deal with this subject are collected in section 6.2.

- The maritime transport is seen as more complicated than road transport: port handling operations, social troubles, strikes, unclear and complicated administrative procedures, all contribute to a lack of confidence in the maritime sector.

Again the unfamiliarity with the maritime transport appears as a major barrier to be solved by the three ports; more presence in the media and the organisation of common events could help to bring near the maritime world to the chemical companies.

- Lack of flexibility of container services for short distance transport: the delays of port operations / transfers from vessels to trailers and vice-versa are seen as major points to be improved. Higher efficiency and frequency are required. Major aspects are:
 - Administrative procedures and documentation processes should be simplified and a reduction of controls should be implemented. Transit procedures and operations should be equivalent to those existing in all road transport.
 - A dependable offer should be set up through fixed-days / fixed times or preferably daily / fixed times services.
 - Fixed time of arrival must be guaranteed.
 - Promote shortsea transport on Saturdays and Sundays, to move trailers onboard of vessels while they would face inland restrictions.
 - Handling operations should be improved to reach a higher efficiency and safety to reduce risks of damage to cargo.

More in depth studies to gather companies' requirements are seen as necessary to develop a suitable product for logistic managers. Proposals for the implementation of an unique interlocutor are collected in section 6.2.

- There is not a clear framework concerning the legislation on the maritime transport of dangerous goods. There is a common feeling that the transportation of these kinds of goods is problematic in containerships and Ro/Ro vessels.

The three ports should investigate further the legislation concerning the transport of chemical products in containerships and Ro/Ro vessels in order to develop a clear offer to the logistic agents that are actually confused.

- Chemical Industry appears to be more sensible to the safety and environmental arguments, and recent accidents in the Alps are accentuating its need to be aware of alternative solutions.

New legislation concerning the transport of hazardous cargoes by road is being currently developed by the European Commission. Ports should stress this fact to the logistic managers in order to promote the shortsea shipping as an environmentally-friendly way of transport. Measures to achieve this are collected in section 6.2.

6. CONCLUSIONS

6.1 CONCLUSIONS OF THE PRELIMINARY STUDY

In this chapter the main conclusions arising from the study are summarised. A brief synthesis of the work done is presented in several headings:

- 1a. There is a potential global market for the development of the shortsea shipping in the Mediterranean corridor. The large amount of goods transported in this area justifies the adoption of measures to promote the shortsea shipping in the area of study.

Table 6.1. Potential input/output of the three ports arising from the study.

POTENTIAL MARKET FOR SHORTSEA SHIPPING (in Tons)	to REGION 1 BARCELONA	to REGION 2 GENOA (Italy)	to REGION 3 MARSEILLE
from REGION 1 BARCELONA	<i>TOTAL INPUT BARCELONA</i> 444,731	Chapter 6 27,662	Chapter 6 30,069
		Chapter 7 20,121	Chapter 7 6,604
	<i>TOTAL OUTPUT BARCELONA</i> 458,716	Chapter 8 314,244	Chapter 8 60,016
	TOTAL	362,027	TOTAL 96,689
from REGION 2 GENOA (Italy)	Chapter 6 21,418	<i>TOTAL INPUT GENOA (Italy)</i> 1,570,798	Chapter 6 387,135
	Chapter 7 12,182		Chapter 7 21,648
	Chapter 8 192,962	<i>TOTAL OUTPUT GENOA (Italy)</i> 921,969	Chapter 8 286,624
	TOTAL 226,562	TOTAL 1,208,771	TOTAL 695,407
from REGION 3 MARSEILLE	Chapter 6 15,401	Chapter 6 241,785	<i>TOTAL INPUT MARSEILLE</i> 792,096
	Chapter 7 34	Chapter 7 15,256	
	Chapter 8 202,734	Chapter 8 951,730	<i>TOTAL OUTPUT MARSEILLE</i> 1,426,940
	TOTAL 218,169	TOTAL 1,208,771	

Chapter 6: Ores, building materials, raw materials for the chemical industry.

Chapter 7: Fertilisers.

Chapter 8: Chemical products.

* Oil products haven't been considered in the study.

1b. The congestion on the Mediterranean roads has reached unmanageable levels. The risk for the population has been continuously increasing as the amount of hazardous goods transported by road has increased in the last decades.

Recent casualties in the tunnels of Mont-Blanc and Tauern have demonstrated that new logistic solutions have to be promoted, specially in the area of study, where for some routes in the Marseille-Genoa connection tunnels account for more than 50% of total length.

The area of study is also chosen by a big amount of population as a route not only in their summer holiday but during the whole year, as it provides access to important tourist areas in the Mediterranean.

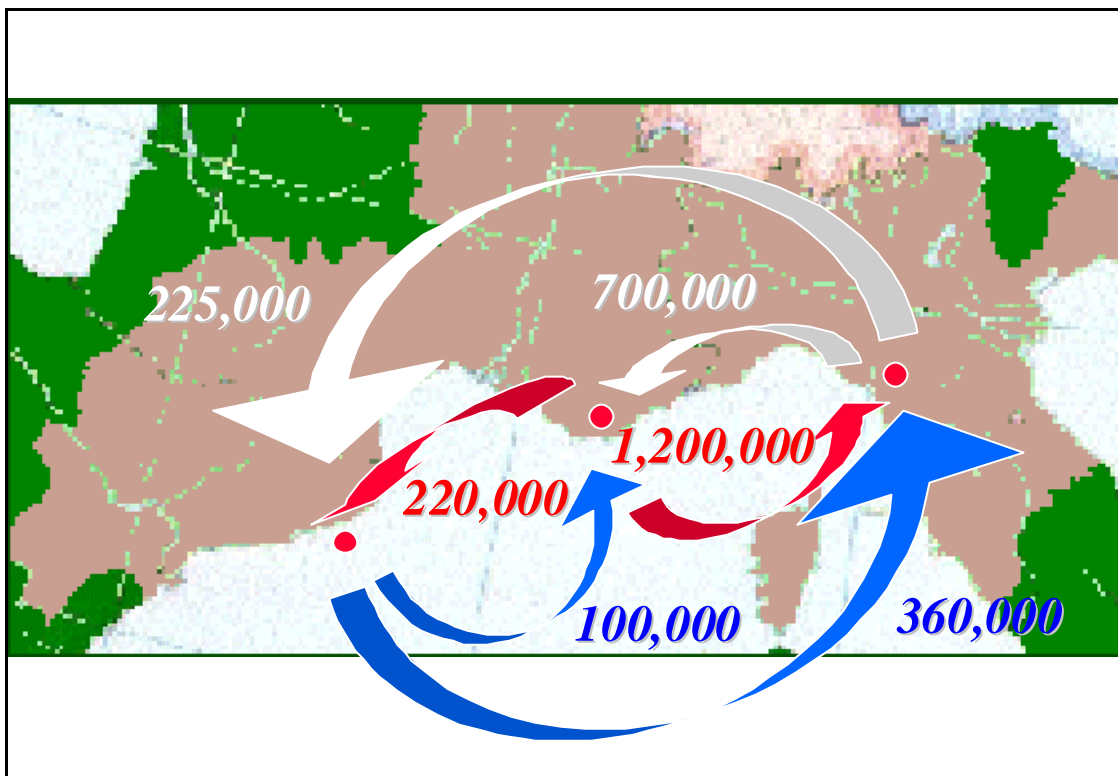


Figure 6.1 Potential market in tons (road and rail fluxes) for shortsea shipping in the Mediterranean corridor.

2a. The potential market is segmented depending on the adaptation of products to shortsea techniques: containers / trailers / bulk.

Ro-Ro regular liner services appear to be the most suitable response to the transfer of cargoes from the current all-road schemes to shortsea alternatives. A tentative segmentation of the market concerning chemical products could be studied to better fit the transportation requirements for each group of products.

2b. The stakeholders are also various: big shippers, forwarding agents, road hauliers, chemical companies,... and also their requirements may be different: bulk, standards of containers, accompanied / unaccompanied trailers,... The setting up of a working group is seen as a suitable measure to better gather the views of each agent.

3. A preliminary analysis of costs reveals that shortsea transport is more expensive than road transport for the route Barcelona-Genoa; a surcharge of approximately 40% has been detected in this preliminary study of costs.

However, this surcharge could change in the future with the adoption of special measures - taxes for the use of roads in road transport, promotion of shortsea as an environmental-friendly mode of transport-. In this case the shortsea shipping transport could be considered as a feasible option to reduce the congestion of the Mediterranean roads also in terms of costs.

Table 4.9. Comparison of costs for each mode of transport in the Barcelona-Genoa route.
Costs expressed in EURO.

Barcelona -Genoa route	Trailer (16,5m)	40' Container
Railway	----	1300 - 1500
Road	900	----
Shortsea (Ro -Ro)	1300	1200

4. There is a lack of supply of maritime shortsea shipping services:

- Not for bulk.
- Although there are some regular lines that call the three ports, they don't do real shortsea shipping, as they call many other ports and don't have the requirements of regularity, transit time and frequency required by the shortsea.
- Although there is a connection between Genoa and Barcelona with a Ro-Ro, there is not a real shortsea chain as it is specially devoted to the passengers traffic.
- The connection Barcelona-Genoa is more feasible than the shorter ones, followed by Genoa-Marseille in view of the important volume and congestion on the coastal motorways. This point of view, however, has to be analysed more in depth, as there are some examples where short routes are preferred instead of long ones (Italy/Toulon instead of Italy/Marseille for traffics crossing the Vallée du Rhône).

- Moreover, there are some characteristics that make attractive the route Genoa/Marseille for the shortsea shipping:
 - Large amount of goods transported (more than Barcelona/Genoa route).
 - Great number of tunnels along the road (more than 50% of total length in some routes).
 - High concentration of traffic along a tourist and populated coast.
 - Near 2/3 of total traffic are chemical products.
5. Among both parties requirements (cargo interests and sea-transport parties), some may be satisfied trough strong port initiatives: common treatment of cargoes, vessels, information,...

A new logistic chain could be developed with all parties of the chemical industry and transport operators (road, ports, shipowners). The framework in which shortsea shipping could be developed should comprehend a common platform between the three ports, with an harmonisation of tariff and administrative procedures, dedicated quays / terminals, intermediate temporary storage facilities, etc.

6.2 ACTIONS TO PROMOTE THE SHORTSEA SHIPPING IN THE MEDITERRANEAN AREA

- Improve the image of the maritime sector through the promotion of bilateral or better multilateral contacts with interested parties: industry logisticians, F/As and road hauliers, ports and vessel operators. Port Authorities could initiate these contacts with the chemical industry and sea shipping actors with the purpose of using the transport of chemical products for attracting other road cargo flows.

Proposed Actions

*Setting up an **Intermed Shortsea Information Bureau** (as the Shortsea Shipping Information Bureau in The Netherlands) amongst the three ports to promote Shortsea shipping (funded by the CE). This unit should work in close co-operation with the companies to find what should be done to make "things easier", to keep them informed, clarify doubts, etc.*

The three ports should promote further studies for a better knowledge of the services the companies are aiming at, and look for suitable solutions to cover the companies' desires.

- Support and, under the shelter of Public Authorities (European Commission, National or Regional Governments,...), drive all Parties' efforts and contributions towards transferring from all road option to road-sea multimodal solution.

Proposed Actions

Ports and involved Authorities should approach their views, perspectives and actions concerning the shortsea transport and arrange a presentation of the results of the study and the shortsea shipping features to a representation of the local chemical industry through chemical associations, federations, etc.

- The opportunity of a strong environmental concern surrounding road transports of chemicals should be seized for developing innovative solutions which have already been discussed within each of the three ports or between them, such as:
 - Shortsea and / or chemical dedicated quays and terminals in each port.
 - Unique types of operations and procedures for loading, unloading, storing, connecting with inland modes, safety, etc.
 - Communication and enforcement of a positive image.

Proposed Actions

Setting up a "unique window" to deal with the whole administrative procedures and burdens of shortsea traffic. Shortsea operations amongst the three ports should be

arranged in each port through an "unique window". One interlocutor should be able to arrange all the steps in the transportation of a chemical product from origin to destination.

All these measures should summarise in a common platform between the three ports: harmonisation, dedicated quays / terminals, storage facilities, etc.

- Harmonisation, simplification, speedy efficiency and safety have to be key words for ports to deal with shortsea trades.

- Develop and present the shortsea shipping as a new product offered by ports:
 - An unique interlocutor: an unique agent that arrange the whole chain, i.e. collection at factory A, delivery at Port A, Port A to Port B, delivery at factory B.
 - Assure frequency / regularity / reliability of shortsea service.

Proposed Actions

INTERMED could arrange a workshop/day session to discuss the practical day-to-day problems concerning the transport of hazardous materials in each one of the three ports.

Measures to be implemented in order to simplify the administrative procedures and increase the safety in ports as well as challenges for the future will arise as a result of this workshop.

All these measures should summarise in a new logistic chain built up with all parties of the chemical industry and transport operators (road, ports, shipowners).

- Promote the use of Ro/Ro services as a short-term solution to road congestion, allowing only unaccompanied units. With this measure major cargo capacity is reached. Studies should be developed to assess the possibility of vessels exclusively dedicated to the transportation of chemical products, either containerhips or Ro-Ro.

- Promote studies on the feasibility of adoption of new cargo units, as containers of 30 / 45 feet, or wide pallet containers.

Proposed Actions

The three ports should study more in depth the different characteristics of containers and trailers to find the different requirements of both traffic and develop suitable solutions for each of them.

The three ports should study more in depth the different requirements of IMO and ADR Codes. Requirements observed in the ADR Code should also be valid in the multimodal (including sea voyage) transport and no extra procedures should be required to the client. If extra procedures were required, ports should provide them.

6.3 COMMENTS ON PORTS

Although the operating conditions of the three ports are not formally described in the report, they are mentioned in several occasions, and most of the recommendations made are actually concerning the ports themselves.

The conclusions of this preliminary study and the revision of some documentation indicate that:

- Navigation conditions are well fitted for all types of shortsea vessels (bulkers, Ro-Ro, containerships).
- Loading/unloading equipment is also properly adapted but some connections between piers and terminals/storage facilities maybe distant and costly, e.g. for multi-tanks and for Ro-Ro ships accepting drivers/passengers. The most sensitive cases are when vessels must move between two berths (which is also time-consuming), and for secured intermediate temporary storage areas for dangerous products.

In this respect, the suggestion to establish dedicated quays and terminals for shortsea chemicals would raise a series of technical problems that must be examined with care in order to avoid complication in vessels' port calls, e.g. separate berthing for chemicals/dangerous and other cargoes (or drivers).

- Another series of questions to be addressed are the working conditions: all shippers interviewed have complained about the social troubles, this is a major concern for port users. The argument is that in case the first tests of shortsea shipping were to suffer from discontinued deliveries, they would be forced to immediate and durably return to road transportation.
- Working time is also an important factor: if one of the main arguments in favour of the maritime mode is the possibility to move cargoes 7 days a week and 24 hours a day, this is far from being the case for port operations, and this inconvenience may cancel the former advantage. Each of the three ports has its internal analysis of the possibilities to enlarge the working hours and to be more flexible depending on local conditions. This concerns Port Authorities, Custom Administrations, other control bodies and all port operators.
- Lastly, Quality Management schemes are applied by some of the port operators (e.g. for pilotage and towage in Marseille) but not by all (e.g. some storage or forwarding companies only). In this sense, the global certification process implemented in the port of Barcelona is quoted as the best practice.

6.4 SUGGESTIONS FOR FUTURE STUDIES ON THE SHORTSEA SHIPPING

From the Port point of view, it would be particularly appropriate to work out in the following subjects in a phase II study on the basis of the most interesting conclusions:

1. Collect and update the figures for the fluxes of 1997 and 1998.

Suggestion

Accurate study of costs associated to each mode of transport taking into account the volume of fluxes.

2. Study more in depth the feasibility to develop maritime services to supply the various market services:
 - Ro-Ro services, i.e. pure transfer of the same technique from all road to road + sea solution, accompanied/unaccompanied trailers. Identification of dangerous products that may/may not be carried according to the regulations and revised potential market, accordingly in order to be more precise on the target cargoes on trailers.
 - Containers, i.e. change of logistic schemes of shippers. Comparison with trailers door-to-door chains (costs, processes, procedures, delays, inland connections, etc.)
 - Bulk, through massification of trades currently moving in tank-trailers: tank storage facilities in ports, inland connections, etc.

Suggestion

Settle down the requirements to set up a pilot project, i.e. a "pilot shortsea chain" between the three ports for the transportation of chemical products.

3. Arbitration between: i) dedicated exclusive service for chemical products, or ii) the chemical industry as a pilot trade to be followed by other industries cargoes and based on the best standard / guarantees (safety) required by chemicals.

Suggestion

Study a possible segmentation of chemical products into different categories with different transport and logistic requirements.

4. A more in depth approach of shippers and of their transport suppliers in order to ascertain their commercial interests and involvement in the project.

Suggestion

Study the involvement of other parties in the study: ports, shipowners/forwarders/chemical companies,... settle down a working group with representatives of all parties in the logistic chain.

5. Harmonisation of the 3 ports practices: operations, procedures, formalities, dedicated terminals, quays, safety issues, etc... up to possible common certification / charters for the three ports,.

Suggestion

Study the adoption of common administrative measures in the three ports to deal with the shortsea traffic.

*Study the development of an **Intermed Shortsea Information Bureau** (as the Shortsea Shipping Information Bureau in The Netherlands) amongst the three ports to promote Shortsea shipping (funded by the CE) in the Mediterranean. Settle down the requirements of this Bureau, services to be provided, costs, etc.*

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